OULU 2015
B 133

ACTA UNIVERSITATIS OULUENSIS

B
HUMANIORA

Noora Hirvonen

HEALTH INFORMATION MATTERS

EVERYDAY HEALTH INFORMATION LITERACY AND BEHAVIOUR IN RELATION TO HEALTH BEHAVIOUR AND PHYSICAL HEALTH AMONG YOUNG MEN

UNIVERSITY OF OULU GRADUATE SCHOOL;
UNIVERSITY OF OULU,
FACULTY OF HUMANITIES,
INFORMATION STUDIES;
EUDAIMONIA RESEARCH CENTER;
MEDICAL RESEARCH CENTER OULU;
OULU DEACONESS INSTITUTE,
DEPARTMENT OF SPORTS AND EXERCISE MEDICINE

ACTA UNIVERSITATIS OULUENSIS
B Humaniora 133

NOORA HIRVONEN

HEALTH INFORMATION MATTERS

Everyday health information literacy and behaviour in relation to health behaviour and physical health among young men

Academic dissertation to be presented with the assent of the Doctoral Training Committee of Human Sciences of the University of Oulu for public defence in Keckmaninsali (HU106), Linnanmaa, on 5 December 2015, at 12 noon

UNIVERSITY OF OULU, OULU 2015

Acta Univ. Oul. B 133, 2015

Supervised by
Professor Maija-Leena Huotari
Doctor Raimo Niemelä
Professor Raija Korpelainen

Reviewed by
Professor Ágústa Pálsdóttir
Professor J. David Johnson

Opponent
J. David Johnson

ISBN 978-952-62-1039-1 (Paperback)
ISBN 978-952-62-1040-7 (PDF)

ISSN 0355-3205 (Printed)
ISSN 1796-2218 (Online)

Cover Design
Raimo Ahonen

JUVENES PRINT
TAMPERE 2015

Hirvonen, Noora, Health information matters. Everyday health information literacy and behaviour in relation to health behaviour and physical health among young men

University of Oulu Graduate School; University of Oulu, Faculty of Humanities, Information Studies; Eudaimonia Research Center; Medical Research Center Oulu; Oulu Deaconess Institute, Department of Sports and Exercise Medicine

Acta Univ. Oul. B 133, 2015

University of Oulu, P.O. Box 8000, FI-90014 University of Oulu, Finland

Abstract

This study increases the understanding of young men's everyday health information literacy and behaviour in relation to their health behaviour, physical health, and socio-demographic characteristics. The conceptual framework of the study builds upon theories of information behaviour, practices and literacy, and health behaviour change.

The empirical data were collected with questionnaires (n = 3,293) and physiological measurements (n = 3,063) in 2010 to 2013 at the Finnish Defence Forces' call-ups, where a population-based sample of young Finnish men could be reached. Everyday health information literacy was studied using a previously developed screening tool, and with a focus on its relationship with health behaviour and physical fitness. Information behaviour was investigated in the context of physical activity, and in relation to men's readiness to change exercise behaviour according to the Transtheoretical Model. Statistical analyses of the data include multivariate regression analyses, and a critical realist approach was adopted in interpreting the results.

The results show that general upper secondary education and higher socio-economic position of a parent increase the likelihood of good health information literacy. Health information literacy is positively associated with health-promoting behaviour and health independent of socio-economic position; confidence in one's abilities to find, evaluate and use health information is associated with regular exercise and healthy eating habits, and good physical fitness, for example. In the context of physical activity, the practices used to acquire information are associated with the stage of exercise behaviour change. Men in the maintenance stage seek information most actively. Information avoidance, in turn, is connected to low health information literacy, not to the stage of change.

The study provides novel knowledge on healthy young people's everyday health information literacy and behaviour, and on their relationship. It is among the first to investigate health information behaviour in the stages of behaviour change and health information literacy in connection with objectively measured fitness. It proposes a framework for future studies on the relationship between health information literacy and behaviour, and health information outcomes. The results may be utilised when designing tailored health communications and health information literacy education.

Keywords: adolescent, health, health behaviour, information behaviour, information literacy, men, physical fitness, young adult

Hirvonen, Noora, Terveystiedolla on väliä. Nuorten miesten arkielämän terveystiedon lukutaidon ja terveystietokäyttäytymisen yhteys terveyskäyttäytymiseen ja fyysiseen terveyteen

Oulun yliopiston tutkijakoulu; Oulun yliopisto, Humanistinen tiedekunta, Informaatiotutkimus; Eudaimonia Ihmistieteiden tutkimuskeskus; Medical Research Center Oulu; Oulun Diakonissalaitos, Oulun Liikuntalääketieteellinen Klinikka

Acta Univ. Oul. B 133, 2015

Oulun yliopisto, PL 8000, 90014 Oulun yliopisto

Tiivistelmä

Tutkimus lisää ymmärrystä siitä, millainen yhteys nuorten miesten arkielämän terveystiedon lukutaidolla ja terveystietokäyttäytymisellä on terveyskäyttäytymiseen, fyysiseen terveyteen ja sosiodemografisiin tekijöihin. Sen käsitteellinen viitekehys rakentuu tietokäyttäytymisen ja -käytäntöjen, terveystiedon lukutaidon sekä terveyskäyttäytymisen muutoksen teorioille.

Tutkimuksen aineisto kerättiin kyselyillä (n = 3 293) ja fysiologisilla mittauksilla (n = 3 063) vuosina 2010–2013 Puolustusvoimien Oulun alueen kutsuntatilaisuuksissa, joissa oli mahdollista saavuttaa suomalaisten nuorten miesten väestöpohjainen otos. Terveystiedon lukutaitoa arvioitiin aiemmin kehitetyllä seulontavälineellä sekä suhteessa terveyskäyttäytymiseen ja fyysiseen kuntoon. Terveystietokäyttäytymistä tarkasteltiin liikunnan kontekstissa ja suhteessa transteoreettisen mallin mukaiseen liikuntakäyttäytymisen muutosvalmiuteen. Aineistot analysoitiin tilastollisesti monimuuttujamenetelmin, ja tuloksia tulkittiin kriittisen realismin näkökulmasta.

Tulokset osoittavat, että lukiokoulutus ja korkeassa sosioekonomisessa asemassa oleva vanhempi lisäävät hyvän arkielämän terveystiedon lukutaidon todennäköisyyttä. Terveystiedon lukutaito on positiivisesti yhteydessä terveyttä edistäviin elintapoihin ja terveyteen sosioekonomisesta asemasta riippumatta. Luottamus omiin kykyihin löytää, arvioida ja ymmärtää terveystietoa on yhteydessä muun muassa säännölliseen liikuntaan ja terveellisiin syömistottumuksiin sekä hyvään fyysiseen kuntoon. Liikunnan kontekstissa terveystietokäytännöt kytkeytyvät käyttäytymisen muutosvaiheeseen. Aktiivisimmin liikuntatietoa hankkivat liikuntakäyttäytymisen ylläpitovaiheessa olevat. Tiedon välttäminen sen sijaan on yhteydessä alhaiseen terveystiedon lukutaitoon, ei muutosvaiheeseen.

Tutkimus tuottaa uutta tietoa nuorten, terveiden ihmisten arkielämän terveystiedon lukutaidosta ja terveystietokäyttäytymisestä sekä niiden suhteesta toisiinsa. Uutta on myös terveystietokäytäntöjen tutkiminen terveyskäyttäytymisen muutosvaiheissa ja terveystiedon lukutaidon tarkastelu suhteessa objektiivisesti mitattuun fyysiseen kuntoon. Tutkimuksessa esitetään viitekehys tuleville tutkimuksille terveystiedon lukutaidon ja tietokäytäntöjen vaikutuksesta terveyteen. Tulokset ovat hyödynnettävissä räätälöidyn terveysviestinnän ja terveystiedon lukutaidon koulutuksen suunnittelussa.

Asiasanat: fyysinen kunto, informaatiokäyttäytyminen, informaatiolukutaito, miehet, nuoret, nuoret aikuiset, terveys, terveyskäyttäytyminen, terveystiedon lukutaito

Acknowledgements

I owe my thanks to many people who have helped, encouraged, and educated me during the research process that led to the doctoral dissertation at hand. The study was conducted at Information Studies, at the University of Oulu, during the years 2010 to 2015. It is also a part of the MOPO studies coordinated by the Department of Exercise Medicine at the Oulu Deaconess Institute. I am grateful for the support of these institutions. Moreover, I would like to acknowledge the financial support for this research provided to me personally by the Finnish Cultural Foundation and the Human Sciences Doctoral Program (EUDA-DP) at the University of Oulu, Finland, and for the MOPO study by the Ministry of Education and Culture, the European Social Fund, the European Regional Development Fund, and the Finnish Funding Agency for Technology and Innovation.

I would like to express my deepest gratitude to my main supervisor Maija-Leena Huotari. Maikki, I don't think I would ever have begun this project without your guidance and support. You have given me confidence and your creative ideas have inspired me throughout the process. I am also grateful to my second and third supervisors, Raimo Niemelä and Raija Korpelainen. Raimo, your wise insights and positive attitude have been important in many challenging situations. Raija, you have helped me learn a lot about research in the field of health, supported me, and, of course, you are the one to thank for the overall concept of the MOPO studies as well.

I also wish to express my gratitude to my other co-authors: Stefan Ek at Åbo Akademi University and Peter Bath at the University of Sheffield, thank you both for sharing your expertise and help with this research. Riitta Pyky and Riikka Ahola, thank you for your work within the MOPO studies, for sharing your knowledge and ideas, and for co-authorship. Heidi Enwald, you have been my closest co-worker during these five years, helped me in countless ways, and become a friend in the process.

All current and former co-workers and doctoral students at Information Studies, and members of the Health Information Mastering Oulu & Åbo (HIM-Oulu&Åbo), and the Institutions and Practices of New Literacies (INSPIRES) research groups have influenced my thoughts. Thank you Anna Suorsa, Anna-Maija Huhta, Erkki Karvonen, Helena Känsäkoski, Kreetta Askola, Laura Palmgren-Neuvonen, Maiju Haapaniemi, Markus Rytinki, Päivi Lohikoski, Riitta-Liisa Korkeamäki, Terttu Kortelainen, Vesa Suominen, and others. I also want to express my warm thanks to our own Humus café for providing a place to share ideas—and for all that coffee.

Furthermore, I would like to acknowledge the entire MOPO research group for their work in the project and specifically for arranging the data collection. I have particularly fun memories of the Finnish Defence Forces' call-ups where we had the time to share our thoughts and life histories in-between InBody and heart rate measurements and participant recruitment. I also want to extend my warm thanks to all the young men who took part in the study.

I wish to express my appreciation to the preliminary examiners of this thesis, Ágústa Pálsdóttir and J. David Johnson, whose comments helped to improve it. I would also like to thank Risto Bloigu of the University of Oulu for his support with the statistical analyses.

Finally, I would like to express my gratitude to my family and friends. I am privileged to have people like you in my life. Many thanks are due to our 'social exclusion prevention' group of former Information Studies students as well as to my friends from way back. My sister and best friend Iira, who also helped by proofreading the dissertation, you rock. My dear mother Tuula and her husband Pertti, you have been an important support for me through the years. I also owe my appreciation to my father Pekka and 'mother-in-law' Marjatta. Jyri, I thank you for being there for me in the highs and lows of my life. I dedicate this work to Mikael, the most important young man in my life.

List of original publications

I Hirvonen N, Huotari M-L, Niemelä R & Korpelainen R (2012) Information behavior in stages of exercise behavior change. Journal of the American Society for Information Science and Technology 63(9): 1804–1819.

II Hirvonen N[a], Enwald H[a], Bath P, Pyky R, Korpelainen R & Huotari M-L (2015) Individual factors affecting preferences for feedback message tactics in the contexts of physical activity. Journal of Health Communication 20(2): 220–229.

III Hirvonen N, Niemelä R, Ek S, Korpelainen R & Huotari M-L (2015) Socio-demographic characteristics associated with health information literacy of young Finnish men. Information Research 20(1): paper: isic25.

IV Hirvonen N, Ek S, Niemelä R, Pyky R, Ahola R, Korpelainen R & Huotari M-L. Everyday health information literacy in relation to health behavior and physical fitness. A population-based study among young men. Library & Information Science Research (manuscript).

V Hirvonen N, Korpelainen R, Pyky R & Huotari M-L (2015) Health information literacy and stage of change in relation to physical activity information seeking and avoidance: a population-based study among young men. Proceedings of the 78th Association for Information Science and Technology (ASIS&T) Annual Meeting, St. Louis, MO, USA, November 6–10, 2015.

[a] Shared contribution

In addition, unpublished data has been added to this doctoral dissertation.

Description of the author's role in each sub-study

In Study I, the first author was responsible for the overall study design, designed the information behaviour questionnaire, and translated/adapted the questionnaires related to readiness to change exercise behaviour. She participated in the collection of questionnaire data and conducted all the statistical analyses. With the help of the other authors she interpreted the results of the statistical analyses. She had primary responsibility in writing the article. Prof. Maija-Leena Huotari is the first author's main supervisor and guided the work at all phases. Dr. Raimo Niemelä is the first author's second supervisor. As experts in the field of information studies they were involved in designing the overall study including the questionnaires and drawing conclusions from the results. Prof. Raija Korpelainen is the first author's third supervisor and represents the field of sports and exercise medicine. She was the leader of the overall MOPO study and participated in the design of the questionnaire items, particularly those that relate to physical activity, and guided in the statistical analyses.

In Study II, the first author translated/adapted the questionnaires related to readiness to change exercise behaviour. She participated in the collection of questionnaire and measurement data. She conducted the majority of the statistical analyses with the help of Prof. Peter Bath from the University of Sheffield, UK. With the other authors, Prof. Bath and Dr. Heidi Enwald in particular, the first author interpreted the results. With Dr. Enwald she had the primary responsibility for writing the article. Hirvonen was in charge of writing those parts of the article that focus on the individual characteristics in relation to feedback preferences. Dr. Enwald designed the questionnaires related to the feedback message tactics, conducted part of the descriptive analyses and was involved in interpreting the results. She was in charge of writing those parts of the article that focus on tailored communication and feedback message tactics. Prof. Bath guided the first author in the regression analyses, contributed to the interpretation of the results and to writing the article. M.Sc. Riitta Pyky was responsible for the overall data collection in the MOPO study and contributed to writing those parts of the article that focus on the data collection. The main supervisor Prof. Huotari and the third supervisor Prof. Korpelainen had the similar roles as in Study I.

In Study III, the first author was responsible for the overall study design, participated in the collection of the questionnaire data, categorised the occupational data, and conducted all the statistical analyses. With the help of the other authors

she interpreted the results of the statistical analyses. She had primary responsibility in writing the article. Dr. Niemelä has been responsible for the design of the everyday health information literacy questionnaire together with Dr. Ek and Prof. Huotari. They all participated in drawing conclusions from the results and contributed to the writing of the article. Moreover, Prof. Korpelainen guided in the statistical analyses and contributed to the writing of the article.

In Study IV, the first author was responsible for the overall study design, participated in the collection of questionnaire and measurement data, categorised the occupational data, and conducted all the statistical analyses. With the help of the other authors she interpreted the results. She had primary responsibility in writing the article. Dr. Niemelä, Dr. Ek, and Prof. Huotari have contributed by desiging the everyday health information literacy questionnaire, and by participating in drawing conclusions from the results and writing. Moreover, Prof. Korpelainen guided the first author in the statistical analyses and contributed to the writing of the article. M.Sc. Pyky and Dr. Riikka Ahola were responsible for the collection of the questionnaire and physiological measurement data in the MOPO study. M.Sc. Pyky contributed to writing those parts of the article that focus on the questionnaire data collection. Dr. Ahola contributed to writing those parts of the article that focus on the physiological measurement data collection.

In Study V, the first author was responsible for the overall study design, designed the information behaviour questionnaire, and translated/adapted the questionnaires related to readiness to change exercise behaviour. She participated in the collection of questionnaire data and conducted all the statistical analyses. With the help of the other authors she interpreted the results. She had primary responsibility in writing the article. Prof. Korpelainen was responsible for the MOPO study and contributed to the writing of the article. M.Sc. Pyky was responsible for the collection of questionnaire data in the MOPO study. She contributed in particular to writing those parts of the article that focus on the data collection. Prof. Huotari guided the work at all phases. She participated in the design of the everyday health information literacy questionnaire and in drawing conclusions from the results. She also contributed to the writing of the article.

Contents

1 Introduction

1.1 Background

Although the health of Finnish people has steadily improved during the last decades, concerns have been expressed about issues such as people's increasingly inactive lifestyles and dietary changes which contribute to the development of obesity along with several chronic diseases (National Institute for Health and Welfare 2014a, 2014b). In Finland, men seem to be in a disadvantageous position when it comes to health issues. Finnish men are more likely than women to be overweight and obese (Helldán *et al.* 2013, NOMESKO 2013) and to develop lifestyle-related diseases such as lung cancer (NOMESKO 2013). The life expectancy of Finnish men is significantly shorter than that of women. Among Finnish working-aged men, cardiovascular diseases, cancer and other neoplasms, and alcohol-related reasons are the most common causes of death (Official Statistics of Finland 2012). Type II diabetes is yet another chronic disease especially prevalent within Finnish population (National Institute for Health and Welfare 2014a, 2014b).

The reasons for these chronic non-communicable diseases are complicated but many of them share the same risk and protective factors. Chronic diseases could often be prevented by adopting a healthy diet, engaging in physical activity, avoiding tobacco and alcohol use, and preventing obesity (National Institute for Health and Welfare 2014a, 2014b, WHO 2014). These health behaviours are typically adopted already at a young age, and often last a lifetime (Pitel *et al.* 2013).

The health of the population is strongly polarised based on socio-economic position. Generally speaking, the rich and educated are healthier than the poor and uneducated (e.g. Lahelma *et al.* 2004, Rahkonen *et al.* 1995). Among Finnish men, the occupational and educational differences in mortality rates are among the highest in Europe (Machenbach *et al.* 2008, Toch-Marquardt *et al.* 2014). Social position affects the opportunities, attitudes, beliefs, and values people have when they make life-course choices, and it may indicate their access to material resources, influence and information (Kestilä *et al.* 2006, Kestilä & Salasuo 2007). Socio-economic differences in health behaviours seem to become evident especially in young adulthood (Huurre *et al.* 2003, Kestilä *et al.* 2006, Martelin *et al.* 2005, Rahkonen *et al.* 1995).

In their everyday lives people deal with constantly evolving and often conflicting information about health issues (Andrews *et al.* 2005, Kerka 2003).

Overall, life in contemporary society has been described as complex, unpredictable, individualised, and filled with insecurities and risks. The necessity to make personal choices under these conditions has become an increasingly important characteristic of everyday life (Savolainen 2008, 1). Increasing access to health information may increase individuals' potential to be informed (Cullen 2005). At the same time, people suffer from information overload (Bawden & Robinson 2009). The authoritative, information-gatekeeper role of health professionals and experts has changed, and media has been filled with lay information on health issues (Cullen 2005, Hardey 1999). Also the focus of health care has largely shifted away from the 'paternalistic' model where an expert makes decisions on behalf of a patient, and towards a patient-centred approach (Barry & Edgman-Levitan 2012, Kerka 2003). This approach has many benefits (Barry & Edgman-Levitan 2012) but it also places demands on individuals requiring them to take more responsibility for their own health, including informed decision-making and self-management of chronic conditions (Kerka 2003, Parker & Ratzan 2010).

Individuals face health related concerns and information equipped with different social and cultural competencies, values and expectations. The choices people make are affected by their ways (Savolainen 2008, 1) and abilities (Johnson & Case 2012) to access and use information. Even though health information is relatively freely accessible to most people in this information age, not everyone is willing (Sairanen & Savolainen 2010) or able (Eriksson-Backa *et al.* 2012) to access it. Moreover, it can be difficult to determine where to find relevant and reliable information, who to trust in health issues, and how to apply this information to one's own life (Niemelä *et al.* 2012, Rieh & Hilligoss 2007). In response, attention should be paid to the behaviours related to and competencies that are necessary to access and use health information (Parker & Ratzan 2010) in this complex information environment.

It is well known that improved knowledge alone does not lead to improved health behaviour (Ek & Widén-Wulff 2008, Eriksson-Backa 2003). Still, knowledge of the risks and benefits of a behaviour can be considered a precondition for changing one's unhealthy habits (Bandura 2004, Berkman *et al.* 2011). Information may also have emotional value for an individual (Case *et al.* 2005) and it can inspire or motivate into action (Niemelä *et al.* 2012b, Zhang 2012). Studies on individuals' health information behaviour indicate that active health information seeking is associated with health promoting behaviours and better self-reported health (Ek & Heinström 2011, Jung 2014, Pálsdóttir 2008, Shim *et al.* 2006). Those with the most damaging health habits are not likely to deliberately seek health

information, but rather encounter it by chance (Pálsdóttir 2008). Moreover, those who are passive in seeking health information are also unlikely to discover information serendipitously (Pálsdóttir 2010) or may avoid heath information altogether (Ek & Heinström 2011, Sairanen & Savolainen 2010). The stage of readiness to change health behaviour is suggested to influence health information behaviour in that those not intending to change their behaviour are unlikely to be receptive to health information (Prochaska *et al.* 2008). Not only the activity of information seeking, but also the competencies related to finding, evaluating, and understanding health-related information (health information literacy) are associated with the ability to make informed decisions concerning health (Furuya *et al.* 2013, Niemelä *et al.* 2012a).

As well as health behaviours and health in general, behaviours and competencies related to health information are linked to socio-economic status, education in particular (see e.g. Eriksson-Backa *et al.* 2012). Overall, segments of society may be distinguished as information rich or information poor, wherein some are 'sensitised' to the value of new information and others lack interest or the ability to access it (Viswanath & Finnegan 1996). There are clear indications that some groups in society are able to gain more from the available information and health communication efforts than others (Ek 2005, Nutbeam 2000). It has been suggested that health promotion may sometimes actually increase rather that decrease inequalities in society as the 'information rich' get 'richer' while the 'information poor' remain uninformed (Lorenc *et al.* 2013). In order to promote health behaviours with the means of health communication in specific populations it is important to understand how these individuals relate to the promoted behaviour, but also how they interact with health information concerning that behaviour.

Often behaviours and competencies related to health information are investigated in relation to severe health conditions, or in specific patient populations rather than as something happening in the everyday lives of generally healthy people (Anker *et al.* 2011, Johnson & Case 2012). In this study, the focus is on individuals' health information behaviour and health information literacy in everyday settings. The study focuses on young Finnish men who represent a generally healthy population.

1.2 Finnish health care and education systems, and military service

According to the Finnish constitution (Ministry of Justice 1999), public authorities should guarantee adequate social, health, and medical services for every inhabitant in Finland. Municipalities (local governments) are responsible for primary and secondary healthcare, and for promoting the health and welfare of their inhabitants (MSAH 2010). Primary healthcare covers healthcare services, such as local healthcare, maternity care, child healthcare, school healthcare, family planning, care for the elderly, long-term hospital care, and preventive services. Moreover, general practitioners in primary healthcare are the gatekeepers to more specialised services in secondary and tertiary care provided by regional hospitals (secondary care) and university hospitals (tertiary care) (MSAH 2010, see also Känsäkoski 2014). Due to the comprehensive public sector, the Finnish private healthcare sector is relatively small. Occupational health services, dentistry, and physiotherapy are the most often used private health services. Employers and educational establishments are obliged to provide occupational healthcare services for their employees and students. This can be done on either public or private sector. The statutory National Health Insurance (NHI) scheme covers all Finnish residents and additional voluntary health insurance has only a marginal role in the Finnish healthcare system (Teperi *et al.* 2008, Vuorenkoski *et al.* 2008). In principal, Finnish health care is available to all people, regardless of income or social status. However, inequality to access health care services has started to grow, and citizens with a lower income do not have access to the same number of services as those with a higher income (Teperi *et al.* 2008). A key reason for this inequality in the use of services is that the private sector and occupational health care, which are less accessible to the low-income population, offer better access to services than the municipal sector (MSAH 2008).

The Finnish education system is composed of nine-year basic, compulsory education (comprehensive school) for the whole age group (starting at age 7 and ending at age 16). Immediately after compulsory education, the majority (more than 90%) of the age group continue their studies to either general or vocational education at upper secondary level. These are alternative tracks after compulsory schooling, but vocational education aims at improving 'the skills of the workforce' whereas general education 'continues the educational task of compulsory school and provides students with the capabilities to continue to further studies'. The syllabus of both educational tracks is designed to last three years. At the end of

general upper secondary education, students attend to a matriculation examination (Finnish Ministry of Education and Culture 2013). Higher education is offered by universities and polytechnics (also known as universities of applied sciences). Universities emphasise scientific research and instruction, whereas polytechnics adopt a more practical approach. With restricted entry (e.g. entrance tests) to all fields of study, success in matriculation examination is a general requirement for university education, and completion of general upper secondary education or vocational education and training for admission to polytechnics. The main objective of Finnish education policy is to offer all citizens equal opportunities to receive an education. There are no tuition fees at any level of education, and most education and training is publicly funded. In basic education also school materials, school meals, and commuting by school bus or taxi are provided free of charge. In upper secondary education, students pay for their books and transport. However, financial aid can be awarded for full-time study in upper secondary education and in higher education (Finnish National Board of Education 2015).

The Finnish military national defence is based on the civic duty of military service. In Finland, all men are required to attend to military service, with the option of exemption, unarmed service, nonmilitary service, or imprisonment. The military service period is from 165 to 347 days. The service time for unarmed service is from 270 to 362 days, and non-military service has a fixed length of 347 days. A citizen, who refuses to perform both military and civilian service, faces a penalty of 173 days in prison, minus any served days (Ministry of Defence 2008). All men turning 18 in the current year are annually called up for service by the Finnish Defence Forces. In addition, those who have been ordered to be re-evaluated, as well as those under 30 years of age who have not appeared for previous conscription call-ups and have not been separately inspected, take part in the conscription call-ups. Missing call-ups without any legal obstacle is a punishable act under the Conscription Act (1438/2007, see Ministry of Defence 2008). The Regional Offices of the Defence Forces are in charge of executing the conscription call-ups. At the call-up event men receive information and guidance. Further, their personal information is checked, the state of their health assessed, and wishes concerning military service noted. Moreover, at the call-ups, a decision is made about whether a man is fit for service, and if so, how he will accomplish it. Fitness for service means that ‘the person liable for military service is able to complete his military service . . . without endangering himself or posing a safety risk to others who are serving’. Whether the person is fit for service is decided based on

information about the person himself, an examination of a health care professional[1], suitability tests, and information from other officials, organisations, and individuals (e.g. data from prison administration, social, and healthcare institutions). Currently, four fitness categories are used: Category A indicates that a man is capable of field service and category B that he can serve in service troops. In category C, the conscript is exempted from service during peacetime and category E indicates temporary exemption for up to 3 years (Finnish Defence Forces 2015). Each year more than one in ten men are found to be permanently or temporarily unfit for service (categories C and E) due to mental or physical reasons. Moreover, about 15 per cent of conscripts fail to complete their military service. All in all, approximately 75 per cent of each annual age cohort carries out their service (Appelqvist-Schmidlechner *et al.* 2010, Appelqvist-Schmidlechner 2011).

1.3 The aim of this study

This study aims at increasing the understanding of young men's everyday health information behaviour and health information literacy in general, and in relation to health behaviours, physical health and socio-demographic characteristics.

The objectives of the study are to investigate:

1. Young men's health information behaviour (information needs, preferences, seeking, and avoidance) in the context of physical activity
    a) In general
    b) In different *stages of readiness to change exercise behaviour* (Studies I, II and V)
2. Young men's everyday health information literacy
    a) In general (Studies III, IV and V)
    b) In association with *health behaviours and physical fitness* (studies III and IV)
3. Young men's *socio-demographic characteristics* in relation to health information literacy and behaviour, and health behaviour and physical fitness (Studies I–V)

[1] Before the actual call-up event each man of conscription age must attend a preliminary physical examination.

4. The association between young men's *health information literacy* and *seeking and avoidance* of physical activity and exercise information (Study V)

1.4 An overview of the articles and structure of the dissertation

This dissertation is based on five studies, which are reported in original articles. The articles are referred to as Studies I, II, III, IV, and V.

In Studies I and II, the focus is placed on young men's *health information behaviour* in different *stages of exercise behaviour change*. How frequently do the men have information needs and attend to different information practices to obtain information on physical activity and exercise? What kind of physical activity feedback would they prefer? Is this physical activity information behaviour associated with their stage of exercise behaviour change as indicated by the Transtheoretical Model?

Studies III and IV take a step towards a more general health context and focus on the *everyday health information literacy* of young men. How do young men evaluate their overall capacity to obtain, process, and understand health information? How does this everyday health information literacy connect to their health behaviour and physical fitness?

Study V focuses on the relationship between seeking and avoidance of physical activity information and stage of exercise behaviour change as well as everyday health information literacy. Are active seekers of physical activity information also more health information literate? Moreover, each of the five studies addresses the way socio-demographic characteristics are associated with health information literacy and behaviour, and health behaviour within this population (see Figure 1).

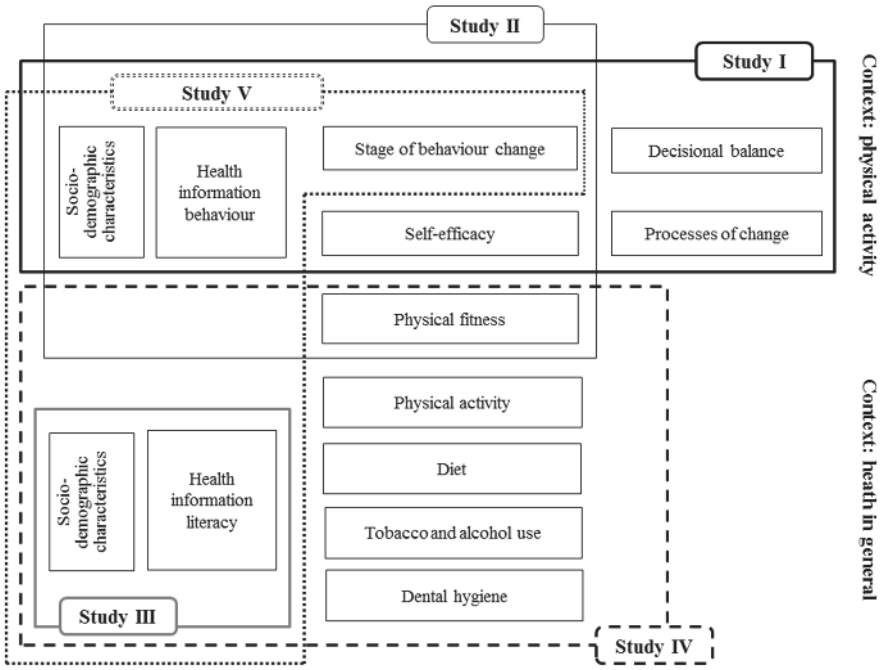

Fig. 1. Key concepts in Studies I, II, III, IV, and V.

The present dissertation includes six chapters. After the Introduction (Chapter 1) the theoretical background of the study is introduced (Chapter 2). Then, the empirical study including the methodological choices, research design, and methods are described (Chapter 3). The results of this study are presented in Chapter 4. Chapter 5 includes discussion on the results in relation to previous research, evaluation of the methodology, ideas for future studies and implications to practice. In Chapter 6 conclusions from the study are drawn.

2 Theoretical background and earlier studies

This chapter introduces the key concepts and theoretical underpinnings of the study. First, the concepts of health and health behaviour are defined and the key issues in health and health behaviour of Finnish young men considered. Then, the concepts of health information behaviour, health information, health information needs and preferences, and health information literacy are introduced and empirical studies related to these themes reviewed. Moreover, based on earlier research, factors explaining health information behaviour are considered, including the stage of behaviour change. Furthermore, different approaches to health information literacy are described. Then, the intersections between health information behaviour and health information literacy research are discussed. At the end of the chapter, a summary is provided on the theoretical background of the study. Finally, a conceptual framework for the study is outlined.

2.1 Health and health behaviour

2.1.1 Health

The concept of *health* can be understood in many ways. The World Health Organization (WHO 1948) defines health as 'a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity'. This general conception is broad and focuses on positive aspects of health. However, more specific operational definitions are also needed for measurement purposes and research (Huber *et al*. 2011).

In longitudinal cohort studies, death (disease specific mortality) can be considered as an ultimate indicator for health status. In Finland, cardiovascular diseases and neoplasms (especially lung and prostate cancer in men) are the most common causes of death when it comes to the whole population. In 2012, working-aged men most often died of diseases of the circulatory system (26%), cancer and other neoplasms (23%), and alcohol-related reasons or accidental alcohol poisoning (18%) (Official Statistics of Finland 2012). Since chronic diseases are the leading causes of death, their prevalence can also be used as powerful health indicators. However, death and chronic illnesses do not apply well to the evaluation of young people's health. Therefore, the assessment of young people's health status focuses either on self-assessment of health and well-being or physical (e.g. obesity, blood

pressure) and behavioural (e.g. smoking, physical activity) risk and protective factors that influence health (Gore *et al*. 2011). In this study, the focus is placed on young men's health behaviours and physical fitness (see Subchapter 3.2.2 for a detailed description of the physical fitness measures), although overall, health is seen broadly as a state of well-being.

2.1.2 Health behaviour

In this study, *health behaviour* is understood as a variety of activities individuals engage in that influence their health. These include, for example, physical activity, eating habits, and attendance to health care, but also the use of intoxicants and tobacco products, and risky behaviour. Thus, in this study both health promoting and health compromising actions are seen as health behaviour (see also Känsäkoski 2014, Morrison & Bennett 2009). This study addresses the physical activity and exercise behaviours, dietary habits, use of tobacco and alcohol, and dental hygiene of young men.

Physical activity has been defined as 'any bodily movement produced by skeletal muscles that requires energy expenditure' (WHO 2011). This definition encompasses any everyday life activity from occupational, household, and other daily tasks to sports and exercise. *Exercise* is a planned, structured, and repetitive form of physical activity, which is performed to improve or maintain physical fitness (WHO 2011). Physical activity provides a wide spectrum of health benefits. The evidence is strong that physical activity reduces the risk of early death, coronary heart disease, stroke, high blood pressure, type II diabetes, breast and colon cancer, excessive weight gain, injurious falls, depression, and loss of cognitive function (Physical Activity Guidelines Advisory Committee 2008). It has been estimated that every year 3.2 million deaths could be prevented by regular physical activity (WHO 2013). Furthermore, *sitting time* has been proved to have an independent effect on the risk of type II diabetes, metabolic syndrome, cardiovascular diseases, neoplasms, and premature death (Matthews *et al*. 2012, Owen *et al*. 2010, Schmid & Leitzmann 2014). Recently, the value of light activities and reduced sitting time has been emphasised because it has been established that, for inactive people, even modest increases in the volume of physical activity provide important health gains. Nevertheless, additional benefits accrue as the volume of activity increases (Powell *et al.* 2011). According to the Finnish physical activity recommendations for 13- to 18-year-olds, young people should engage in

at least 1.5 hours of daily physical activity, half of which should be performed at a vigorous pace (Tammelin & Karvinen 2008).

Diet can be defined as 'food and drink regularly provided or consumed' or as 'habitual nourishment' (Merriam-Webster 2015). *Dietary habits*, on the other hand, are the habitual decisions made when choosing what to eat (Preedy & Watson 2010). Nutrition is another related concept. It refers to 'the intake of food, considered in relation to the body's dietary needs' (WHO 2015). Diet is an important contributor to the development of obesity, and associated with diseases such as cancer and cardiovascular diseases (Willet 2008). The WHO (2014) recommends, for example, energy balance and a healthy weight, increased consumption of fruits and vegetables, and limited intake of free sugars. In this study the focus is placed on dietary habits related to the consumption of sugary products (sweets, soft drinks, and energy drinks) and vegetables, fruit and berries. The habit of eating breakfast has been shown to be associated with a reduced risk of becoming overweight or obese (Croezen *et al*. 2009). Therefore, this dietary habit was also taken into account in this study. Energy drinks are rather new products popular among adolescents. Their use has been discussed especially because they contain large amounts of caffeine as well as calories and sugar. Among adolescents excessive use of energy drinks is related to caffeine induced health complaints such as headache, sleeping problems, irritation and tiredness (Huhtinen *et al.* 2013).

Tobacco products are made entirely or partly of leaf tobacco and are intended to be smoked, sucked, chewed, or snuffed. All contain nicotine, which is highly addictive. Tobacco use is known to be one of the main risk factors for chronic diseases such as cancer, lung diseases, and cardiovascular diseases (WHO 2014). In Finland tobacco is usually smoked as cigarettes, and approximately 16% of Finnish people smoke cigarettes daily (Official Statistics of Finland 2013). Another popular tobacco product in Finland is *Swedish snuff*, which is a moist powder tobacco product. Snuff has been totally banned in Finland since 1995 but is used daily by approximately 2.9% of working-aged men and 0.1% of women (Helldán *et al*. 2013). The prevalence of cigarette smoking has decreased among Finnish young people (Kinnunen *et al*. 2013, Mattila *et al*. 2012) but this trend is not evident when it comes to snuff use.

Alcohol is clearly the most dangerous intoxicant in Finland when it comes to its health consequences. A special feature of Finnish drinking culture is the tendency to consume large amounts of alcohol at a time. In addition, the consumption of alcohol has also become a part of everyday life in Finnish culture and therefore the total intake of alcohol has set at a rather high level (Mustonen &

Simpura 2006). Among working-aged men in Finland, alcohol-related reasons, including accidental alcohol poisoning, are one of the most common causes of death (Official Statistics of Finland 2012). The alcohol consumption of minors (under 18-year-olds) has decreased from early 2000's (Rimpelä *et al*. 2006) but in young adults no such decrease has been reported. According to Finnish surveys, the majority of young adults drink alcohol, and alcohol use disorders and alcohol-related problems are common already at young adulthood (Kestilä & Salasuo 2007, Latvala *et al.* 2009).

Oral health is considered to be essential to general health and quality of life. *Poor oral hygiene* is a risk factor for oral diseases such as dental cavities, oral infections, tooth decay, and periodontal disease. Moreover, chronic dental infections are associated with chronic diseases such as cardiovascular diseases (WHO 2012). According to Finnish recommendations, teeth should be brushed twice a day. Still, for example the Finnish school health survey (Luopa *et al*. 2014) showed that only approximately half of the upper secondary school students brush their teeth according to this recommendation.

2.1.3 Health behaviour and health of young Finnish men

In 2012 the life expectancy of Finnish men was estimated to be 77.5 years, being the shortest of Nordic countries except for Greenland. By contrast, the life-expectancy of women was 83.4 years (NOMESKO 2013). Finnish men are more likely than women to be overweight and obese (Helldán *et al*. 2013, NOMESKO 2013) and to develop lifestyle-related diseases such as lung cancer (NOMESKO 2013). Moreover, among Finnish men, occupational and educational differences in mortality rates are among the highest in the European Union (Machenbach *et al*. 2008, Toch-Marquardt *et al*. 2014).

At least partly, both gender- and socio-economic disparities in health can be explained by differences in health behaviours (Helldán *et al*. 2013). In general, women and girls seem to be more concerned of looking after their health, whereas men and boys are characterised as risk-takers (Hoikkala & Hakkarainen 2005). Men consume more alcohol (Ahlström *et al.* 2001) and tobacco products (Helldán *et al*. 2013), and eat more meat and less vegetables and fruit (Prättälä *et al*. 2007) than women. These gender differences in dietary habits and use of alcohol and tobacco products are evident already at adolescent age (NIHW 2013). Finnish men are also physically less active than women; everyday physical activity, such as commuting or running errands, is less common among men, and they are also less

likely to exercise (Fogelholm 2005). As children, Finnish boys are more active than girls in all age groups, but their physical activity decreases by age and plummets at adolescence (Husu *et al*. 2011, Turpeinen *et al*. 2012). Moreover, boys and men of all ages sit more than girls and women (Husu *et al*. 2011, Turpeinen *et al*. 2012).

Socio-economic differences are reported in health behaviours such as vegetable consumption (Martelin *et al*. 2005), physical activity (Mäkinen *et al*. 2010, Borodulin *et al*. 2012), good oral hygiene (Tanner *et al*. 2015), and tobacco use (Martelin *et al*. 2005, Huurre *et al*. 2003). Moreover, the connection between overweight, obesity, and socio-economic status has been demonstrated in a variety of studies among adults (see e.g. Sarlio-Lähteenkorva *et al*. 2006). Among working-aged Finns, the most highly educated (Helldán *et al*. 2013) and those categorised into 'white-collar' occupations (Sarlio-Lähteenkorva *et al*. 2006) have been proved to be least likely to be overweight.

According to Finnish studies, differences in health and health behaviour between socio-economic groups are relatively invisible in childhood and at young age (Pensola & Valkonen 2003, Rahkonen *et al*. 1995, West 1997), but tend to culminate in young adulthood (Huurre *et al*. 2003, Kestilä *et al*. 2006, Luopa *et al*. 2014, Martelin *et al*. 2005, Rahkonen *et al*. 1995, West 1997). Especially education (individual's achieved social class) seems to be strongly related to health whereas the influence of a parental social class (class of origin) is not as clear (Rahkonen *et al*. 1995). For instance, when compared to men in general upper secondary school, vocationally educated young men are more likely to smoke, and less likely to eat breakfast, vegetables, fruit and berries, to brush their teeth according to recommendations, and to exercise (Luopa *et al*. 2014).

Less evident socio-economic differences are discovered in the use of snuff and alcohol. Ten per cent of Finnish men in vocational education and eight per cent of general upper secondary school students reported daily use of snuff in the Finnish school health survey (National Institute for Health and Welfare 2013). In Finland, snuff is often used within regular competitive team sports, especially ice hockey (Mattila *et al.* 2012)[2]. Alcohol use is most common among young adults with only compulsory school education, but differences between other educational groups are not evident; 81% of men in vocational education and 72% in general upper secondary education reported to use alcohol (Martelin *et al*. 2005). Of young men, 37% and 21%, respectively, reported being drunk at least once a month (Luopa *et*

[2] It has been suggested that sports clubs or teams may promote or even distribute snuff (Mattila *et al*. 2012).

al. 2014). Studies among adult populations indicate that people in higher socio-economic positions use alcohol more frequently but drink smaller amounts at a time. Thus, binge drinking seems to be more common among people in low socio-economic positions (Kestilä & Salasuo 2007). However, patterns between socio-economic status and alcohol use among adolescents are not clear (Hanson & Chen 2007).

In a study among young adults by Martelin *et al*. (2005), obesity was discovered to be significantly associated with lower education among women but not among men. Also, girls and women of 'manual class' origin have been found to have higher rates of obesity but similar association was not evident in men (Huurre *et al*. 2003). According to the Finnish school health survey, overweight is more common among vocationally educated young men than in the other educational groups, with approximately 26% of men in vocational education and 18% of men in general upper secondary school being overweight (Luopa *et al*. 2014). Research on the association between socio-economic status and other fitness indicators is scarce (Valkeinen *et al*. 2013). However, Valkeinen and colleagues (2013) found that higher educated Finns were in better physical fitness than the lower educated ones. Fitness was measured by participants' self-estimated overall physical fitness and running ability, a physician's estimate of a participant's working capacity, the trunk extensors' endurance and hand grip strength (Valkeinen *et al*. 2013).

In the light of previous research on Finnish adolescents and young adults, especially young men with general upper secondary education seem to be in a better position than their peers when it comes to health (National Institute for Health and Welfare 2014b). Vocationally educated men are less likely to exercise, to have healthy eating habits and to brush their teeth according to recommendations, and more likely to smoke, use alcohol and to be overweight (Luopa *et al*. 2014). Men with only compulsory school education, on the other hand, are suggested to be at risk for marginalisation (Cederberg & Hartsmar 2013). Within this group smoking and excessive use of alcohol is especially prevalent (Martelin *et al*. 2005).

As a whole, concerns have been raised on the lifestyles and health of young Finnish men (see e.g. YLE News 2014/03/25). Studies conducted among Finnish military conscripts show signs of a deteriorating trend in cardiorespiratory and muscular fitness, and an increasing trend in body mass among young men (Husu *et al*. 2011, Santtila *et al*. 2006). Similarly, studies among working aged Finns show a degrading trend in cardiorespiratory fitness especially among men under 40 (Heiskanen *et al*. 2011). This trend is suggested to be caused by health behavioural

changes, and to lead to an increase in incidence of several serious health conditions in the future (Heiskanen *et al*. 2011, Santtila *et al*. 2006).

2.2 Health information behaviour

The concept of *information behaviour* is used to describe the various ways in which individuals interact with information, mainly the ways in which people seek and use information (Bates 2010). According to Wilson's (2000, 49) definition, information behaviour is 'the totality of human behaviour in relation to sources and channels of information, including both active and passive information seeking and information use.' This wide definition allows a variety of different types of actions to be seen as information behaviour. People can actively seek information (Wilson 2000), acquire information serendipitously (Erdelez 1999), use information in different ways (Case & O'Connor 2015), and share information with others (Oh 2012), for example. They may also avoid (Sairanen & Savolainen 2010) or abstain from (Niemelä 2006) information.

2.2.1 Health information

The concept of *information* is complex and multidimensional, and there are a variety of definitions for it (see e.g. Capurro & Hjørland 2003 and Case 2007 for discussion). For instance, information has been defined as 'something that either reduces uncertainty or changes one's image of reality' (Case 2007, 74) and 'stimuli from a person's environment that contribute to his or her knowledge or beliefs' (Brashers *et al.* 2002, 259). Information may be seen as a sign (as something that depends on the interpretation of a person) or as a thing (such as numbers or bits) (Buckland 1991, Capurro & Hjørland 2003). The former approach is adopted in the present study.

Distinctions can be made between the concepts of 'facts', 'advice', and 'opinion' being information (Wilson & Walsh 1996), or between information and entertainment (Case 2007). However, as Case (2007) notes, these distinctions are rarely discrete. For example, watching a television programme may be perceived as entertainment but may also be informative (Case 2007).

In this study, information is understood broadly as stimuli from a person's *environment*, although in health settings 'bodily information' such as experiencing pain, changes in functioning or physical symptoms (Yates 2013), or memories and previous experience (Bar-Ilan *et al.* 2006), could be considered as information as

well. Excluding these, any information that relates to health, illness, or well-being in some way is considered as *health information* in this study. Therefore, any information from mass media (e.g. news on health issues) or interpersonal sources (e.g. discussions with health care professionals, family, or friends) is included in this broad category of health information. For example, specific facts about nutrition and its effects, information about local exercise venues, and information on a cancer diagnosis of a friend are all seen as health information.

2.2.2 Needs for and preferences of information

People's lack of knowledge of the causes and prevention of diseases and their detection and treatment has been acknowledged as an important problem (see Johnson & Case 2012). Knowledge of the risks and benefits of a behaviour can be considered a precondition to changing unhealthy habits (Bandura 2004) and changes in public knowledge, attitudes, and behaviours are considered critical to better health (Johnson & Case 2012). In addition to the lack of knowledge of, for example, the causes of diseases (Johnson & Case 2012), the lack of awareness of one's own behaviour is considered to be a potential barrier in health promotion (van Sluijs *et al*. 2007). For example, people who do not recognise themselves as sedentary (Corder *et al*. 2011) are found to be unlikely to perceive a need to change their physical activity behaviours (De Bourdeaudhuij *et al*. 2005) and may, therefore, be less receptive to health promotion strategies.

The concept of *information need* is used to refer to individuals' recognition that the knowledge they have is inadequate to satisfy a certain goal (Case 2007) or to make sense of their situation or the world around them (Dervin 1983). Information seeking (see Subchapter 2.2.3) is traditionally conceptualised as a purposive activity that emerges from an information need. As such it is assumed that there are underlying factors motivating individuals to search for information (Case 2007, Wilson 2006). Information needs are often considered to be secondary and caused by primary needs (Wilson & Walsh 1996, Wilson 2006). Then again, 'the need to ask' and 'the need to seek knowledge' are suggested to be primary needs themelves (Murray 1938, 83).

Information can have both instrumental and emotional value for an individual (Case *et al*. 2005). *Cognitive needs* refer to obtaining more factual information about an issue and *affective needs* to obtaining information that will aid in dealing with an issue emotionally (Wilson & Walsh 1996). For example, Johnson and Meischke (1991) note that, in terms of cancer-information seeking, cognitive needs

could include obtaining more factual information about cancer prevention, detection or treatment, whereas affective needs could include needs for information that offers emotional support. Yates (2013) notes that people often want to learn about other people's experiences in addition to factual, clinical, or technical information on health. Savolainen (2010) studied dietary blogs and found that, primarily, they did not offer factual information but emotional support.

A close concept to information need is *information preference*, which is used to describe the types, structure, or level of information individuals favour (De Vleminck *et al*. 2015, Fujimori & Uchitomi 2009, Maibach *et al*. 2006) or the channel they prefer the information to be delivered through (Cristancho *et al*. 2014, Cunningham *et al*. 2014)[3]. The concept of information preference is not frequently used in the field of information studies, but is common in the health promotion and communication literature. Information preferences have been studied, for example, with regard to communication on life-limiting illnesses (De Vleminck *et al*. 2015, Fujimori & Uchitomi 2009). For instance, De Vleminck *et al*. (2015) studied whether people wanted to be informed by a doctor on issues such as diagnosis, chances of curing the disease, life expectancy with the disease, and treatment options. The majority, but not all, of the respondents wanted to be informed on these issues (De Vleminck *et al*. 2015). Other examples of information preference studies include preference of specific types of feedback. Feedback can be presented in various forms: it may, for example, contain theoretically driven arguments or it may compare individuals' behaviour with current recommendations, peers' behaviours, or previous assessments (Enwald 2013). This study focuses on three types of feedback message tactics: ipsative, normative, and theoretically driven. An ipsative (i.e. iterative or longitudinal) feedback message tactic is based on a comparison of an individual's current and prior states (Noar *et al*. 2007); feedback based on a normative message tactic compares an individual's behaviour or prior state to that of peers (Lustria *et al*. 2009); and a theoretically driven feedback message tactic includes theory-based argumentations like a fact-based explanation of the reasoning used to generate the feedback and justifications for the conclusions derived (Lustria *et al*. 2009).

Some type of generic or *tailored* feedback is often used in health interventions (Lustria *et al*. 2009). Feedback is suggested to direct individuals' attention to their

[3] Sometimes the concept of information want is also used to describe the type of information an individual would prefer (Wilson 1996) Brown (2004) discusses the differences between information need and information want in a public library setting, and argues that the information a person 'needs' may not be the information he/she 'wants'.

own characteristics or behaviours (Lustria *et al*. 2009). It is acknowledged that individuals with different predispositions may prefer feedback constructed by applying different message tactics (Hawkins *et al*. 2008). However, this has rarely been studied empirically (Enwald 2013).

Ormandy (2011) notes that a clear differentiation should be made between *information need* and *need for education*. Both imply a 'knowledge deficit' but education needs refer to cognitive knowledge deficits that could be measured objectively whereas information needs are subjective (cognitive or affective) knowledge deficits. Both could be satisfied with information. Education, however, has a specific aim to modify behaviours (Ormandy 2011). This distinction should be acknowledged also in this study. Information needs and preferences refer to subjective views of an individual, whereas information literacy (see Sub-chapter 2.5) comes close to the view of a need for education, although it is approached in the present study as a subjective evaluation of individual's own abilities.

Despite this distinction, individual information needs and preferences can be taken into account when designing health promotional strategies, including health education. A better fit to a person's preferences and needs is suggested to increase the 'motivational impact' of the message (DiClemente *et al*. 2001, Hawkins *et al*. 2008). In this study, information needs are studied in relation to physical activity information and information preferences in relation to feedback on one's own physical activity. Moreover, the recognition of a health information need is a key feature within the concept of health information literacy (see Subchapter 2.5).

2.2.3 Information seeking and other modes of information acquisition

Information seeking can be defined as 'the purposive acquisition of information from selected information carriers' (Johnson & Case 2012, 16). Information seeking is intentional activity that is usually thought to be 'triggered' by an information need (Wilson & Walsh 1996) and is often problem-oriented (Erdelez 1999). Other modes of information acquisition have been acknowledged as well. People may discover information unexpectedly while looking for information on another topic, or by scanning their environment, for example. Information encountering, incidental information acquisition, accidental discovery of information, passive information acquisition, and opportunistic information acquisition are concepts that have been used to describe this type of behaviour (Erdelez 1999).

Wilson's (2006) *model of information seeking behaviour* describes four distinct modes of behaviour: passive attention (information is acquired without intentional seeking, e.g. watching television programmes), passive search (information is found coincidentally, e.g. when searching for other information), active search (active search of specific information), and ongoing search (seeking information to update or expand one's knowledge).

In a rather similar way, in her *model of information practices in accounts of everyday-life information seeking*, McKenzie (2003) conceptualises four modes of information acquisition: active seeking, active scanning, non-directed monitoring, and obtaining information by proxy. In McKenzie's (2003) model active seeking refers to actions in which individuals specifically seek out a known source, conduct a systematic known-item search, or ask a planned question from someone. Active scanning refers to actions in which individuals identify a particular source as likely to be helpful or a particular location as a potential information ground (see Pettigrew 1999). Non-directed monitoring refers to situations in which individuals serendipitously encounter a source in an unlikely place or whilst monitoring information sources such as newspapers. Obtaining information by proxy refers to situations in which participants encounter sources through the initiative of another agent (McKenzie 2003).

McKenzie's (2003) model is two-dimensional: it consists of the four above-mentioned modes of information acquisition, but also of two stages of 'information process', namely, *making connections* and *interacting with sources*. Making connections refers to the barriers and practices involved in identification and contact with information sources, and interacting with sources refers to the barriers and practices involved in the actual encounter with a source (McKenzie 2003).

McKenzie's (2003) categorisation was based on a qualitative study on women pregnant with twins. It has later been empirically tested in other qualitative studies by Yeoman (2010), Niemelä (2006), and Zhang (2012). Yeoman (2010) conducted in-depth interviews among women in menopause transition and found that the data fit McKenzie's (2003) model rather well. However, in Yeoman's (2010) study, there were hardly any examples of unexpected encounters of information ('non-directed monitoring'). According to the author, this may be due to menopause being rather invisible to the outside world or that it is something many women wish to be discreet about.

Niemelä (2006) utilised McKenzie's model in studying the information behaviour of older adults. Niemelä's study focused on a broader and more general setting of everyday-life media use and social interaction, when compared with the

subject-specific topics of McKenzie's and Yeoman's studies. In general, Niemelä (2006) found that the conceptualisation of four distinct information practices provided a useful tool for investigating information behaviour in this broader context. However, Niemelä (2006) included an additional information practice, abstaining from information, into the model (see Subchapter 2.2.4).

Zhang (2012) applied McKenzie's model in a qualitative study on college students' use of social networking sites for health and wellness information, and found evidence for the use of three of the four practices: active seeking, active scanning and non-directed monitoring, but not for receiving information by proxy. Zhang (2012) further identified two additional modes of behaviour: sharing information with others and participating in group activities.

Askola *et al.* (2010) applied two of the information practices identified by McKenzie (2003), active seeking and non-directed monitoring (encountering), in a quantitative study examining the web-based health information acquisition of Finnish and Japanese university students. They surveyed the frequency of active seeking and accidental encountering of health information online. Based on their findings, in online environments health information is encountered more often than it is actively sought (Askola *et al*. 2010). Pálsdóttir (2010) and Baxter *et al*. (2008) have also investigated both information seeking and information encountering in health settings, and have come to similar conclusions: information is encountered more often than sought on purpose. Basic and Erdelez (2014), on the other hand, discovered that among college students, active seeking of health information was a more commonly recognised practice than passive acquisition when seeking for health information online. However, passive information acquisition of topics such as fitness, exercise, diet, and nutrition was more common than, for example, of symptoms and medication (Basic & Erdelez 2014).

The concept of *everyday life information seeking* has been used in research for ways to acquire information in non-work contexts. It refers to different types of information acquisition, specifically to seeking orienting information and, on the other hand, to seeking problem-specific information (Savolainen 2005). Overall, the concept of *information-seeking behaviour* has been used to describe any type of information acquisition. However, this concept can be considered to be misleading since encountering does not necessarily involve any active effort of the person (Erdelez 1999). In this study, any mode of acquiring information falls under the broad concept of information behaviour. Following McKenzie's model, the concept of information practices is also used to describe different ways of information acquisition. However, the theoretical underpinnings of McKenzie's

study or those associated with the line of research on information practices (see e.g. Savolainen 2008) are not adopted as such in this study[4]. The present study focuses on individual-level actions, and therefore conceptions related to information behaviour rather than information practices seem more relevant in this context.

2.2.4 Information avoidance

Most information behaviour models (see Subchapter 2.3.1) describe information behaviour as a chronological progression from an experienced information need to seeking information, finding it, and thus solving the need (see e.g. Wilson 1999). People, however, often do not follow optimised routes in their information acquisition (Godbold 2006), especially when it comes to everyday life contexts. Abstinence or avoidance of information is an example of this type of seemingly 'non-optimised' behaviour.

In Niemelä's (2006) study on information behaviour of elderly people, he discovered that some people would avoid or ignore specific *channels* of information, such as television or the Internet. Based on his findings, Niemelä (2006) included a fifth information practice, abstaining from information, into McKenzie's model (see Subchapter 2.2.3). According to Niemelä (2006), abstinence occurs when an individual attempts to consciously avoid or ignore information from a specific channel or source. In line with McKenzie's (2003) model, Niemelä (2006) described abstinence from information as a two-stage process: distancing oneself or abstaining from an information source or channel (connecting), and not receiving information, being deprived from information (interacting).

A more commonly used concept in the field of information studies is information *avoidance*, which has been defined as behaviour 'designed to prevent or delay the acquisition of available but potentially unwanted information' (Sweeny *et al*. 2010, 4). People may, for example, avoid thinking about an issue or avoid reading or seeing information on it (Sairanen & Savolainen 2010). According to Sweeny *et al*. (2010) people may avoid information for two main reasons: if

[4] According to Savolainen (2008) the concepts of information behaviour and information practices both descibe the ways in which people 'do things' in relation to information. The major difference in the use of these concepts is that within the discourse on information behaviour, the 'dealing with information' is seen to be triggered by information needs, while the discourse on information practice emphaises the continuity and habituation of activities affected and shaped by social and cultural factors (Savolainen 2008, 126).

receiving the information would necessitate an undesired action such as behaviour change, or if the information itself is expected to result in negative emotions (see Subchapter 2.3.1). From the perspective of uncertainty management, people may avoid information in an attempt to achieve and maintain an optimal level of uncertainty in a given situation (Brashers 2001, Sairanen & Savolainen 2010).

Selective exposure and blunting are related concepts to information avoidance (Case *et al*. 2005). Furthermore, avoidance has been studied in relation to the use of fear appeal message strategies in health communication (Enwald 2013). Already in the 1940's Hyman and Sheatsley (1947) stated that selective exposure provides an explanation why mass media campaigns often fail to change people's attitudes or behaviour. They discovered a general tendency for people to reinforce their pre-existing knowledge, beliefs, or attitudes. Also, they noted that some people are 'chronically ignorant' in relation to the topic of specific information campaigns (see also Case 2007). 'Blunting' refers to a style of information processing in which people respond to information by blocking it or distracting themselves from it (Case 2012). Studies on fear appeals have shown that the attempt to frighten people into changing health behaviours may not be effective since people may ignore this information (Sairanen & Savolainen 2010).

Sairanen and Savolainen (2010) note that avoidance can occur either within or outside the process of information seeking. People may seek information but stop if they are confronted with undesired information (selective avoidance), or refrain from accessing any source of potentially unwanted information (comprehensive avoidance). In health settings, avoidance has been studied especially in relation to serious health concerns such as cancer (Case *et al*. 2005) and HIV (Brashers *et al*. 2000). However, information may be avoided in less anxiety-laden contexts as well; if a person feels overexposed by a topic, if habitual activities are interfered (Barbour *et al*. 2005), or if the information does not suit one's needs (Sairanen & Savolainen 2010), for example.

This study focuses on the different actions by which individuals obtain health information. They are conceptualised according to McKenzie's (2003) model of information practices in everyday life information seeking (see Subchapter 2.2.3).

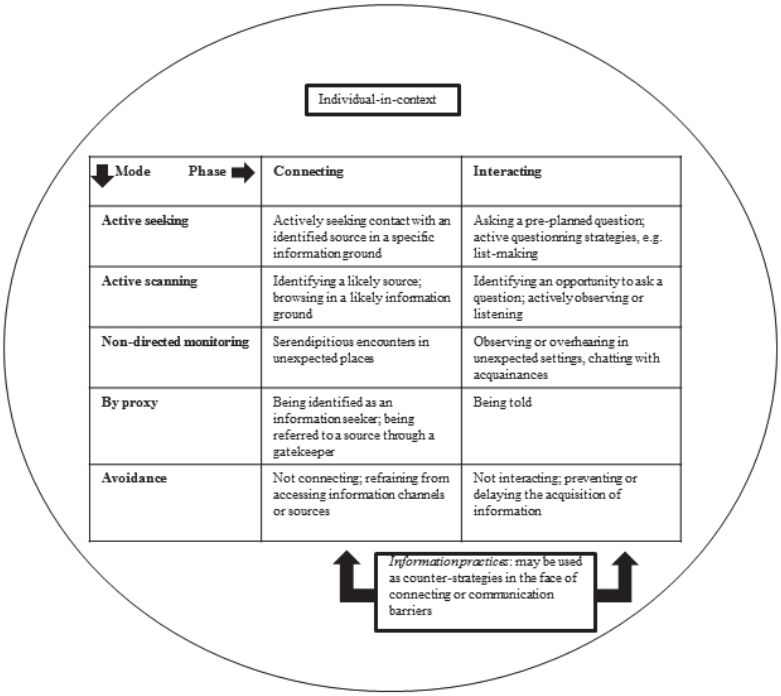

Fig. 2. Modes of health information seeking and avoidance [adapted from McKenzie (2003) and Niemelä (2006)].

Furthermore, following Niemelä's (2006) framework, individuals' attempts to consciously avoid or ignore information were included to this framework. However, for the purposes of this study the concept of avoidance instead of abstinence was regarded more suitable for its wider definition and usage in the field of information studies (see Figure 2).

2.2.5 Health information use and outcomes

In comparison to studies on information needs and seeking, relatively little research has been conducted with the focus on what individuals do with the information they acquire, and what are the effects, consequences, impacts or outcomes of information (Case & O'Connor 2015, Albright 2010). Within the field of information studies the concept of information use has been used to refer to actions that 'consists of the physical and mental acts involved in incorporating the

information found into the person's existing knowledge base' (Wilson 2000, 50). The information that is incorporated to construct knowledge may 'be wielded to further action, for example, solving a current problem' (Savolainen 2008, 50). It is thus recognised that information use may involve both physical and mental acts; for example, marking sections in a text or comparing new information with existing knowledge (Wilson 2000).

Taylor (1986) distinguishes between 'intangible' and 'tangible' functions of information, and Rich (1975), in turn, between 'conceptual' and 'instrumental' utilisation of information. Information may 'inform' and 'instruct' (Taylor 1986) and lead to changes in the way individuals think or what they know (Rich 1975). On the other hand, information may 'trigger' action (Taylor 1986) and lead to observable changes in behaviour (Rich 1975, see also Case & O'Connor 2015). Information may also have affective outcomes, such as relaxation or increase in self-esteem (Walwyn & Rowley 2011), and it may be used for entertainment (Case 2007).

Niemelä (2006) uses the concept of enactment to describe 'the phenomenon of information and media use leading to action in concrete daily activities' (Niemelä *et al*. 2012b). The concept highlights the activating role of information in everyday life. People may, for example, get inspired to exercise from a television show they see (Niemelä 2006) or get 'motivated and inspired to keep exercising and be on healthy diets' by using social networking sites (Zhang 2012).

Kari (2010) points out that information use is often only vaguely defined and 'seemingly connotes both utilization and utility of information'. He proposes a more general concept, *outcome of information*, to be used instead of information use since the former encompasses both use and effect of information (Kari 2010).

In health settings, information studies scholars have been interested in, for instance, how reading on a health issue influences knowledge and opinions (Todd 1997) and how health professionals use clinical information (Grad *et al*. 2011). Furthermore, health information use has been studied in relation to health information literacy (Yates *et al*. 2012, see Subchapter 2.5). Overall, the abilities to read and understand (health literacy) or evaluate (health information literacy) health related information are clearly related to information use although these fields of study seem rather disconnected. Health literacy is found to be associated with a variety of health outcomes, and there are indications that health information literacy is connected to health behaviours as well as health (see Subchapter 2.5.3).

In health communication and promotion oriented research, the outcomes of health information have been studied by investigating the effects of health

communication campaigns and interventions. For example, the effects of tailored health messages have been investigated[5]. These studies indicate that messages that are tailored according to individual characteristics such as health status, socio-demographic characteristics, or psychosocial characteristics (self-efficacy, interest, stage of change) (Enwald 2013), would be more effective than non-tailored ones in that they are read more deeply, rated more highly, and remembered better. A careful elaboration of a message is suggested to lead into positive health behaviours and thus to positive physical health outcomes (Rimer & Kreuter 2006). Measuring the outcomes of information is challenging since thoughts and decisions are difficult to observe and they are subject to 'self-reporting bias' (Case & O'Connor 2015). In tailoring studies outcomes are often measured as changes in health behaviours or clinical outcomes such as changes in cholesterol levels or body weight (Lee & Lustria 2009).

In this study information use is addressed as a *perceived ability* to 'analyze, understand, and use the information to make good health decision' (Medical Library Association 2003), making it a component of health information literacy (in Studies III, IV, and V, see Subchapter 2.5). Moreover, health information literacy is studied in connection with health behaviours and physical health. These could be seen as possible outcomes of health information use, but also as antecedents for health information literacy. The association between the concepts of health information literacy and health information use will be further discussed in Subchapter 2.6.

2.3 Factors explaining health information seeking and avoidance

Various models have been introduced to describe the factors that influence information behaviour. Depending on the perspective taken, these models focus on different levels of action, such as the cognitive processes of individuals or their actions within a particular community or social group. Further, the models focus on different aspects of information behaviour such as the way information needs arise (Dervin 1983) or the process of information seeking (Kuhlthau 1991, see also Niedzwiedzka 2003, Robinson 2013). The focus of this study is on individually oriented models of information behaviour.

[5] In information studies tailored communications have been studied for example by Cortese and Lustria *et al*. (2013) and Enwald (2013).

Although other modes of information behaviour have been acknowledged, the majority of the current models (see e.g. Niedzwiedzka 2003) as well as the empirical studies (Anker *et al*. 2011) focus on active information seeking. According to Beaudoin and Hong (2011), there are two basic approaches to studying health information *seeking*. The first approach addresses the profiles or predictors of information seeking. In this line of research empirical studies have shown that people with different predispositions tend to expose themselves (i.e. through information seeking) to different types of health information. Based on a review of current literature on health information seeking, Anker *et al*. (2011) state that these predisposing characteristics include, for instance, socio-demographic factors (age, education, race), desire and intention to seek health information, health literacy, psychological characteristics (locus of control), and health conditions.

The second approach focuses on the outcomes (or effects) of information seeking. Broadly based on a media effects perspective (see e.g. Chaffee & Schleuder 1986), this body of research focuses on the way information seeking can lead to specific outcomes as a result of attention, cognition, and development of attitudes and behaviours (Beaudoin & Hong 2011). Outcomes that have been associated with active health information seeking include adherence, desire for second opinion, discussions about health information with a physician, patient satisfaction, self-diagnosis, and treatment decisions (Anker *et al*. 2011).

Anker *et al*. (2011) further distinguish a third category of health information seeking studies, which focus on engagement in health information seeking such as individual's self-efficacy to seek information, frequency of information source use, the content of health information seeking, information credibility, the information source utilised, and satisfaction with health information.

Lalazaryan and Zare-Farashbandi (2014), on the other hand, note that health information seeking has been studied from three different perspectives: 1) coping with situations that put a person's health at risk, 2) involvement in medical decision-making, and 3) behaviour change and preventive behaviour. Within this categorisation the present study falls into the third category. Further, this study addresses the 'profiles' or 'predictors' of information seeking (see Beaudoin & Hong 2011) by focusing on the stage of change, beliefs about exercise (self-efficacy, decisional balance), processes of exercise behaviour change, socio-demographic characteristics, and health information literacy as possible antecedents for information behaviour, and the engagement in health information seeking (see Anker *et al*. 2011) by studying different modes of information acquisition (see Subchapter 2.2.3).

2.3.1 Activating and intervening variables

Information seeking and avoidance have been associated both rather stable 'trait' (e.g. personality trait) characteristics and with more temporary 'state' (e.g. emotional state) features (see Chaplin *et al*. 1988). Personality traits (Ek & Heinström 2011) as well as current health status (Longo *et al*. 2010) are seen to contribute to actions of seeking or avoiding information. According to Johnson and Case (2012), the degree to which avoidance of information is a trait a person has as opposed to it being triggered by a situation, is still 'an unsettled' issue.

Based on a review of information behaviour models, Robinson (2013) concludes that a number of factors affecting information behaviour emerge from these models, including:

1. *Context,* such as location, social influences, culture, activity-related and work-related factors, and technology.
2. *Demographics*, such as age, sex, ethnicity, and socio-economic status.
3. *Expertise,* such as knowledge, education, training, experience on the subject area, and the task, and use of information sources.
4. *Psychological factors*, such as personality and mental processes including self-perception and self-efficacy, perception of others, perception of knowledge gaps, cognitive dissonance or cognitive avoidance, perception of risk, ability to cope with stress, and thoughts and feelings when searching for information.
5. *Needs, wants, and goals*, either internally or externally prompted.
6. *The information provider's needs, wants, and goals*.
7. *Motivating and inhibiting factors* that encourage or discourage information behaviour.
8. *Features of the information seeking process*; activities, feelings, and thoughts involved when seeking information.
9. *Characteristics of information and sources*, such as utility (e.g. usefulness, relevance, accessibility) and credibility (e.g. authority, reliability).

Wilson's information behaviour models (Wilson 1981, 1999, Wilson & Walsh 1996) take into account many of these elements, including contextual, role-related, and personal (psychological and demographic) factors that influence information behaviour. Wilson's *general model of information behaviour* describes information behaviour as a process from information need to information seeking and use (Wilson & Walsh 1996). According to Beaudoin and Hong (2011), it is as an example of a model with a focus on the profiles or predictors of information seeking.

In Wilson's model context (personal characteristics of individuals, their social roles and environmental conditions) is suggested to influence information needs that direct actions to seek information. Other cognitive, social, and environmental factors that influence information behaviour are conceptualised as 'activating' and 'intervening' variables. Furthermore, the possibility of avoidance is acknowledged in this model (Wilson & Walsh 1996).

Drawing from previous theories mainly from the field of psychology, the model includes features from the *stress/coping theory*, the *risk/reward theory*, and the concept of *self-efficacy* as activating mechanisms for information behaviour. According to Wilson and Walsh (1996), these theories may be useful in studying different aspects of information behaviour. For example, a decision to take action to satisfy an information need is suggested to be related to stress and coping theory, and a decision to search information resources to the risk-reward theory and the theory of self-efficacy (Wilson 2007).

Psychological, demographic, role-related or interpersonal, environmental and source characteristics (Wilson & Wash 1996, see also Niedzwiedzka 2003) that may 'act to prevent the initial emergence of a coping strategy, or may intervene between the acquisition of information and its use' are conceptualised as *intervening variables* in Wilson's model (Wilson & Walsh 1996). For example, cognitive characteristics such as knowledge base[6] and verbal limitations, ability to understand medical terminology, educational level, and other demographic factors are considered as possible intervening variables (Wilson & Walsh 1996). The model presents information behaviour as a logical, sequential process (see e.g. Robinson 2013) and as such is unfit for the purposes of this study. However, it includes key factors that are pointed out as important antecedents of information behaviour.

Models that are designed to describe information behaviour especially in health settings include *the comprehensive model of information-seeking* by Johnson (1997), *the health information acquisition model* by Freimuth *et al*. (1989), and Longo's *expanded model of health information seeking behaviours* (Longo *et al*. 2010). The health information acquisition model describes health information acquisition as a sequence of actions beginning with a stimulus and ending to a decision point where the adequacy of information is evaluated. This descriptive model focuses on the decision-making of an individual at different stages of information seeking (Freimuth *et al*. 1989).

[6] Especially perceived knowledge is suggested to be an important determinant of information seeking: people whose perceived knowledge is low searched more (Radecki & Jaccard 1995).

Johnson's (1997) model builds upon the basic elements of the Health Belief Model (Rosenstock 1974) and highlights the role of demographics, direct experience, and salience in explaining the motivation to seek and strategies used in seeking health information. In this model information seeking is connected with self-efficacy and control expectations. These health-related factors are suggested to motivate information-seeking actions, which are shaped by the choices of different information channels with varying characteristics. This model is directed to 'explain the communication channel usage of information seekers' (Johnson 1997, 33). Beaudoin and Hong (2011) state that it represents an approach where the outcomes of information seeking are at the focus of investigation.

Longo's (Longo *et al*. 2010) model describes the effects of personal and contextual factors in patients' information seeking behaviour. Personal factors include factors ranging from genetics, socio-economic factors, and cognitive abilities to attitudes, behaviours, and health status. Contextual factors, on the other hand, include health situation, delivery of care, information environment, and networks, for example. These personal and contextual factors are seen to influence information behaviour through two modes: active seeking and passive receipt of information. Information acquisition leads to outcomes such as empowerment, satisfaction, activities of daily living, and health. Longo and colleagues (2010) note that there is interplay between active seeking and passive acquisition of information. Furthermore, awareness, access, and ability to use information are incorporated into the health information behaviour component of this model.

The usage of specific channels (Johnson 1997) or the process of information acquisition (Freimuth *et al*. 1989) are not of interest in this study, and therefore the comprehensive model of information-seeking (Johnson 1997) or the health information acquisition model (Freimuth *et al*. 1989) were not applied. Longo's model, on the other hand, is rather general for the purposes of this study, where the focus is on the contextual and personal factors that influence health information behaviour. However, each model includes features that are relevant to this study. These key features are described in the following subchapters.

Stress and coping, risks and rewards

According to the *stress/coping theory*, seeking and avoidance of information are ways of coping in a stressful situation: people may cope by orienting towards a threat (attention) or turning attention away from the threat (cognitive avoidance) (Krohne 1993, Wilson & Walsh 1996). Janis and Mann (1977), drawing from

theories of information processing and psychology, describe different types of coping patterns people have when making decisions as adaptive and maladaptive coping behaviours. Adaptive behaviour is characterised as a vigilant, careful, and deliberate decision whereas maladaptive behaviours do not meet the criteria for 'high quality information processing' (Janis & Mann 1977, 77). The terms monitoring and blunting have also been used to describe these dimensions of coping (Miller & Mangan 1983). In stressful situations blunters may distract themselves from information that is considered as unpleasant, reinterpret or intellectualise it, or completely deny it. Monitors, in turn, are suggested to actively seek for information about the situation or threat, and use the information to reduce stress (Ek & Heinström 2011, Miller & Mangan 1983).

The style of coping is suggested to be a rather stable personality trait (see Johnson & Case 2012, 152–153 for discussion). However, also beliefs such as perception of risk and self-efficacy seem to orient a person to 'productive' behaviour such as information seeking, or 'counterproductive' behaviour such as avoiding information (Case *et al*. 2005, Ek & Heinström 2011).

The *risk/reward theory* implies that weighing the perceived risk and reward in a given situation will define actions. Risks may be of various types, for example financial, physical, social or ego-related, or risks for safety or loss of time (Murray 1991, Wilson 1997). With regard to information behaviour, it is hypothesised that more information is sought by people who perceive the risks to be high (Murray 1991, Wilson & Walsh 1996, Wilson 1997).

According to Johnson (1997), typically, perceived lack in knowledge alone is not a sufficient motivator for information seeking unless it becomes *salient* to the person (Case *et al*. 2005, Johnson & Meischke 1993). Salience refers to information that is relevant to match an information need and is also 'applicable to a person's concerns' (Case *et al*. 2005). Salience is influenced by 'the degree of health threat perceived by an individual' (Hartoonian *et al*. 2014). According to Hartoonian *et al*. (2014), people who worry about developing cancer and perceive themselves to be at high risk of developing one are likely to seek for information on the topic.

Perceptions of *threat* may also lead to avoidance of information. People may respond to threatening information by blocking it or distracting themselves from it, 'blunting' (Case 2012). Studies on fear appeal message strategies indicate that people may respond defensively to a message if it causes a threat to their self image (Steele 1988). According to Sweeny *et al*. (2010), people may avoid information if it necessitates an undesired action such as behaviour change, or if the information itself is expected to result negative emotions. An example of the first type of

scenario is provided by Barbour *et al*. (2012), who found that people would avoid information if it interfered with habitual activities, even when the habits were known to be unhealthy. An attempt to shun exposure to cancer information after receiving a cancer diagnosis is an example of avoidance as an action to avoid negative emotions caused by information itself (Sairanen & Savolainen 2010).

Self-efficacy

Self-efficacy refers to individuals' confidence in their ability to sustain target behaviour in various situations (Bandura 1997, Velicer *et al*. 1998, see also Subchapter 2.4.1). It is concerned with individuals' judgements of personal capability (Bandura 1997). The concept was first introduced by Bandura (1977) in his Social Learning Theory, and has later been included as a part of various behavioural theories in the fields of health and education, for example. Self-efficacy is, according to Bandura (1997), related to coping strategies; efficacy beliefs are suggested to determine whether an individual will try to cope with a given situation. Moreover, efficacy expectations are linked with the effort an individual puts into action. Self-efficacy is context-specific; individuals may differ in their perceived efficacy to exercise and to abstain from smoking, for example (Bandura 1997).

The relationship between self-efficacy and health information behaviour has been studied in two distinct ways: by considering how health-related self-efficacy influences information behaviour (Banas 2008, Pálsdóttir 2008, Rimal 2001), and, on the other hand, by studying how self-efficacy to seek information is associated with information seeking (Rains 2008)

Rimal (2001) studied how self-efficacy related to exercise and healthy diet was associated with information seeking, use, and knowledge of heart disease. The main finding of the study was that if people perceive themselves to be at high risk for heart disease and also have high self-efficacy beliefs, they are likely to seek for health information (Rimal 2001). Banas (2008) noticed that college students in a state at which both one's self-efficacy and threat perceptions are high[7], were likely to seek health information on a daily basis. Pálsdóttir (2008) established that people

[7] In a 'danger-control state'; Danger-control state is a concept included in the Extended Parallel Process Model (EPPM) (Witte 1994) which has been used in studying fear appeals. It suggests that health messages act as a stimuli to threat and efficacy, and will lead to one of three outcomes: low/no response (low threat; no response), danger-control response (high threat, low high efficacy; an individual takes action), or fear-control response (high threat, low efficacy; an individual avoids or denies the message).

with high health self-efficacy beliefs were likely to seek health information actively. Low self-efficacy beliefs, then again, are suggested to be associated with avoidance of information (Bandura 1997, Case 2005). According to Sweeny *et al*. (2010), perceived control over consequences of information and resources to cope with the information are possible moderators for information avoidance.

On the other hand, Rains (2008) found that perceived ability to use the Web to acquire health information (Internet self-efficacy) was associated with greater perceived search success and more positive attitudes towards the quality of health information online. According to Wilson and Walsh (1996), it may be expected that although an individual would be aware of a particular information source, low self-efficacy expectations of accessing the source or carrying out a search may result in failure to use that source. They (Wilson & Walsh 1996) further propose that one motive for information seeking can be to increase self-efficacy 'in coping with problems of whatever kind'.

Furthermore, individuals with different (health) self-efficacy levels are understood to have differing needs for information and education: for example, those with low self-efficacy are suggested to need help in restructuring their belief system (e.g. overcoming their feelings of inadequacy), whereas those with high self-efficacy need encouragement (Murray-Johnson & Witte 2003). Interestingly, self-efficacy has been shown to be positively affected when individuals are provided with ipsative and normative feedback (Ashford *et al*. 2010).

2.3.2 Demographics

Earlier research shows that in general, female gender (Arora *et al*. 2008, Drentea *et al*. 2008, Ek 2013, Ek *et al*. 2011, Ek & Heinström 2011, Niedzwiedzka *et al*. 2014), good socio-economic position (Anker *et al*. 2011, Cotten & Gupta 2004, Ek & Widén-Wulff 2008), and older age (Ek & Heinström 2011, Zhao 2009) are associated with active health information seeking.

Gender

Gender, the complex of social relations and practices attached to biological sex, is one of the most important socio-cultural factors influencing health-related behaviour (Courtenay 2000). It has been discovered that men are less interested in health information (Ek 2013, Ek *et al*. 2011, Ek & Heinström 2011), seek health information less often than women (Arora *et al*. 2008, Drentea *et al*. 2008, Ek 2013,

Ek & Heinström 2011, Jiménez-Pernett *et al*. 2010, Niedzwiedzka *et al*. 2014, Nölke *et al*. 2015, Percheski & Hargittai 2011, Rakowski *et al*. 1990, Tong *et al*. 2014), and are also less attentive to monitoring and gathering information on health (Ek *et al*. 2011, Niedzwiedzka *et al*. 2014). Men also report receiving less informal health information from family members and friends (Ek 2013). Overall, men have been identified as being less receptive than women to health promotion messages (Drummond & Drummond 2010).

On the other hand, in a study of Vermaas and van de Wijngaert (2005) men sought health information online less often than women, but looked for a wider variety of health subjects and searched information on mental health issues more often than women. Fox and Rainie (2000) noticed that men were less likely than women to focus their information search on specific illnesses or symptoms and tended to focus on the prognosis and treatment of an illness.

Gender differences in health information behaviour have been explained by the notion that women often carry the role of a caretaker in the family (Connell & Craford 1988). Overall, men are often unwilling or lack motivation to engage in health information in everyday life in general, but also in stressful situations (Mansfield *et al*. 2003, Rothman & Salovey 1997, Wellstead 2011). Girls and women are more likely to see health habits, knowledge about health, and following health recommendations as more important than boys and men do (Koski 2006). Moreover, it is more likely for boys to see health recommendations as restrictive and oppressive (Koski 2006). Drummond and Drummond (2010) note that perceptions of masculinity influence the way boys and men recognise, interpret, and act upon health information; for example, taking care of one's health is seen by some men as being feminine, whereas risk-taking can be understood as a masculinised trait. The objectives of health promotion may clash with the values traditionally associated with masculinity (Östlin *et al*. 2006) such as challenging health, rather than taking care of it (Verdonk *et al*. 2010).

Age

At adolescence and young adulthood individuals typically seek and obtain independence from parental control. At this age personal decision-making increases, identity is progressively consolidated, and affect, behaviour and cognition increasingly self-regulated (Zimmer-Gembeck & Collins 2006). With regard to health behaviour, parents may have 'set some kind of standards' at childhood, but behaviours tend to stabilise at adolescence and young adulthood and thereon often

last a lifetime (Pitel *et al*. 2013). Overall, young people are in the process of learning the skills that will impact the way they are able to manage their own lives and make choices that influence their health.

As young people move from families toward peer groups, and as their autonomy increases, traditional sources of information such as parents or teachers may lose authority (Eysenbach 2008). Young people may even feel a need to resist information coming from adults, health education being part of this information. Young people tend to be less interested in health information (Ek & Heinström 2011) than adults and older people. Older adults have been discovered to be more active in seeking health information (Ek & Heinström 2011, Zhao 2009). Young people may use the Internet for seeking health information more often than older people who may use sources such as newspapers more frequently (Beaudoin & Hong 2011, Gray *et al*. 2005a). For many young people, Internet is the main source of health related information (Gray *et al*. 2005a, 2005b). Based on a survey by Ek and Niemelä (2010) of 18- to 25-year-old Finns 82% reported to have visited health related Web sites during the last 12 months at least once.

Young people seem to be interested in wellness as well as illness related information: specific diseases or medical problems, sexual and mental health issues, weight loss and gain, nutrition and vitamins, and exercise and fitness (Horgan & Sweeney 2012, Fox & Duggan 2013, Baxter *et al*. 2008, Escoffrey *et al*. 2005) have been identified as main topics of information seeking among young people.

Socio-economic position

There are clear health inequalities among people based on socio-economic position; in general, people with high level of education, high occupational status or high level of income tend to be healthier and live longer (Kröger *et al.* 2015). Traditionally, either the so-called causation or selection models, or their combination, have been used to explain this socio-economic health inequality. According to the selection model, people with good health are able to rise in the social stratification system, while those in poorer health fall to a lower level. The causation model, on the other hand, explains health differences through the indirect effect of unequal distribution of different health indicators in socio-economic groups (Kröger *et al*. 2015).

Socio-economic position affects health in many ways by influencing opportunities, attitudes, beliefs, and values people have when they make life-course choices. Occupation, education, and income (which are often used as descriptors of

social position) can indicate individuals' location in the social stratification system and thereby their access to material and immaterial resources (Wingood & Keltner 2013). A good socio-economic position is understood to create cognitive and economic opportunities to live and work in an environment that is beneficial for health, and to strengthen the ability and motivation to choose a healthy lifestyle. In addition to individual choices, structural factors relating to education, health care, and distribution of income, for example, are seen to influence health inequalities (Kestilä & Salasuo 2007, Kröger *et al*. 2015).

Previous studies clearly show that among adults, education (Anker *et al*. 2011, Cotten & Gupta 2004, Ek &Widén-Wulff 2008, Niedzwiedzka *et al*. 2014, Niederdeppe 2008, Rice 2006, Zillien & Hargittai 2009) and income (Ayers & Kronenfeld 2007, Cotten & Gupta 2004, Dutta-Bergman 2003, Pandey *et al*. 2003) are positively associated with active health information seeking. For example, Ramanadhan and Viswanath (2006) found that cancer information non-seekers were more likely to come from a socio-economically disadvantaged background. They paid less attention to health in the media and had little trust in media sources regarding health issues (Ramanadhan & Viswanath 2006). Nölke and colleagues (2015) discovered that low class decreased the likelihood to seek health information from the Internet. Zillien and Hargittai (2009) noticed that people in the lowest social status category were much less likely to look for health information when compared to people in the highest social status category. Niedzwiedzka *et al*. (2014) studied information seeking on nutrition, and found that high education was associated with information seeking and reading nutrition labels. Higher education has also been associated with increased likelihood of responding to celebrity cancer news by seeking information (Niederdeppe 2008).

Among adults, differences in source preferences for health information between socio-economic groups have also been identified. For example, Beaudoin and Hong (2011) found that people with higher education were likely to seek health information trough the Internet or newspapers, whereas there were no significant educational differences in seeking health information from television.

Among young people, the Internet has been identified as an important source of health information, and many studies have focused on the online health information seeking and use of adolescents (Borzekowski & Rickert 2001a, Borzekowski & Rickert 2001b, Zhao 2009). These studies have not confirmed the findings on socio-economic disparity in health information seeking (Borzekowski & Rickert 2001a, Borzekowski & Rickert 2001b, Zhao 2009). For instance, Zhao (2009) discovered that teens of lower educated parents were either as likely or even

more likely than teens of higher educated parents to seek for online health information. This was a surprising result since it could be expected that children from higher educated families would be more engaged in health information seeking as they are generally found to be more health oriented (Zhao 2009). According to Zhao (2009), however, children from low education families may be asked to seek out health information for their (illiterate) parents. Moreover, it has been suggested that the 'digital divide' that has been found prevalent in older age groups would not be as strong among adolescents (Borzekowski & Rickert 2001a). In Finland, 99% of young people use the Internet, and 89% use it several times a day (Official Statistics Finland 2014).

2.3.3 Health behaviour and health

Seeking information on health can be considered as an indicator of a proactive attitude towards health (Rakowski *et al*. 1990, Johnson & Case 2012, 17). In general, people who engage in health promoting behaviours (Pálsdóttir 2008, Shim *et al*. 2006) and report better health (Ek & Heinström 2011, Jung 2014) are found to actively seek health information. Active health information seekers are likely to exercise (Pálsdóttir 2008), consume fruit, vegetables (Shim *et al*. 2006), and light food products (Pálsdóttir 2008), and attend to screening (Shim *et al*. 2006). The frequency of obtaining information on physical activity from different sources has been positively associated with both aerobic and resistance training behaviours (Plotnikoff *et al*. 2010). In studies by Ek (2005) and Ek and Heinström (2011), monitors reported better health than blunters.

Dutta-Bergman (2004) found that 'health-oriented' individuals used active sources such as the Internet to seek information, whereas those who were not 'health-oriented' were more likely to obtain health information from passive media sources such as television and magazines. Cotten and Gupta (2004) found that healthy and happy people were more likely to use online sources in health information seeking instead of relying only on offline sources.

Beaudoin and Hong (2011) studied health information seeking via mass media as predictors of the consumption of fruit and vegetables, unhealthy snacks, and sweetened soft drinks, and physical activity. In their study, seeking health information from newspapers was associated with fruit and vegetable consumption, whereas seeking information from television was associated with sweetened soft drink consumption. None of the medium-specific indicators were associated with physical activity (Beaudoin & Hong 2010). Rodgers *et al*. (2007) investigated the

effects of both media information sources and social information sources on various health behaviours, including aspirin use, vitamin use, diet, and exercise, but found no evidence of significant effects.

Andreassen and colleagues (2007) identified that people who had poor self-assessed health used the Internet for health purposes less often than those who assessed their health to be good. However, medical indicators of health, such as a current diagnosis of long-term illness or disability, were associated with a higher level of health-related Internet use (Andreassen *et al*. 2007). Accordingly, in a study by Fox and Rainie (2000) less healthy people were more apt to seek health information online. Nölke and colleagues (2015) established that heavy use of health care services was associated with a higher likelihood of health information seeking from the Internet. Jung (2014), in turn, found no association between avoidance of information and self-rated health.

The type of information sought may play a role in explaining these contrary findings. A study by Weaver *et al*. (2010) showed that people who actively seek for wellness information are likely to engage in physical activities, whereas people who seek for illness information are more likely to report health risks, such as not engaging in physical activities or use of prescription drugs. Moreover, people who sought for wellness information were likely to report having a good health status while people who seek for illness information are likely to report poorer health status, more diminished physical health days, and a poorer quality of life (Weaver *et al*. 2010).

An unusual health situation (e.g. pregnancy or a disease) may also lead to a preference for certain health information sources (Eriksson-Backa 2003). In their study on cancer related information seeking, Johnson and colleagues (1992) discovered that especially the degree of direct experience with a disease was associated with information seeking. Enwald *et al.* (2012) found that prediabetic individuals with poor physical fitness and high BMI were more open to receiving tailored information on nutrition and physical activity than those with high fitness and low BMI levels (Enwald 2013). Experience of one's own disease or that of a family member or friend is likely to serve as a 'trigger' for seeking information on that specific topic (Johnson 1997). Overall, people may be more active in seeking information on one health topic than on another (Chisolm 2010).

Savolainen (2005) notes that people seek for problem specific information episodically (with a specific starting and ending point) to satisfy their information needs when the concern is 'active'. Orienting information, on the other hand, is sought most actively when an issue is of primary interest to the individual, and

more passively when the issue is of marginal interest. According to Savolainen (2005), the level of interest together with an existing body of knowledge dictate information seeking.

Health behaviour and health can be seen both as the antecedents of information seeking and use (Johnson 1997, Longo *et al*. 2010), as well as their possible outcomes (Longo *et al*. 2010). Individuals' health status may influence their information seeking, but, on the other hand, information seeking and use may contribute to activities in daily life, and thus, to health outcomes (Longo *et al*. 2010). Overall, the relationship between health behaviours, health, and health information behaviour seem complex, and it is difficult to determine, for example, whether active seeking of health information contributes to engaging in more health promotive behaviours, or if attendance to these behaviours leads to information seeking (see also Eriksson-Backa 2003). Anker *et al*. (2011) note that predisposing characteristics of an individual may lead to engagement in health information seeking behaviours, which, in turn, are predictive of associated outcomes.

The outcomes of health information seeking have not been examined comprehensively (Anker *et al*. 2011). However, there are indications that health information seeking is associated with outcomes such as discussing search results with physicians, knowledge of treatment options and decisions, and patient satisfaction, which may contribute to other health outcomes. Frequent seeking of health information has been associated with health knowledge (Ramanadhan & Viswnath 2006) and healthier behaviour (Pálsdóttir 2008; Shim *et al*. 2006). Wang *et al*. (2013) state that disparities in self-rated health between socio-economic groups could be partially mediated by health information seeking from media sources. Some negative consequences of health information seeking have been acknowledged as well; for example, self-diagnosis and non-adherence to care (Anker *et al*. 2011) have been associated with active information seeking. Moreover, media use in general, particularly screen time, has been associated with poorer health (Booker *et al*. 2015).

2.3.4 Health information behaviour in the stages of behaviour change

Longo's (Longo *et al*. 2010) expanded model of health information seeking includes the notion of individuals' *health situation* as a contextual factor that may influence their information behaviour. Johnson (1997) notes that needs for health information may change in varying stages of a disease (also Rutten *et al*. 2005).

Yet, few empirical studies have focused on information behaviour in association with the *process* of behaviour change, and the stage of health behaviour change has not been acknowledged in the models that describe the antecedents of acquiring or avoidance of information.

Bar-Ilan and colleagues (2006) provide one exception to this in their study on the role of information in the process of weight maintenance among women. Based on this empirical study, they also propose a model of information behaviour in the process of weight maintenance (Bar-Ilan *et al*. 2006). Partially based on the Transtheoretical model (see Subchapter 2.4), they conceptualise the process of weight loss and maintenance into five stages: weight gain, becoming and being aware and motivated, decision making, taking action, and maintenance.

Their findings indicate that information needs and the role of information fluctuate with the stages of change. Bar-Ilan *et al*. (2006) identified five roles of information in weight maintenance process: 1) building the internal schema, 2) background information, 3) motivation, 4) enabling information, and 5) reinforcement. Specific type of information could serve several of these roles depending on situational and context-specific issues. For example, information on risk factors could be categorised as background information in one situation and as motivating information in another.

In their model, the cycle of behaviour change begins with weight gain. In this stage an individual is often unaware of the weight gain, and would benefit from increase in the awareness of the problem. The major role of information is to provide *background information* (e.g. general information on health risks, healthy lifestyle and stories of peers) to establish basic knowledge and motivate the progress towards a solution. According to Bar-Ilan and colleagues (2006), enough information on the consequences of weight gain, self-realisation (looking in the mirror, for example), or social pressure serves as a 'trigger' for transferring to the next stage.

Becoming and being aware and motivated is the next stage where a person has become aware of the problem. The role of information in this stage is to help understand the positive effects of weigh loss. Individuals become aware of information flows around them and may start seeking information actively. In this stage, individuals are suggested to need background information (e.g. relevant terminology), motivational information (e.g. success stories) as well as information on the different modes of action (procedural information).

The third stage is *decision making*. In this stage mostly practical information is needed, for example, about where to turn to, what modes of action are available,

and what are the expected outcomes. Reassurance from family and friends is also considered important in this stage. The major roles of information in this stage are enabling and motivating. In *action* stage a person starts to apply procedural knowledge. In this stage reinforcement and information on overcoming difficulties are needed. Also enabling information gathered in previous stages is applied.

Provided that individuals succeed in weight loss, they go into *maintenance* stage. Support and motivation is needed in this stage to overcome temptation and previous habits. Information that is needed in this stage includes information on how to maintain weight, the advantages of a healthy lifestyle, and health risks related to overweight. The roles of information in this stage include background knowledge, enabling information, and reinforcement. Bar-Ilan *et al*. (2006) note that information on a healthy lifestyle and risks related to unhealthy behaviour are a part of the general flow of information on media, and through the information flow people may acquire this relevant information. Individuals in this stage may also rely on their social ties and health professionals. Furthermore, according to the model, in each stage a person may seek for new information or rely on previously collected information and experience (Bar- Ilan *et al*. 2006).

The Transtheoretical Model of behaviour change, which was used as a guideline in Bar-Ilan and colleagues' study (2006), provides an overall framework for understanding behavioural change and also presents concrete strategies on how to design interventions for a specific individual (Prochaska & DiClemente 1983, Nigg *et al*. 2011). The model focuses on intentional change and therefore, according to Johnson and Case (2012), has direct implications for information seeking. Furthermore, in the model it is acknowledged that information should be tailored and matched to individuals' readiness to change, which, according to Wathen and Harris (2005), is the main value of the model from information behaviour perspective.

The Transtheoretical Model is mentioned as being related to information behaviour in Theories of Information Behaviour by Fisher *et al*. (2005), in Health Information Seeking by Johnson and Case (2012), and in Lalazaryan's and Zare-Farashbadi's (2014) review on models and theories of health information seeking behaviour. Furthermore, Dutta-Bergman (2013) states that the stage of change is likely to influence an individual's information seeking and processing strategies. Rather surprisingly, however, information behaviour in relation to the constructs of the Transtheoretical Model has not been extensively studied (see Grayson & Johnson 2015). In the present study, the stage of behaviour change is investigated in relation to information behaviour in the context of physical activity and exercise.

2.4 Information behaviour and the Transtheoretical Model

Several theories and models have been presented in attempt to explain why people adopt or do not adopt particular health behaviours. These theories concentrate mainly on the *determinants* of a behaviour. The determinants of health behaviours include both personal (biological and psychological) and environmental (social and physical) factors, some of which are 'unmodifiable' (e.g. sex, age, ethnicity) and some are 'modifiable' (e.g. health knowledge, self-efficacy, social support). Determinant-based models of behaviour, such as the Health Belief Model, identify the underlying factors behind specific health behaviours and thus help us understand them. Theories of change, such as the Transtheoretical Model, on the other hand, attempt to describe how behaviours change over time, and how they can be changed. While behavioural theories are 'diagnostic' in the sense that they are designed to explain the determinant factors underlying behaviour, change theories are more pragmatic. They are developed in order to support interventions for changing current behaviours or encouraging the adoption of behaviours (Darnton 2008).

The Transtheoretical Model (TTM) of behaviour change integrates processes and principles from different theories of behaviour change and intervention (Prochaska & Velicier 1997). The model has its roots on psychotherapy and it has been further established trough research on smoking cessation (Prochaska & DiClemente 1983), followed by research and utilization on some 50 different behaviours, including physical activity (Hall & Rossi 2008). The Transtheoretical Model was one of the first to conceptualise behaviour change as a process rather than a single event.

In their seminal study Prochaska and DiClemente (1983) established that current and former smokers could be categorised into distinct groups with different cognitive and behavioural tendencies when it came to smoking (Noar & Van Stee 2012). One group of smokers processed little information about smoking, spent little time re-evaluating themselves as smokers and experienced few negative reactions to the negative aspects of smoking, and did little to change their environment to keep from smoking. Another group, in turn, were much more open to information about smoking and spent more time evaluating their smoking habit (Noar & Van Stee 2012, Prochaska & DiClemente 1983).

According to Noar and Van Stee (2012) the implications of this research were significant and represented a 'paradigm shift' for the study of behaviour change. This research was notabe in that it demonstrated that behaviour change is better

conceptualised as a process, not as a single event. Moreover, based on these results, Prochaska and DiClemente (1983) suggested that an individuals' stage of change could be evaluated, and based on the evaluation, messages and interventions targeted and tailored to the stage of readiness to change health behaviours. At the time, this idea was novel as in most cases smokers coming to treatment were assumed to be ready for action. This research led on to the development of the Transtheoretical Model (Noar & Van Stee 2012).

The central components of the Transtheoretical Model are *stages of change*, *self-efficacy*, *decisional balance*, and *processes of change* (Prochaska *et al*. 1992). The stages of change represent a temporal dimension of behaviour change (Norcross *et al*. 2011). The five stages are: precontemplation, contemplation, preparation, action, and maintenance[8]. In the precontemplation stage individuals are not intending to take action within the next six months. In the contemplation stage individuals are intending to make a change in the next few months, but have not made a commitment to do so. In the preparation stage individuals intend to change their behaviour within the next month. In the action stage individuals have successfully made the behaviour change less than six months ago. In the maintenance stage individuals have made the behaviour change more than six months ago. In the TTM behaviour change is understood as a cyclical process where most people relapse to previous stages several times before achieving successful behaviour change (Prochaska *et al*. 1992).

2.4.1 Self-efficacy

The concept of self-efficacy was integrated into the TTM from Bandura's (1977) Social Learning Theory to refer to individuals' confidence in their ability to sustain target behaviour in various situations (Velicer *et al*. 1998, see also Subchapter 2.3.1). The TTM proposes that this situation-specific confidence increases with each stage of change, and this is supported by empirical studies (Spencer *et al*. 2006).

According to Bandura (1986), people tend to avoid engaging in a task if their self-efficacy beliefs are low. Strong self-efficacy beliefs are suggested to result in more persistent efforts. Self-efficacy is also suggested to influence thought patterns

[8] Sometimes a sixth stage, termination, is included as a final stage of change. In termination behaviour is 'permanently ingrained'. However, this stage can be seen as theoretical in nature (Clark & Janevic 2014, 15).

and emotional reactions; people with low self-efficacy tend to believe things are harder than they 'really' are, and tend to attribute failure to deficient abilities rather than insufficient effort. Relatively accurate self-efficacy appraisal is considered important since excessively high self-efficacy can also lead to the feeling that not much invest in effort is needed (Bandura 1986).

Self-efficacy beliefs are influenced by various sources of self-efficacy information. The most influential of these is an authentic mastery experience: success in a behaviour raises efficacy beliefs whereas failure lowers them. Vicarious experience is another source of self-efficacy information. It refers to information that is acquired through observation of events or other people. Social persuasion refers to verbal encouragement where individuals are persuaded to believe that they can master a specific task. For instance, feedback is a way of social persuasion. Physiological states such as pain, fear reactions, or fatigue, are also suggested to influce self-efficacy (Bandura 1986). Bandura (1986) notes, that much depends on the way an individual interprets this self-efficacy information. Further, he suggests that the cognitive processing of self-efficacy information involves: a) the type of information people attend to and use as indicators of efficacy, and b) the combination of rules they employ to integrate information from different sources in forming their self-efficacy beliefs. Although self-efficacy is context-specific, enhanced self-efficacy is suggested to generalise to other situations as well, at least within activities that are rather similar (Bandura 1986, 1997).

2.4.2 Decisional balance

Derived from Janis and Mann's (1977) conflict model of decision making, the TTM involves the evaluation of decisional balance, which refers to the relative weighing of the pros and cons associated with behaviour change (Prochaska & Velicer 1997). These can be understood as the motivators and barriers to behaviour. Health related actions may be perceived as unpleasant, expensive, inconvenient, or time-consuming, for example, and individuals' weigh these costs of an action against the perceived benefits.

Janis and Mann's (1977) original model attempted to specify conditions in which individuals will prioritise health issues and seek out information about, for example, the consequences of actions. Janis and Mann (1977) identified five stages individuals go trough in the decision-making process. In the first stage communication conveys a threat or an opportunity. In this stage individuals ignore this challenge, repeat it, or proceed to the next stage. In the second stage individuals

consider the goals relevant to the decision and seek for alternatives. In the third stage individuals evaluate the costs of each alternative, and in the fourth stage they increasingly commit to action. In the final, fifth stage, individuals discard new challenges and continue with implementing the decision (Janis & Mann 1977).

In the TTM it is suggested that decisional balance shifts as individuals progress through the stages of change. In order for the behaviour to change, the benefits should exceed the costs (Prochaska *et al*. 1992). In the context of exercise, it has been found that precontemplators place emphasis on negative aspects of exercising, including the time involved while maintainers focus on the positive aspects, such as the increased feelings of confidence associated with exercise (Nigg & Cortneya 1998).

2.4.3 Processes of change

Processes of change represent the type of activities that are initiated or experienced by individuals in their attempt to modify affect, behaviour, cognitions, or relationships (Prochaska & DiClemente 1986) in order to produce progress in each stage. Each process is a broad category of techniques, methods, and relationship stances associated with different theories related to behaviour change (Norcross *et al*. 2011). Different processes of change are emphasised in the five stages of change (see Figure 3). Processes associated with each stage of change in the context of exercise (adapted from Nigg *et al*. 2011)

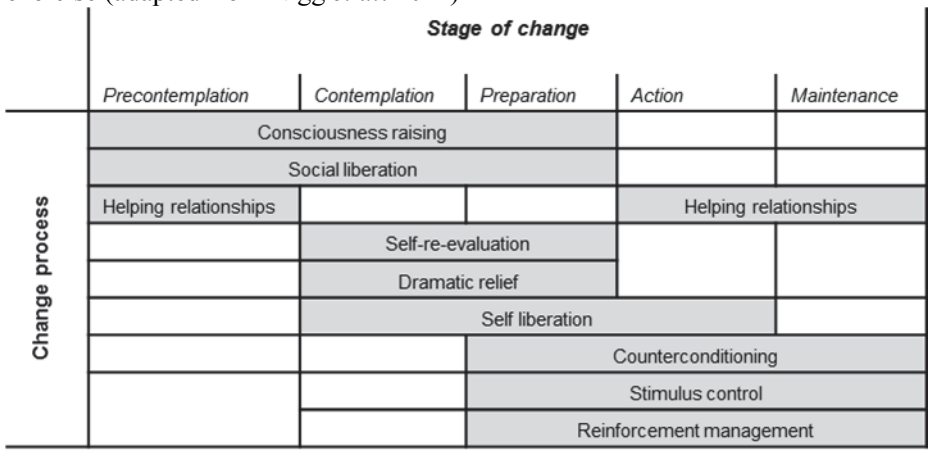

Fig. 3. Processes associated with each stage of change of the Transtheoretical Model in the context of exercise (adapted from Nigg *et al*. 2011).

The time spent in each stage may vary, but the tasks to be accomplished in the stages are assumed to be invariant. The ten processes of change are: consciousness raising, dramatic relief, environmental re-evaluation, self re-evaluation, social liberation, counterconditioning, helping relationships, reinforcement management, self liberation, and stimulus control (Prochaska *et al*. 1988). The five first processes are *experiental and cognitive processes* which involve changes people make in the way they think and feel about a behaviour.

Consciousness raising (increasing knowledge) stands for the efforts of an individual to recall and seek information and to gain understanding and feedback in order to increase consciousness about oneself and the problem behaviour (Velicer *et al*. 1998, Woods *et al*. 2002). In this process individuals attempt to increase their awareness about the negative consequences, the causes, and the cures of the problem behaviour (Patten *et al*. 2000). In the context of physical activity and exercise, individuals may attempt to increase their knowledge, for example, by thinking about the health effects of sedentary lifestyle, or the negative influences (weight gain, poor fitness) of not exercising, reading materials about exercising, or watching television shows with exercise content.

Self-re-evaluation (comprehending benefits) refers to the emotional and cognitive reassessment of values by the individual, with respect to the problem behaviour (Velicer *et al*. 1998). Individuals assess the way they feel and think about the problem behaviour (Patten *et al*. 2000) and their own self image with and without the behaviour (Prochaska *et al*. 1992). In this process individuals comprehend the benefits of the healthier behaviour in contrast to the unhealthy one and may also become aware of feelings of guilt towards the behaviour (Patten *et al*. 2000). Self-re-evaluation can actualise, for instance by individuals considering themselves no longer happy being inactive, or imagining themselves as active persons instead of 'couch potatos' (Prochaska *et al*. 1992).

Dramatic relief (being aware of risks) refers to experiencing and expressing feelings about the problem behaviour and potential solutions to the situation (Prochaska *et al*. 1992). This can mean experiencing strong emotional reactions to events associated with the problem behaviour, followed by reduced affect when appropriate actions are taken; for example, deciding to do something about one's exercise habits after one's grandmother is diagnosed with a heart disease, seeing the effects of inactivity in others, or thinking about negative health consequences of inactivity (McKenna & Francis 2003).

Environmental re-evaluation (caring about consequences to others) means consideration and assessment of how problem behaviour affects physical and social

environment (Patten *et al*. 2000, Woods *et al*. 2002) and can also include awareness of how the individual can be a positive or negative role model to others (Velicier & Prochaska 1997); for example, thinking about the effects of inactivity to spouse or children.

Social liberation (increasing health opportunities) refers to individuals' attempts to increase health opportunities and raise awareness, availability, and acceptance of alternative, problem-free lifestyles in society (McKenna & Francis 2003). This can include noticing and using social conditions that support personal changes (Woods *et al*. 2002). According to Patten *et al*. (2000) the need for an increase in opportunities or alternatives for non-problem behaviours in society are crucial, especially for those who are deprived or oppressed (see also Toscos & Connelly 2010). Noticing and using social conditions that support personal changes may include, for example, noticing exercise areas around oneself or joining an exercise course.

Behavioural change processes involve people making changes to their behaviour. *Counterconditioning* (substituting alternatives) refers to substitution of alternatives for the problem behaviour. When concerning physical activity this can mean replacing the sedentary lifestyle with more active behaviours and positive experiences related to physical activity and exercising (Woods *et al*. 2002). Counterconditioning requires the individual to learn to substitute healthy behaviours for problem behaviours (Patten *et al*. 2000).

Helping relationships (enlisting social support) represents trusting, accepting, and utilizing the support of others during attempts to change behaviour. This can mean seeking out social support to help initiate and maintain activity (Woods *et al*. 2002) and being open and trusting with those who are actively involved in helping the individual to change behaviours (Patten *et al*. 2000). Enlisting social support may mean trusting others and accepting their support in behaviour change, for example, asking for help from a professional or a friend.

Reinforcement management (rewarding oneself, orig. contingency management) stands for rewarding oneself or being rewarded by others for making positive changes in behaviour. Rewards for exercising and being active could be, for example, receiving praise from family, or buying oneself flowers after reaching a goal (Patten *et al*. 2000, Woods *et al*. 2002).

Self-liberation (committing oneself) refers to choice and commitment to change the problem behaviour. This includes choosing and making a commitment to change (Woods *et al*. 2002) but also the belief within individuals that they can

change (Patten *et al*. 2000). Self liberation may include telling oneself that one can start exercising, setting a day to start or telling others about changing one's lifestyle.

Stimulus control (reminding oneself) means reminding oneself of the positive behaviours and avoiding situations that trigger the problem behaviours. The individual needs to remove or avoid those stimuli that are associated with the problem behaviour and replace them with prompts to participate in healthy behaviours (Patten *et al*. 2000, Woods *et al*. 2002). Avoiding or countering stimuli that elicit the problem behaviour can mean, for instance, keeping a set of exercise clothes conveniently located or using the calendar to schedule exercise time.

During the earlier stages, the change processes associated with 'the experiential, cognitive, and psychoanalytic persuasions' are considered to be most useful, while the change processes associated with 'the existential and behavioural traditions' stimulate later stage transitions (Prochaska & Norcross 2013, 467). In other words, cognitive processes such as consciousness raising and dramatic relief are emphasised in the earlier stages of change to help individuals increase their awareness of the advantages of behaviour change and move people affectively to produce progress in these stages. Behavioural processes such as counterconditioning, stimulus control, and reinforcement management, in turn, are suggested to be relevant for those who are ready to take action, but can produce resistance in precontemplators (Prochaska *et al*. 2008).

2.4.4 The model's implications for information behaviour research

The stage of behaviour change is suggested to influence individuals' information seeking and processing strategies (Dutta-Bergman 2013, Prochaska 2008). Descriptions of individual information seeking and avoidance are embedded in the descriptions of stages and processes of change. According to Prochaska (2008) individuals may be at the precontemplation stage because they are 'uninformed or underinformed' about the consequences of a behaviour. Individuals may also be 'demoralised' about their ability to change behaviour after previous, failed attempts. Either way, precontemlpators tend to *avoid* reading, talking or thinking about the behaviour in question (Prochaska 2008).

Of the ten processes included in the Transtheoretical Model, the process of consciousness raising is most evidently linked to information behaviour (see Johnson & Case 2012). Consciousness raising refers to individuals' efforts recall and seek information and to gain understanding and feedback about their behaviour, in order to increase consciousness about themselves and the problem behaviour

(Velicer *et al*. 1998, Woods *et al*. 2002). In this process individuals attempt to increase their awareness about the negative consequences, the causes, and the cures of the problem behaviour (Patten *et al*. 2000). It is suggested that this process may be supported by encouraging subjects to read the materials they receive (Woods *et al*. 2002) and by providing feedback, education, confrontation, interpretation, and media campaigns (Prochaska *et al*. 1992, Prochaska & Velicier 1997). Consciousness raising is considered to be an important process at early stages of change.

According to Johnson and Case (2012, 43–44), it can be assumed that individuals in the contemplation stage would seek information most actively. They are seriously considering taking action and are gathering information to be used in their decision making (Johnson & Case 2012). According to Dutta-Bergman (2013), individuals in contemplation and preparation stages would be most likely to seek out health information related to the behaviour in question. Johnson and Case (2012) note that information seeking in later stages of change is likely to be used to confirm and reinforce decisions that individuals have already made. According to them, information seeking would then prevent individuals from relapsing to previous stages of change (Johnson & Case 2012). Empirical studies on information behaviour in different stages of behaviour change processes are very rare (see Joinson & Banyard 2003 and Bar-Ilan *et al*. 2006 for exceptions).

As discussed earlier (see Subchapter 2.3.1), information behaviour may also be associated with self-efficacy beliefs which, according to the TTM, increase by stage of change. Empirical studies in the field of information studies suggest that people with high health self-efficacy are prone to seek exposure to health information. This would imply that active information acquisition would be most prominent in late stages of change where self-efficacy beliefs are high.

2.4.5 Critique of the Transtheoretical Model

The TTM has been widely used particularly in health settings, but it has also been widely criticised. Originally the model was developed in the context of smoking and there are doubts whether the model is adaptable to non-addictive behaviours (Povey *et al*. 1999), such as physical activity and exercise. In the context of physical activity interventions, its limitations include the notion of the complexity of physical activity behaviour, the lack of validated staging algorithms, and the possibility that physical activity behaviour is influenced by factors not yet included in the TTM (Nigg *et al*. 2011). Moreover, the incongruent philosophical

perspectives (Nigg *et al*. 2011), classification into distinct stages as opposed to continuous process (Armitage 2009, Brug *et al*. 2005, Nigg *et al*. 2011), and the relevance of time frames (Lippke *et al*. 2009) have been questioned. Furthermore, numerous inconsistencies are suggested to exist regarding the application of the TTM to interventions (Hutchison *et al*. 2009).

This study draws mainly from individually focused theories of health behaviour and information behaviour. Overall, individually focused theories of behaviour have been criticised for the social 'gap' in them (Morris *et al*. 2012), as well as for their ignorance of the context (Ong *et al*. 2014). Often, the impact of social contexts is vastly underestimated, and society treated as an external factor (Morris *et al*. 2012). Furthermore, most health behaviour and behaviour change models rely on a model of a person as a rational decision maker, who is subject to motivational forces but essentially being the one making decisions and following them trough. The roles of emotions and situational variables are relatively underplayed (Pitts 1998). These limitations are acknowledged in this study.

Individually focused models are often highly intuitive and explicit, when compared to the more abstract and diffuse influences of social structures, and can therefore be considered useful. Moreover, it is evident that individuals do play a role in deciding upon their own health behaviour (Morris *et al*. 2012). Interpersonal (social, cultural) factors are taken into account in the study in terms of socio-demographic factors, which are known to play an important role in shaping individuals' health-related behaviours. Moreover, although the Transtheoretical Model is adopted as part of the framework of this study, the study does not attempt to test its explanatory power, nor does it adopt its philosophical background assumptions.

2.5 Everyday health information literacy

2.5.1 Health information literacy and related literacies

The concept of *health information literacy* was introduced in early 2000's 'to increase health literacy by fostering . . . an understanding of the role that health information literacy plays in empowering people to read, understand, and act' (Medical Library Association 2003). According to the working definition of the Medical Library Association Task Force on Health Information Literacy, health information literacy includes the abilities to 'recognize a health information need;

identify likely information sources and use them to retrieve relevant information; assess the quality of the information and its applicability to a specific situation; and analyze, understand, and use the information to make good health decisions' (Medical Library Association 2003). The definition was framed within two related concepts: *health literacy* and *information literacy*.

Information literacy can be defined as a set of abilities enabling individuals to 'recognize when information is needed and have the ability to locate, evaluate, and use effectively the needed information' (American Library Association 1989). Information literacy is understood to form the basis of lifelong learning (Lau 2006) and is considered to be the key to empowerment and 'survival' in the information age (Yates *et al*. 2012). The concept of information literacy has mainly been applied in educational settings, but more recently the focus has expanded to everyday life context as well. However, this field of study has been identified as a significant gap in research (Lloyd & Williamson 2008, Partridge *et al*. 2008).

Health literacy can be defined as 'the degree to which individuals have the capacity to obtain, process, and understand basic health information and services needed to make appropriate health decisions' (U.S. Department of Health and Human Services 2000). Health literacy is often understood as the basic reading and numerical skills that are needed to be able to function in the health care environment (Baker 2006). More recently the focus of health literacy research has shifted to a wider variety of social, personal and cognitive capabilities, such as critical thinking, problem-solving, information seeking and communication (Chinn & McCarthy 2013, Mancuso 2009). However, most studies still investigate health literacy as a set of basic reading and numeracy skills (Jordan *et al*. 2011, Mancuso 2009). The way in which health literacy has been operationalised in these studies directs investigation to detecting individuals with limited basic literacy. Measures such as the Test of Functional Health Literacy in Adults (TOFLA) and the Rapid Estimate of Adult Literacy in Medicine (REALM) are not well-suited for investigating literate populations, and do not represent the health information related challenges people face in their everyday life (Niemelä *et al*. 2012). There is also a lack of studies on health literacy in non-medical settings and on generally healthy individuals (Mancuso 2009).

Nutbeam (2000) suggests that there are three levels of health literacy: 1) basic literacy (basic reading, writing and literacy skills), 2) communicative literacy (communicative and social skills that influence health), and 3) critical literacy (higher level cognitive and social skills required to 'critically analyze information, and to use this information to exert greater control over life events and situations

through individual and collective action to address the social, economic and environmental determinants of health'). The concept of critical health literacy can be further divided into three components: the critical appraisal of information, the understanding of the social determinants of health, and the engagement in collective action (Chinn 2011, Nutbeam 2000, 2008). The level of an individual's health literacy is understood to remain relatively stable over time. Yet, it may improve with education and decline if a person's cognitive functioning deteriorates for some reason (Baker 2006).

Other related concepts for health information literacy include health numeracy and eHalth literacy. Health numeracy refers to the ability to use and understand quantitative health information (Ancker & Kaufman 2007[9]), and eHalth literacy to 'the ability to seek, find, understand, and appraise health information from electronic sources and apply the knowledge gained to addressing or solving a health problem' (Norman & Skinner 2006).

Overall, the definitions of health literacy (and other related literacies) and health information literacy overlap to some extent. For example, according to Lloyd *et al*. (2013), health literacy is an expression of information literacy in health context. Niemelä *et al*. (2012) and Eriksson-Backa *et al*. (2012), in turn, use the concept of health information literacy to combine the concepts of health literacy and information literacy.

Within Nutbeam's three-level-categorisation of health literacy (basic, communicative, critical), the topic of this study can be seen to fall into the former two categories and especially to the domain of critical appraisal of information. Basic health literacy skills are the basis of higher level cognitive abilities. However, although having adequate basic health literacy, people may lack the necessary competencies to find and use health information (Andrews *et al*. 2005). The concept of health information literacy is directed especially towards literate populations (Niemelä *et al*. 2012).

[9] Lack of health numeracy is suggested to contribute to skepticism towards science and poor assessment of risks to health. This can lead to ignoring or underestimating the cosequences of health behaviours. For example, a person may refuse to believe that smoking is causally linked to the development of lung cancer if he has trouble in understanding probability statements. Innumeracy can influence perception of risk since many health issues are expressed in terms of statistical probabilities (Johnson & Case 2012).

2.5.2 Perspectives to health information literacy

Health information literacy may be approached from several theoretical perspectives (Limberg *et al*. 2012, Yates 2013). According to Yates (2013), there are three distinct theoretical perspectives to (health) information literacy: behavioural, relational, and socio-cultural[10]. From the relational perspective, focus is placed in information literacy as individuals themselves experience it. Yates (2013, Yates *et al*. 2012) has studied older adults' health information literacy from this perspective in an everyday context. From a socio-cultural viewpoint, the focus is placed on the social settings, in which health information literacy is developed (Lloyd 2005, Lloyd *et al*. 2013, Tuominen *et al*. 2005). Studies by Lloyd (2005) for example, draw from this perspective.

In this study the Medical Library Association's (2003) definition of health information literacy is adopted and health information literacy is understood from a behavioural perspective (see e.g. Yates 2013); as skills or competencies of a person. This does not mean, however, that health information literacy would be seen as disconnected from socio-cultural aspects. Literacy is not seen only as an 'individual achievement' but also as a socio-cultural advantage (see Budd & Lloyd 2014). Criticism towards the behavioural perspective on information literacy has focused on the standards and models developed for information literacy education. Information literacy is considered to be a complex set of skills that these 'recipe' or 'tick the box' type of standards often fail to encompass. Moreover, most of these standards have been developed in educational context and may not therefore transfer well to everyday life contexts (Yates 2013, Webber & Johnston 2000).

According to Niemelä *et al*. (2012), the concept of *everyday health information literacy* puts health information literacy in everyday life contexts, as a concept for studying laypersons' general and nonprofessional abilities related to health information. Based on the MLA's (2003) definition of the concept of health information literacy, Niemelä *et al*. (2012) designed a 10-item screening tool 'aiming to detect individuals with problems related to their interest and motivation, finding, understanding, evaluating and using health information but being literate at the average level'. On the basis of a factor analysis, they identified three

[10] Limberg *et al*. (2012), on the other hand discuss the perspectives of phenomenoraphy, sociocultural theory, and Foucauldian discourse analysis on studying information literacy, and Budd and Lloyd (2014) distinguish between approaches where information literacy is seen as 1) metacognition, 2) a practice 'as a social site that is connected to other practices' 3) literacies; socio-material practices (sociocultural approach), 4) 'boundary activity'.

independent factors, namely, motivation, confidence, and evaluation, as 'most fundamental aspects of everyday health information literacy among the literate population'. Moreover, the perceived ability to understand health related terminology was considered as an essential element of everyday health information literacy. Niemelä *et al*. (2012) acknowledge that there are no rapid methods to screen overall everyday health information literacy. However, they found that with the screening tool individuals who had difficulties in areas of everyday health information literacy could be identified. According to them, the tool could be used to separate respondents whose answers are biased to the extreme alternatives, which indicates problems in health information literacy (Niemelä *et al*. 2012). This screening tool is used in this study (see Subchapter 3.2.2).

2.5.3 Determinants and outcomes of health information literacy

Health information literacy research has focused on health professionals' health information literacy and the roles of libraries and librarians in the promotion of health information literacy (Shipman *et al*. 2009, Yates *et al*. 2012). In everyday life settings, health information literacy has been studied among upper secondary school students (Niemelä *et al*. 2012), adults attempting to manage their weight (Marshall *et al*. 2012), individuals with high risk for metabolic syndrome (Enwald *et al*. 2015b), and older adults (Yates 2013, Eriksson-Backa *et al*. 2012, Gazibara *et al*. 2015, Hallows 2013). Whereas health information behaviour studies have concentrated on various psychological variables that influence individuals' actions to seek health information (see Subchapter 2.3), studies on health literacies have focused on the socio-demographic determinants and outcomes of these literacies.

Determinants

Basic health literacy is understood as a social determinant of health. Inadequate health literacy is recognised to contribute to health inequalities, since it is more prevalent among lower socio-economic groups, ethnic minorities, the elderly, and those with long-term conditions or disabilities (Chinn & McCarthy 2013). Moreover, inadequate basic health literacy has been found to be more prevalent among males than females (Paasche-Orlow & Wolf 2007). Drawing on earlier literature, Paasche-Orlow and Wolf (2007) argue that social (e.g. income, social support, culture, language), physical (e.g. memory, hearing, vision), and

demographic (e.g. ethnicity, education, age) factors together determine health literacy.

In terms of *health information literacy* evidence of its determinants is not as comprehensive. Among young people, a positive association has been found between health information literacy and female gender (Niemelä *et al*. 2012). Eriksson-Backa *et al*. (2012) found that among older adults men were more confident in their ability to use obtained health information. Other dimensions of health information literacy, however, were not associated with gender in their study (Eriksson-Backa *et al*. 2012). The study also showed that among older adults, education was clearly related to differences in health information literacy: more highly educated had a higher level of health information literacy. Educated people have been found to be more aware of existing nutrition information sources and use more 'reliable' sources such as web pages endorsed by nutrition specialists (Niedzwiedzka *et al*. 2014). Low educational level has also been associated with information overload (Kim *et al*. 2007). According to Kim and colleagues (2007), the findings indicate that overload is strongly predicted by health information literacy skills. Higher education has also been associated with openness regarding dissonant information (see Case 2007, 98). Already in the 1960's Sears and Freedman (1967) found that people were open to dissonant information if the information was estimated to be highly useful or if the person already knew a lot about the topic, and that educated individuals were more likely to be open to this information. Ivanitskaya *et al*. (2006) focused on university students' skills on finding quality information on a specific health topic and found that self-perceptions of these skills tended to increase with increasing level of education. However, self-estimated skills were only weakly associated with more directly measured skills (Ivanitskaya *et al*. 2006).

Outcomes

Previous research clearly indicates that *basic health literacy* is positively associated with health promoting behaviour as well as physical health, at least among the elderly and in specific patient populations (Berkman *et al*. 2011). Low health literacy has consistently been shown to associate, for example, with poorer health-related knowledge and comprehension, and among elderly persons, with poorer overall health status (Berkman *et al*. 2011). For example, among older people, poor basic health literacy has been found to associate with poorer walking speed, lung function, grip strength, body mass index, and count of natural teeth (Mõttus *et al*.

2014), and even with death (Baker *et al*. 2007). In younger populations basic health literacy has been associated with health-promoting eating behaviour (Chang 2011, von Wagner *et al*. 2007), being a non-smoker (von Wagner *et al*. 2007), lesser use of alcohol and drugs, less dental diseases, and general healthy lifestyle (Berkman *et al*. 2011). Despite these findings, the evidence for the association between health literacy and health behaviours, as well as with physical health is inconsistent and insufficient (Berkman *et al*. 2011). It has also been suggested that poor health literacy is associated to poorer health largely because it reflects general cognitive ability, and educational or occupational levels of populations (Mõttus *et al*. 2014).

So far there is little evidence on whether *communicative and critical health literacy* (see Nutbeam 2000, 2008, Chinn 2011) or *health information literacy* are associated with health promoting behaviours and physical health. Eriksson-Backa (2014, Eriksson-Backa *et al*. 2012) has studied the connection between health information literacy and health among older adults. Her studies indicate that there are associations between aspects of health information literacy and self-rated health (Eriksson-Backa *et al*. 2012), and that health information literacy is associated with the level of HDL cholesterol and body mass index (Eriksson-Backa 2014). In Pálsdóttir's (2008) study, a critical approach to the selection of information sources and low information behaviour barriers, such as the ability to understand information, were related to healthy behaviour. Lam and Lam (2015) investigated how 'competency of health information acquisition' was associated with intentions to act in a health promoting way. They found that competency of health information acquisition both online and offline were associated with these intentions. Basic health literacy, in turn, was not (Lam & Lam 2015). Furuya *et al*. (2013) found a positive association between communicative/critical health literacy and self-reported health.

The level of eHealth literacy (see Subchapter 2.5.1) has been studied in relation to health outcomes with somewhat inconclusive results: For example, Mitsutake *et al*. (2012) found that eHealth literacy was positively associated with knowledge in and screening for colorectal cancer. Paek and Hove, (2012) on the other hand, did not find any association between health status and eHealth literacy among adolescents.

To the author's knowledge, no explicit models on the mechanisms through which health information literacy influences health have been introduced. However, there are several models on health literacy and its outcomes. For example, Berkman and colleagues (2011) present a 'logic model' on the relationship between health literacy and its outcomes for the basis of a systematic review. In their model

outcomes of health literacy include knowledge and self-efficacy, which influence a variety of other outcomes. Knowledge is suggested to influence attitudes and skills (e.g. self-monitoring, seeking additional health information), as well as self-efficacy. Together with social norms, attitudes, and self-efficacy lead to behavioural intent and, provided that the individual has sufficient skills and recources, initiation of and adherence to behaviours, and through them physical and mental health outcomes (Berkman *et al*. 2011).

The model also provides possible explanations to the associations between health information literacy and health outcomes. The concept of health literacy cannot be replaced with that of health information literacy in this model, however, since health information literacy, by definition, already includes specific competencies that in this model are understood as skills (e.g. seeking additional health information).

2.6 Health information literacy and health information behaviour

There is an intuitive connection between people's abilities to access and use information (information literacy) and the actions of information acquisition, avoidance and use (information behaviour). However, the relationship between information behaviour and information literacy has not been thoroughly investigated (Longo *et al*. 2010, Nesset 2014). Although these research fields have been rather disconnected (Julien & Williamson 2011, Limberg & Sundin 2006, Nesset 2014), there is an overlap between information literacy and behaviour in both conceptual and empirical levels (Julien & Williamson 2011).

Hepworth *et al*. (2014, 51) acknowledge that both concepts concern 'the interaction and experience of a person or a group with information'. According to them, information behaviour research has focused on the aspects and factors influencing information behaviour, while information literacy research has studied the individual capabilities needed to interact with information. Both aspects and factors have been approached from social, psychological, behavioural as well as environmental perspectives. Moreover, information literacy research has focused on ways to enhance individuals' information literacy, whereas studies on information behaviour tend to have a more theoretical focus (Hepworth *et al*. 2014).

Hepworth *et al*. (2014) argue that information literacy could be seen as a sub set of information behaviour, and that one aspect of information literacy could be described as metacognition associated with information behaviour. In a health setting Yates *et al*. (2012) defined the concept of health information literacy as

'using information to learn about health'. Niedzwiedzka *et al*. (2014) studied the determinants of information behaviour and information literacy related to healthy eating habits among Internet users in five European countries. They focused on, for example, people's awareness of health information sources, reading nutrition labels, and seeking for nutritional information. However, a clear definition of the concepts of health information literacy and behaviour or their connections was not presented in the study. Eriksson-Backa *et al*. (2012) used the concept of health information literacy 'to describe health-related information behaviour, including needs, seeking and use of information related to health or medicine'.

Eriksson-Backa's studies have focused on the assessment of everyday health information literacy as individuals' health information needs, use of information sources, perceptions of information quality, and ability to understand information (Eriksson-Backa 2005, Eriksson-Backa *et al*. 2012). These studies are among the few that have focused on the association between health information literacy (as skills or abilities) and health information behaviour (as actions). Eriksson-Backa *et al*. (2012) found that, among elderly people, elements of health information literacy, such as the ability to decide when information is needed, the confidence in finding information, and evaluation of the trustworthiness of information, were associated with active health information seeking. Similarly, among young adults in differing health situations, those who were more active at seeking information were also more health information literate (Eriksson-Backa 2005).

Pálsdóttir (2008) studied information behaviour in relation to elements that could be understood as health information literacy. She studied individuals' perceptions of costs, awareness of information, beliefs about the availability, accessability and trustworthiness of information, and the ability to interpret or understand information, and conceptualised them as the 'information behaviour barriers' (Pálsdóttir 2008, see also Savolainen 2015 for a conceptual analysis on cognitive barriers to information seeking). Pálsdóttir (2008) discovered that high information behaviour barriers were associated with passive information acquisition. Moreover, according to Ek and Heinström (2011), people with high interest in health information and low information avoidance seem to possess relatively more cognitive, affective, and instrumental personal resources which are important in terms of information behaviour in stressful contexts. Also, it has been suggested that poor health information literacy predisposes people to the experience of information overload (Kim *et al*. 2007).

DuBenske *et al*. (2009) studied cancer caregivers' orientation to information and their perceived ability to obtain and use information in health care settings.

They used the concept of *information competence* for this ability and understood it as a domain of self-efficacy. They found that those who 'endorsed greater information engagement' (orientation toward information gathering and continued interaction with health information), also reported greater information competence. In turn, higher information apprehension ('underlying discomfort' with health information) was associated with poorer information competence. Andrews *et al*. (2005) suggest that health information literacy may be affected by a person's self-efficacy, which, in tun, may influence information seeking. Lack of understanding or misconceptions about health issues, including an individual's perception of risk, may affect whether or not one will seek information on an issue.

Overall, perceived lack of skills may lead to a lack of interest as shown by Millward (2003) in a study on older adults' use of the Internet. The findings of Feufel and Stahl (2012) support this possibility; they found that poorly skilled participants doubted the quality of information found online primarily because they doubted their own skills. Moreover, they were easily distracted by unrelated information, and searched information to confirm their preconceived opinions, such as 'vaccinations are harmful' (Feufel & Stahl 2012, see also Hallows 2013). The risk information seeking and processing model by Griffin *et al*. (1999, see also Yang & Aloe 2014) suggests that 'perceived information-gathering capacity', among other factors, would moderate the relationship between perceived lack of knowledge and information seeking. Yang and Kahlor (2013) applied this model in a study on seeking and avoidance of climate change information and found that people who were confident in their abilities to engage in information seeking (to find and understand information) were not likely to avoid information (Yang & Kahlor 2013). However, the connection between information seeking and 'perceived information-gathering capacity' was not as evident in their study (Yang & Kahlor 2013).

2.7 Summary of the theoretical part of the study and research questions

This study focuses on two main themes: health information behaviour which is studied in a physical activity and exercise context, and in relation to the stage of behaviour change, and health information literacy, which is studied in a more general health context and in association with various health behaviours and physical fitness. The study participants, young Finnish men, represent a population of generally healthy individuals.

2.7.1 Health information behaviour and related research questions

The interest in individuals' health information behaviour has evoked research on the ways people need, seek, organise, give, share, use, and avoid heath-related information, who does and who does not engage in these behaviours, and their relationship to health behaviour (Anker *et al*. 2011, Lustria 2007, Oh 2011, Robins *et al*. 2010, Warner & Procaccino 2004). These earlier studies clearly indicate that health information behaviour, health behaviour, and health are associated with each other. Seeking health information seems to be indicative of a proactive attitude towards health (Johnson & Case 2012), and health promotive behaviours may be seen as outcomes of information acquisition. At the same time, individuals' health status may influence their information behaviour (Andreassen *et al*. 2007, Fox & Rainie 2000, Eriksson-Backa 2003, Beverley *et al*. 2007).

So far, health information behaviour research has focused on goal-directed seeking of general health information (Anker *et al*. 2011), or on information about serious health conditions such as HIV/AIDS (Veinot 2009), diabetes (Longo *et al*. 2010), and cancer (Johnson 1997). The health information behaviours of healthy individuals as such (Pálsdóttir 2008), or in relation to their ongoing health conditions, such as physical activity or exercise (Anker *et al*. 2011), have been less examined. Studies have often focused on purposive information seeking and the information needs that motivate this behaviour (Case 2007). However, health information is not necessarily purposefully sought, but rather encountered by chance (Pálsdóttir 2008). People may also avoid information for various reasons (Sairanen & Savolainen 2010). Health information seeking and avoidance are often assumed to be 'all or nothing' phenomena, in that people either seek or do not seek information, rather than being a behavioural continuum that is determined by a range of factors (Case 2007). Moreover, often the focus of studies has been on people who search for health information from the Internet. Therefore, there is a need for further knowledge that examines people's search for health information from the broader information environment (Lambert & Loiselle 2007).

Previous research indicates that various socio-demographic factors (e.g. sex, age, educational level, income) and psychological characteristics, such as self-efficacy and the perception of threat, underlie health information related activities. However, the stage of behaviour change has not been studied as a possible antecedent for health information behaviour. In the Transtheoretical model of behaviour change (Prochaska & DiClemente 1983), concrete strategies on how to design interventions for individuals in different stages of change are provided, and

individuals' information processing is embedded in the descriptions of different stages and processes of change. Yet, information behaviour in relation to this process has not been extensively investigated.

In this study information behaviour is investigated in the context of physical activity and in relation to individuals' readiness to change their exercise behaviour. Thus, the study focuses on information behaviour in relation to health promotive activities, rather than illness-related behaviours. The stage of change is behaviour specific, and thus health information behaviour is also studied behaviour-specifically. The purposive seeking of information, but also other modes of information acquisition as well as the avoidance of information, are being studied (see Figure 4). The frequency of these behaviours, rather than their mere prevalence, is being investigated, and the study is not limited to information behaviour in relation to a specific channel or source. Moreover, the study participants' information needs and preferences for feedback types are investigated.

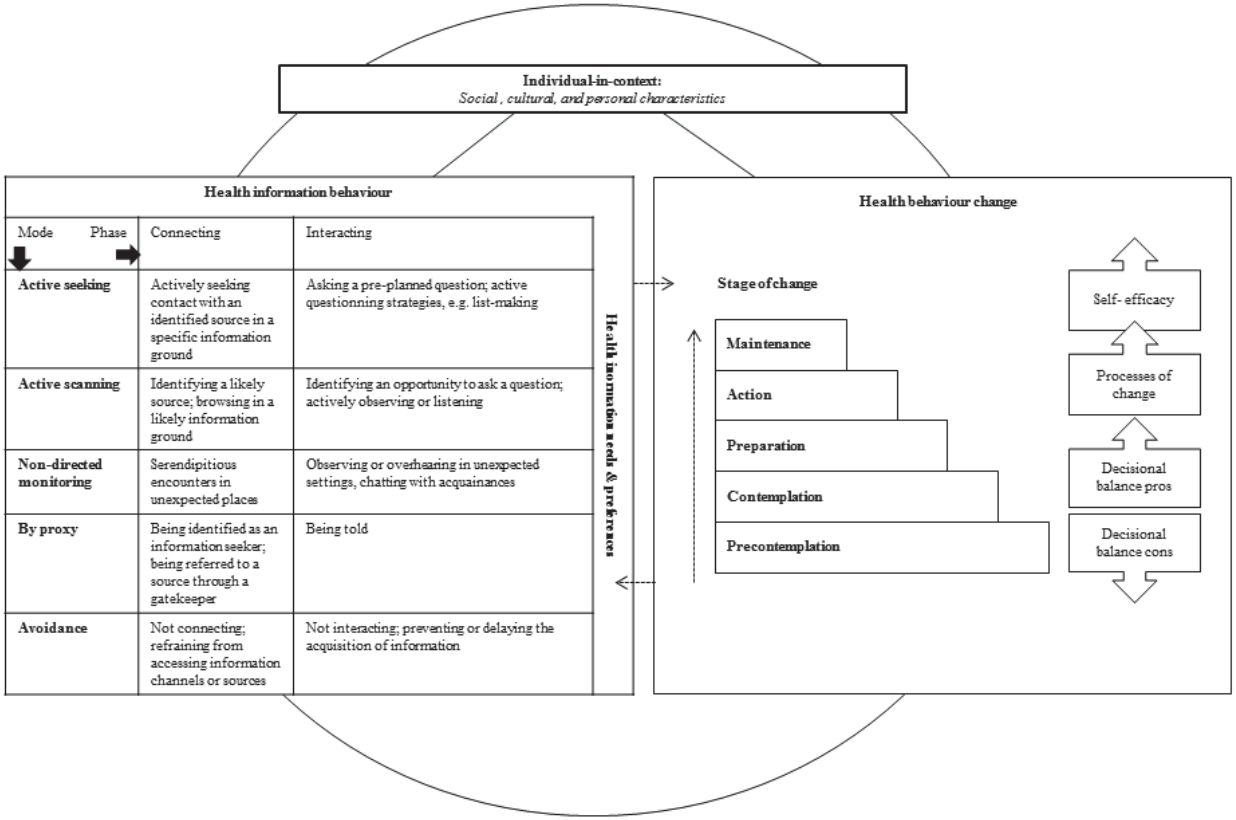

Fig. 4. Conceptual framework of Studies I and II

The focus of the study is in the relationship between information behaviour and the readiness to change exercise behaviour. However, since earlier research shows that health information behaviour as well as health behaviours are related to socio-demographic factors, these are also taken into account in the study.

In terms of health information behaviour, the study attempts to respond to the following research questions (RQ's):

- RQ1.1: How frequently do young men experience information needs, acquire information, or avoid it in a physical activity context?
- RQ1.2: What kind of preferences do they have for physical activity feedback; do they prefer feedback based on normative, ipsative or theoretically driven message tactics?
- RQ1.3: Does their information behaviour vary according to the stage of exercise behaviour change?
- RQ1.4: Are other factors related to the readiness to change exercise behaviour (self-efficacy, decisional balance, processes of change) associated with information behaviour in this population?
- RQ1.5: Do the young men's information needs, practices to acquire information, avoidance, or preferences for feedback message tactics vary according to their socio-demographic characteristics?

2.7.2 Health information literacy and related research questions

Research on health information literacy in everyday life settings is scarce. Basic health literacy, that is, the ability to read and understand medical text, has been studied rather extensively among different patient populations and in medical settings (Mancuso 2009). Health literacy is suggested to influence health knowledge and self-efficacy, which contribute to a variety of other outcomes. Empirical research indicates that health literate people engage in more health promotive behaviours and are healthier than those with inadequate health literacy (Berkman *et al*. 2011). Moreover, inadequate health literacy is recognised to contribute to health inequalities between socio-economic groups (Chinn & McCarthy 2013). However, basic health literacy does not represent the health information related challenges generally literate people face in their daily lives. The concept of information literacy directs attention to the higher-level abilities that are needed in order to find, evaluate, and use health information. In health settings, the concept of health information literacy is used for these abilities. So far, health

information literacy research has mainly focused on health professionals' health information literacy and the roles of libraries in promoting health information literacy (Shipman *et al*. 2009, see also Yates 2013). Overall, information literacy has been studied mainly in educational contexts, and there is a gap in research on information literacy in people's everyday lives (Lloyd & Williamson 2008, Partridge *et al*. 2008).

Everyday health information literacy as skills or competencies of a person has been studied among general upper secondary school students (Niemelä *et al*. 2012), individuals with metabolic syndrome (Enwald *et al*. 2015b), and older adults (Eriksson-Backa *et al*. 2012). These studies indicate that health information literacy is associated with socio-demographic characteristics such as gender (Niemelä *et al*. 2012) and education (Eriksson-Backa *et al*. 2012). Moreover, aspects of health information literacy have been associated with self-rated health (Eriksson-Backa *et al*. 2012) and health behaviour (Pálsdóttir 2008).

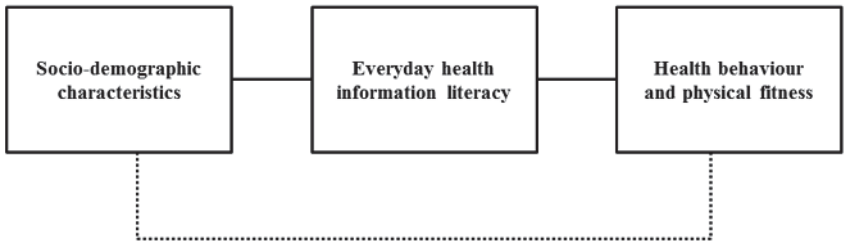

Fig. 5. The conceptual framework of Studies III and IV

In this study young men's everyday health information literacy is studied in relation to their socio-demographic characteristics, health behaviours, and physical fitness. A simplified conceptual framework (see Figure 5) is adopted for this section of the study. Young men's socio-demographic characteristics are expected to be associated with their everyday health information literacy which, in turn, is anticipated to be positively associated with health promoting behaviours and good physical fitness. Moreover, as previous research clearly shows, socio-demographic characteristics are important determinants of health behaviours, as well as of physical health. This association is also acknowledged (see Figure 5).

In terms of this theme, the study attempts to respond to the following research questions:

- RQ2.1: How do young men perceive their own health information literacy in an everyday life context?
- RQ2.2: How is young men's everyday health information literacy associated with their socio-demographic background, namely, age, education, living arrangements, current occupation, and parents' occupation?
- RQ2.3: How is young men's everyday health information literacy associated with their
  - RQ2.3a: health behaviour (physical activity, dental hygiene, smoking, eating habits), and
  - RQ2.3b: physical fitness (body mass index, body composition, aerobic fitness, grip strength)?
- RQ2.4: Are these associations independent of the socio-demographic background of the young men?

2.7.3 Health information behaviour in relation to health information literacy and related research questions

Although there is an intuitive connection between health information behaviour and health information literacy, this association has rarely been studied (Longo *et al*. 2010, Nesset 2014). Overall, these research fields have been rather disconnected (Julien & Williamson 2011, Nesset 2014). Despite this, the research so far gives some clues as to the possible relationships between health information behaviour and health information literacy. Eriksson-Backa's (2005, Eriksson-Backa *et al*. 2012) and Pálsdóttir's (2008) studies indicate a positive connection between health information literacy and active health information seeking.

In the present study, information behaviour is studied in the context of physical activity and exercise, and healh information literacy in relation to a more general health context. With regard to this theme, the study focuses on active seeking and avoidance of physical activity and exercise information. Everyday health information literacy is studied in relation to these actions. Moreover, the stage of exercise behaviour change is taken into account in the study. The study attempts to determine whether there are any associations between information seeking and avoidance, and health information literacy and the stage of change, and if so, to assess the strength of these associations (see Figure 6).

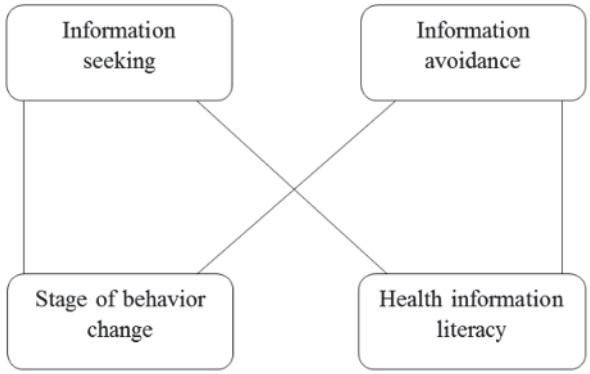

Fig. 6. Conceptual framework for Study V.

The research questions are set as follows:

- RQ3.1: How is everyday health information literacy associated with the frequency of seeking and avoidance of physical activity and exercise information among young men?
- RQ3.2: Is everyday health information literacy more strongly associated with these behaviours than individuals' stage of exercise behaviour change?

The study attempts to fulfill its aim by answering these research questions (Subchapters 2.7.1, 2.7.2, and 2.7.3) by empirical investigation. The following chapter describes the empirical study.

3 Empirical study

3.1 Methodological choices

The philosophical perspective of this study is based on the ideas of critical realis[11]. This philosophical approach derives from the ontological understanding that there is a world outside and independent of the human mind (reality), and that we are able to observe only some aspects of this world. The critical realist approach thus includes the idea that ontology (the theory of being) is distinct from epistemology (the theory of knowledge) (Alvesson & Sköldberg 2009, Bhaskar 1975).

The main aim of this study is to increase the *understanding* of young men's health information literacy and behaviour. The study does not, however, build on interpretive approach that strives to understand and interpret the world in terms of its actors[12]. From the viewpoint of critical realism, knowledge is seen as construed. However, critical realist researchers emphasise that there is a mind-independent reality behind this knowledge (Alvesson & Sköldberg 2009). Thus, critical realism diverges also from positivistic views, which see reality consisting of what is available to our senses (Alvesson & Sköldberg 2009, Gray 2014). Critical realism can be seen as an approach that diminishes the differences between social and natural sciences. Therefore, it may be especially appropriate for multi- or interdisciplinary research such as the present study (Wikgren 2005).

According to Bhaskar (1975), a distinction should be made between transitive and intransitive objects of knowledge in the world: intransitive objects are 'real' things, structures and mechanisms, while transitive objects include theories, models and methods, for example, which are subjective by nature (see also Johnston & Smith 2010). Thus, the reality is seen as material, though changing, but also as dependent on theories and concepts, that is, as a defined, an interpreted, and a constructed entity (Sayer 1992, 2000). According to Bhaskar (1975) the *empirical* domain must be distinct from the *actual* and the *real* (Budd 2010). The actual domain is the domain of events (Johnston & Smith 2010). The empirical domain, on the other hand, is what people may experience. Things of the actual domain cannot be experienced as such, but people may perceive 'empirical traces' of those

[11] Danemark (2002) notes that critical realism is not a homogenous movement within social sciences, and there are many perspectives and developments within it. However, the basic elements of this approach seem fairly similar across approaches.

[12] From interpretive approach the focus would be in understanding multiple perspectives and the way they are constructed through social interaction.

events. Furthermore, as our senses are limited and perceptions subjective, experiences will vary from one person to another (Johnston & Smith 2010). Behind events there is the domain of real which includes the structures and mechanisms that give rise to the actual and empirical (Alvesson & Sköldberg 2009, Johnston & Smith 2010). Material objects, as well as ideas and discourses, for example, are seen as real in the sense that they work as *generative mechanisms* that have causal effects (Alvesson & Sköldberg 2009). The relationships between the three domains are nested (see Table 1): the mechanisms, events, and experiences are all included in the domain of real; events and experiences are also actual; and experiences are also empirical.

Table 1. Bhaskar's three domains.

Level	Domain of real	Domain of actual	Domain of empirical
Mechanisms	X		
Events	X	X	
Experiences	X	X	X

Originally, the critical realist approach was applied to natural sciences that investigate intransitive objects. However, it is argued that the principles of critical realism also apply to social sciences research, where transitive objects are under study (Johnston & Smith 2010). Wikgren (2005) and Budd (2010) have discussed the applicability of this approach in the field of information studies. According to Wikgren (2005), the idea of domains of reality implies that complex social phenomena, such as information need, seeking, and use, cannot be explained in terms of mechanisms or processes working at just one level, be it personal, cognitive, discursive, or socio-cultural. Furthermore, none of these levels, nor the causes of what occurs on these levels, can be reduced to another level (Bhaskar 1975, see also Wikgren 2005). The critical realist concept of a stratified ontology makes it possible to analytically investigate the relationship between different levels of reality without collapsing the one into the other. For example, the context of our action has structural and cultural conditions that affect us as individual human beings (Archer 1995).

The selection of methods goes hand in hand with the philosophical perspective of the study. Usually interpretistic researchers choose qualitative methods whereas positivistic researches rely on quantitative approach to studying a phenomenon (Gray 2014). The ideas of critical realism support methodological pluralism, because the levels of reality are seen to vary in regard to how they can best be

analysed (Danermark *et al*. 2002). Nonetheless, this does not mean that all methods are equally suitable (Wikgren 2005); different methods can be used in studying different levels of context (Kari & Savolainen 2003).

From a methodological point of view, according to Delanty (1997, 130), critical realism aims at unifying three approaches: 1) it defends the possibility for causal explanation, 2) it recognises the idea that social reality construes in communication but does not end up in constructivistic conclusions, and 3) it includes a dimension of social criticism. Critical realists argue for 'a shift from prediction to explanation, the use of abstraction, and reliance on interpretive forms of investigation' (Wikgren 2005, 13). Bhaskar (1979) argues that critique presented for example in the hermeneutic tradition (towards the positivistic one) is problematic, since it leads to adopting such anti-naturalistic position to the philosophy and methodology of the social sciences that separates the social sciences strictly from the natural sciences.

Defending the possibility for causal explanation does not mean that a phenomenon would have clear or simple causes. On the contrary, critical realists emphasise the complexity of social life and its explanations. Critical realists tend to 'generate tendencies rather than inevitable, specific and measurable conditions' (Alvesson & Sköldberg 2009, 42). Thus, causality should not be understood as universal, predictable patterns, but as contextual and evolving. The explanations of social phenomena can focus on different levels of social life and be based on very different background assumptions. These explanations are extremely rarely simple (if X then Y) (Alvesson & Sköldberg 2009). Moreover, Sayer (1992) emphasises that whether natural or social objects are under research, our observations are always liable to the applied theories, concepts and perspectives.

This study draws from the integration of several models and theories to fulfil its aim. The Transtheoretical Model is applied to describe the way people change their exercise behaviour. As the name of this theory implies, it is construed by eclectically including several theories into one unifying theory of behaviour change. Yet, the model exists 'within a positivist and cognitive-rational paradigm where the main focus is to predict and control' (Buchan *et al*. 2012, 7). Furthermore, models depicting both information behaviour and practices were utilised to guide the study, although they may be seen as conflicting in terms of the philosophical perspectives they derive from. However, the present study does not seek to test these models as such but rather uses them as tools for inquiry (see Table 2).

The study can be seen as descriptive as it attempts to provide a picture of the phenomenon under study as it occurs. It also entails features of an explanatory study, which seeks to explain this descriptive information (see Gray 2014). Thus,

not only ‘how’ but also ‘why’ questions are being asked. However, with a cross-sectional study design, it is not possible to reveal causal associations, and thus, the study may be seen as ‘correlative’ in nature (Gray 2014). Ultimately, the objective of research, from the perspective of critical realism, would be to reveal the mechanisms operating in the domain of real. Descriptive studies may still be valuable. Kemp and Holmwood (2003, 197) note that although ‘it is correct to point out that statistically derived regularities cannot, by themselves, establish a causal link, it is also important to acknowledge that the search for such patterns can be an important part of the process of identifying causes operating in the social world’.

Table 2. The methodological choises of this study.

Methodological choises	
Ontology	Critical realism;
What constitutes reality and how can we understand existence?	The research phenomena and objects are to be seen as real (onthological relativism) but our observations on them are limited (levels of reality).
Epistemology	Relativism;
What constitutes valid knowledge and how can we obtain it?	There is not only one way to gain reliable information on reality. Different methods (methodological approaches) can build our understanding of the research phenomenon.
Research design	Cross-sectional; Descriptive (correlative)
Methods	Quantitative strategy; Questionnaire survey & physiological measurements

In this study a quantitative strategy was chosen as appropriate to study a whole age cohort of 18-year-old young men in the area of Oulu, Finland. Although quantitative methods focus on numbers and frequencies rather than on meaning and experience, they are relevant for investigating behaviours, attitudes and opinions as well (Gray 2014). A non-experimental, population-based, cross-sectional research design was used, and the chosen methods were questionnaire survey and physiological measurements. In addition, data collected by the Finnish Defence Forces was available for analysis and were used to provide further background information on the men. The methods were used to gather data mainly on individual factors, such as the stage of exercise behaviour change, health information behaviour, and health information literacy. These factors are construed in a social reality, of which the socio-economic position of the men can provide information on.

The role of quantitative methods in critical realism is often viewed as descriptive, since 'quantitative summaries and correlations between variables alone cannot uncover evidence on the causal mechanisms that generate the actual events we observe' (Zachariadis *et al*. 2013, 8). Scholars have argued that the use of quantitative methods, causal modeling in particular, is not suitable for critical realist research (e.g. Archer 1998, see Pratsche 2003). However, others (Nash 2005, Pratsche 2003, Williams 2003, Zachariadis *et al*. 2013) state that the use of statistical methods can in principal be consistent with the ideas of critical realism, as long as the indirect relationship between the statistical models and theoretical hypotheses is understood. In other words, the way the results of statistical analyses are interpreted distinguishes critical realism from positivism (Zachariadis *et al*. 2013).

This study attempts to increase understanding of health information behaviour and literacy with a descriptive approach. However, the results of this study may further contribute to understanding the mechanisms behind these phenomena under study. As such, the present study does not seek to explain the phenomena or seek for causal explanations.

3.2 Research design and methods

3.2.1 Research environment and data collection

In the present study a non-experimental, population-based, cross-sectional research design was used. Data were collected with questionnaire surveys and physiological measurements administered at the Finnish Defence Forces' call-ups in the city of Oulu, Finland, in September 2010, 2011, 2012, and 2013 where a large, population-wide, representative sample of young men could be reached.

Table 3. Research participants.

Population	2010	2011	2012	2013	Total
Men attending the call-ups	997	1,260	1,242	1,265	4,764
Respondents	622	829	819	1,023	3,293
	(62.3 %)	(65.8 %)	(66.0 %)	(80.9 %)	(69.1 %)
Participants in physiological	610	887	762	804	3,063
measurements	(61.2 %)	(70.4 %)	(61.4 %)	(63.6 %)	(64.3 %)
Study	I	II	III, IV	IV, V	

All men present at the call-ups were invited to participate in the study. From 62.3% to 80.9% of the men participated by filling in the questionnaire (see Table 3) and 61.2% to 70.4% of the men participated in the physiological measurements. In addition, data collected by the Finnish Defence Forces were available for analysis and were used to provide background information on the men.

The study is a part of a larger MOPO study (2013), which aims at promoting physical activity among young men and preventing their social marginalisation. Within the MOPO study, large amounts of questionnaire and physical measurement data have been collected at the Finnish Defence Force's call-ups in 2009, 2010, 2011, 2012, and 2013. Based on the collected data and in cooperation with the University of Oulu (Information Studies, Electrical Engineering, Health Technology), the Department of Exercise Medicine at the Oulu Deaconess Institute, the City of Oulu, and corporate partners (Polar Electro Oy, Ludocraft), a novel 'wellness coaching service' was developed. This service was piloted among the young men in 2011 and 2012 and its effectiveness investigated in a full-scale intervention study in 2013.

3.2.2 Measures

Questionnaire survey

The questionnaires included several themes with items on socio-demographic information, information behaviour related to physical activity and exercise, readiness to change exercise behaviour (the four dimensions of the TTM), health behaviours, and everyday health information literacy (see Appendices 1–4). The following measures were incorporated:

Age, education, current occupation, parents' occupation, living arrangements, and geographical residence were selected as the variables to differentiate respondents according to their *socio-demographic status*. All respondents were male and homogeneous in terms of their ethnicity. The categories for *educational level* were compulsory school only, vocational upper secondary school, general upper secondary school and higher education. Data on the men's educational level were collected from the Finnish Defence Force's health questionnaires.

The participants were categorised according to their *current occupation* as: student, working, unemployed, and other. *Parents' occupation* was asked in an open-ended question. Occupations were categorised according to the Classification

of Occupations 2010 by Statistics Finland (2013). The categories were further pooled into six as follows: 1) managers and entrepreneurs, 2) professionals, 3) associate professionals (technicians and associate professionals), 4) service and sales workers (clerical support workers; service and sales workers), 5) manual labourers (craft and related trades workers; plant and machine operators, and assemblers; skilled agricultural, forestry and fishery workers; armed forces occupations), and 6) other (unemployed, pensioner, student or unknown).

The participants were asked whether they *lived with* one or both parents, alone, with a roommate or sibling, with a spouse, with a grandparent or a relative, or were homeless or living in another situation. Living arrangements were further categorised into three groups: living with a parent or parents, living with someone else, and living alone. Of the socio-demographic variables used in this study, education and parents' occupation can be seen to reflect socio-economic position (Galobardes *et al*. 2006).

The *information behaviour* scale consists of 12 items focusing on information behaviour related to physical activity and exercise. The following subscales were included: (a) information needs; information practices of (b) active seeking, (c) active scanning, (d) nondirected monitoring, and (e) receiving information by proxy; and (f) avoiding information. This scale consists of statements describing the respondents' thoughts and behaviours. The respondents were instructed to select the alternative that best described them on a scale of 1 (never) to 5 (regularly) (Appendices 2 and 4). Cronbach's α's for the information behaviour subscales were 0.809 for information needs, 0.887 for active seeking, 0.811 for active scanning, 0.824 for nondirected monitoring, 0.671 for obtaining information by proxy, 0.707 for avoiding information, and 0.874 for the information behaviour scale as a whole (see Appendix 5).

To investigate *preferences for feedback message tactics* the participants were asked how strongly they agreed, on a six-point scale (strongly agree – strongly disagree, not sure), with the following statements [13] : 'information about improvement in my physical fitness motivates me' (ipsative comparison), 'I get motivated when I have done better than others' (normative comparison), and 'I don't desire scientific facts about health' (theoretically driven information) (see Appendices 2 and 4).

[13] It was assumed that those who preferred normative comparison, for example, would also prefer messages that were constructed on the basis of a normative feedback message tactic.

The *everyday health information literacy* of the participants was assessed with a screening tool developed by Niemelä and colleagues (2012). The tool was designed by applying the Medical Library Association's (2003) definition of health information literacy, and aimed at detecting individuals with problems related to their interest and motivation, finding, understanding, evaluating, and using health information, but being literate at the average level. It consists of ten tasks, to which the participants were instructed to respond on a scale from 1 (strongly disagree) to 5 (strongly agree) (see Appendices 3 and 4).

The *stage of exercise behaviour change* scale (modified from Cardinal 1995) is based on the Transtheoretical Model. It contains a picture of a ladder with four rungs and five descriptors corresponding to each stage of change (0 = precontemplation, 1 = contemplation, 2 = preparation, 3 = action, 4 = maintenance). The respondents were instructed to select a rung that best described their regular exercise behaviour and intentions to exercise. In questionnaires administered in 2010 and 2011, regular exercise was defined as 20 min or more of continuous physical activity performed at a vigorous pace three or more times a week (see also Spencer *et al*. 2006). In 2013, regular exercise was defined according to Finnish physical activity recommendations for 13- to 18-year olds (Tammelin & Karvinen 2008) as at least 1.5 hours of daily physical activity, half of which would be performed at a vigorous pace (see Appendix 4). Those not meeting the criterion of exercise were grouped into the first three stages: those not intending to start regular exercise in the future (precontemplation), those intending to start within the next six months (contemplation), and those intending to start within the next month (preparation). Those already meeting this criterion were categorised into the action stage if they had been exercising regularly less than six months and into the maintenance stage if they had been doing so for more than six months.

The 18-item *exercise self-efficacy* scale originally formed by Bandura (2006), is suggested to indicate the respondents' confidence in their ability to sustain regular exercise in varying situations. The original version's scale of 0 (not confident at all) to 100 (extremely confident) was modified to a scale of 1 (not confident at all) to 5 (extremely confident). It consisted of descriptions of situations that can make it difficult to persevere with regular exercise. The respondents were instructed to rate their confidence in their ability to perform exercise on a regular basis (see Appendix 4). Cronbach's α was used as a measure of the internal consistency of the self-efficacy scale, and it was 0.951 in 2010 and 0.952 in 2011 (see Appendix 5). For further analysis, the participants were categorised into three groups based on their scores on this scale (low, moderate, high).

The *decisional balance* scale consists of two subscales that represent the perceived pros (18 items) and cons (18 items) of exercise. The scale consists of items included in a 10-item scale by Nigg *et al*. (1998). This scale was extended to better match the study population by adding items such as money needed for exercise (decisional balance cons) and increasing sexual desirability (decisional balance pros) (see Appendix 4). Cronbach's α's were 0.879 and 0.878 for the pros and cons subscales, respectively, and 0.807 for the whole scale (see Appendix 5).

A *processes of change* scale by Nigg *et al*. (1999), consisting of 30 items in which three items represent each process of change, was reduced to a 20-item scale with two items representing each subscale (consciousness raising, dramatic relief, environmental reevaluation, self-reevaluation, social liberation, counterconditioning, helping relationships, reinforcement management, self-liberation, stimulus control). The scale consists of statements regarding the processes, and the respondents were instructed to select the alternative that best described their behaviour on a scale of 1 (never) to 5 (regularly) (see Appendix 4). Cronbach's α for the experiental processes subscale was 0.879, for behavioural processes 0.859, and 0.925 for the whole processes of change scale (see Appendix 5).

Physical activity was assessed by enquiring about the daily hours spent on physical activities (e.g. walking to school, exercising, doing household chores). The answer options were: 1) less than one hour, 2) one to two hours, and 3) more than two hours. The intensity of everyday physical activity was surveyed and the answer options were: 1) 'I read, watch television and do tasks that are not physically demanding', 2) 'I walk, bicycle, or attend to some physical activity in other ways at least 4 hours a week', 3) 'I exercise (e.g. running, jogging, swimming, skiing, gymnastics, ball games, laborious gardening) on average at least 2 hours a week', and 4) 'I do hard physical training for competitions (e.g. running, orienteering, skiing, swimming, ball games) several times a week' (see Saltin & Grimbly 1968). Daily sedentary time in hours during leisure time and at school or work was surveyed (see Appendix 4).

The participants were asked whether they smoked or used snuff regularly (yes/no). Their frequency of drinking more than six units[14] of alcoholic drinks (never, less than once a month, once to twice a month, once a week, several times a week) and tooth brushing habits (never or almost never, a few times a week, once

[14] One unit refers to one standard drink (33cl of beer, 12cl wine, or 4cl of spirits) and contains approximately 12–14 grams of alcohol.

a day, twice a day, more than twice a day) were also surveyed. Eating habits were investigated by asking whether the participants usually ate breakfast (yes/no), how often they ate vegetables, fruit and berries, and sweets, and drank soft and energy drinks (days per week) (see Appendix 4). For multivariate logistic regression analyses each health behaviour variable was collated into two groups (see Subchapter 4.3.2).

Physical fitness measures

Physical fitness has been defined, for example, as 'the capability of the heart, blood vessels, lungs, and muscles to perform at optimal efficiency' (Getchell 1992 as cited in ACSM 2014, 2) and as 'a state of ability to perform sustained physical work characterised by an effective integration of cardiorespiratory endurance, strength, flexibility, coordination, and body composition' (Miller *et al*. 1991 as cited in ACSM 2014, 2). Health-related physical fitness is a more specific term that refers to the specific components of physical fitness that have a relationship with good health (President's Council of Physical Fitness & Sports 2000). These include cardiorespiratory fitness, body composition, muscular strength, muscular endurance, and flexibility (ACSM 2014). For example, agility, speed, and reaction time are considered to be skill or sport related physical fitness and are not included in this definition. In this study, measurable physical fitness indicators include evaluation of cardiorespiratory fitness (estimate of maximal oxygen uptake), body composition (body mass index, percentage body fat and muscle mass, waist circumference), and muscular strength (grip strength).

Body composition refers to the relative amounts of different types of tissue (bone, fat, muscle) in a body. The most commonly used body composition measure is body fat percentage. Obesity can be defined as an excess of fat tissue in the body, and is recognised as to have both immediate and long-term health effects, such as heightened risk for cardiovascular disease and type II diabetes (ACSM 2014). Different methods for assessing body fat can be used. Measurements of body weight and body dimensions (anthropometry) provide a relatively cheap and rapid way to estimate body fatness and are generally used to reflect body fat in large studies (Han *et al*. 2006). Body Mass Index (BMI) is calculated by dividing the weight (kg) of a person by his or her height (m) squared. High BMI value indicates excessive body fat and therefore relates to increased health risks (Han *et al*. 2006). According to the international BMI classification (World Health Organization 2006) a BMI under 18.5 indicates underweight, from 18.5 to 24.9 normal weight, from

25.0 to 29.9 overweight, and over 30.0 obesity. Waist circumference is another simple measure to assess body fatness. It is found to indicate body fat as well as BMI (or skinfold thickness) and it is also the best anthropometric predictor of visceral fat. Even within a normal BMI range, people with large waists are at risk for ill health (Han *et al*. 2006). A waist circumference over 102 cm in men and over 88 cm in women can be considered as a marker for high risk for type II diabetes, hypertension, and cardiovascular diseases (National Institutes of Health 2000).

Technological devices can also be used in measuring body fat. Bioelectrical impedance analysis (BIA) is one of the most widely used methods for estimating body composition. The technology determines the electrical impedance of body tissues, which provides an estimate of total body water. From this analysis, fat-free mass and body fat can be estimated (National Institutes of Health Technology Assessment Conference Statement 1996).

In addition to adiposity, muscle plays a key role in the development of many pathologic conditions and chronic diseases. For example, higher muscle mass (relative to body size) is associated with better insulin sensitivity and lower risk of pre-diabetes (Srikanthan & Karlamangla 2011). The importance of maintaining muscle mass in the elderly has been well recognised but the role of muscle throughout life and in preventing common clinical conditions such as obesity and diabetes has been less acknowledged (Wolfe 2006). Further, muscular strength (muscle quality, grip strength) has been demonstrated to be an even stronger marker than muscle quantity in estimating mortality risk (National Institutes of Health 2000). Wolfe (2006), therefore, suggests factors directly related to muscle mass and strength to be included in health-related studies.

Cardiorespiratory fitness refers to 'the ability of the circulatory, respiratory and muscular systems to supply oxygen during sustained physical activity' (Lee *et al*. 2010, 27) and can be considered as a powerful marker of health in young people (Ferreira *et al*. 2005, Ortega *et al*. 2008). It is considered to be a reliable measure of habitual physical activity and also to be associated with morbidity and mortality (Lee *et al*. 2010). Barry *et al*. (2014) found in their meta-analysis that poor cardiorespiratory fitness increased mortality risk regardless of body mass index. Usually cardiorespiratory fitness is expressed as metabolic equivalents (METs) or maximal oxygen uptake (VO2 max). The 'gold standard' for measuring cardiorespiratory fitness is direct measurement of maximal oxygen uptake (VO2 max) during exercise (using e.g. a treadmill). However, these types of tests are often difficult to arrange, and indirect non-exercise tests have been found to be feasible as well (Jurca *et al*. 2005).

The physiological measurements used in this study included the calculation of BMI, percentages of body fat and muscle, and evaluation of cardiorespiratory fitness and muscle strength (see Table 4). The BMI of the participants was used as an estimate of body mass status as follows: underweight (< 18.4), normal (18.5–24.9), overweight (25.0–30.0) and obese (> 30.1) (World Health Organization 2006). According to the WHO, the BMI classifications for adults also apply to 18-year-old young people (World Health Organization 2007), and therefore the classification for adults was used.

Body composition was measured using bioelectrical impedance analysis technology with an InBody 720 device (Biospace). Body weight, and body fat and muscle mass percentages were recorded and utilised in this study. Body composition classification according to total body fat percentage was used. The applied classification of total body fat percentage for men at the age of less than 19 years was: underweight < 3%, excellent < 12.0%, good 12.1–17.0%, moderate 17.1–22.0%, overweight 22.1–27.0%, significantly overweight/obese > 27.1% (Hoeger & Hoeger 2011).

Table 4. Physiological measurements in Studies II, IV, and in additional analyses for study I.

Measurement	Study II	Study IV	Additional analyses for study I
BMI	X	X	X
Waist circumference		X	X
Body fat	X	X	X
Muscle mass		X	X
Grip strength	X	X	X
Aerobic fitness	X	X	X

Cardiorespiratory fitness was estimated with a Polar Fitness Test™ feature in an FT 80 device (Polar Electro, Finland). This test predicts a person's aerobic fitness indirectly from resting heart rate, heart rate variability, gender, age, height, body weight, and self-assessment of the level of long-term physical activity. To obtain the measures for heart rate and heart rate variability, 255 heart beats (3–5 min) were measured during the test. The result of the test is comparable to maximal oxygen uptake (VO2max, ml/kg/min). The categories of maximal oxygen uptake for 18-year-old men are: poor (≤ 44), moderate (45–52), good (53–58), very good (59–64), and excellent (≥ 65) (modified from Shvartz & Reibold 1990).

Muscle strength was assessed with a bilateral grip strength test using a handgrip dynamometer (Saehan, Saehan Corporation, Korea) (Bohannon *et al*. 2006). During the examination the participants stood with their legs apart and an elbow bent at a 90° angle and they were asked to grip the instrument with maximum strength. The result was the better of two attempts per hand. The mean grip strengths for the right and left hands were used in the analysis. Cutoffs for quartiles of grip strength were calculated and the participants were categorised according to the quartiles as low (≤ 43 kg), moderate (44–48 kg), high (49–54 kg), or very high (≥ 55 kg) (see Ahola *et al*. 2013).

3.2.3 Data analysis

Statistical methods

Statistical analyses were performed using the IBM Statistical Package for the Social Sciences Version 19.0 software. No specific criteria for rejecting incomplete questionnaires were set. Therefore all questionnaires with any answers were treated as completed and included in the sample. In question-specific analysis all non-responses were excluded, and the percentages reported were calculated from the number of responses per question.

Descriptive analyses were performed using mean (*M*) and standard deviation (*SD*) for continuous variables and percentages for categorical variables. Associations between the categorical response and explanatory variables were analysed using cross-tabulation with Pearson's chi square or two-sided Fisher's Exact test. The exact version of the test was used whenever possible; otherwise, a Monte-Carlo simulation was performed. The non-parametric test was used when the expected cell counts were low (< 5) due to unequally distributed data among the cells of the table.

To invesigate the relationship between continuous variables, Pearson (*r*) and Spearman (*sr*) correlation coefficients were calculated. Student's t-test and one-way analysis of variance (ANOVA) were used to analyse the statistical significance of the differences between group means. In Studies II and IV, non-normally distributed data (BMI, body fat %, and aerobic fitness) were analysed following logarithmic transformation. A non-parametric alternative (Kruskall-Wallis) was used when the distribution could not be normalised.

In study II, multivariate logistic regression analyses were conducted. Independent variables were entered into the model using a stepwise method of variable selection in which variables were added to the model if they had a p value < 0.05 and were removed from the model if they had a *p* value > 0.1. In study III, multivariate multinomial regression analyses and in Studies IV and V, a series of multivariate logistic regression analyses with enter method were performed. Odds ratios (OR), 95% confidence intervals (CI), and *p* values were calculated for each continuous independent variable, and for each category within a categorical variable relative to a reference category in relation to the dependent variable.

Table 5. Statistical analyses used in Studies I–V.

Analysis	Study I	Study II	Study III	Study IV	Study V
Descriptive analysis	X	X	X	X	X
Cross-tabulation	X	X	X	X	X
Correlation analysis	X			X	X
Student's t-test		X		X	
Analysis of variance (ANOVA)	X			X	
Multivariate logistic regression analysis		X		X	X
Mulitvariate multinomial regression analysis			X		

The level of significance for all the tests was set at $p < .05$. Summary of the statistical methods used in each study is presented in Table 5.

Ethical considerations

The study follows the legislation, decrees and ethical principles concerning medical research on humans in Finland. The MOPO study was approved by the local ethical committee, the Ethics Committee of the Northern Ostrobothnia Hospital District on January 27, 2010 (see Ahola *et al*. 2013). Furthermore, guidelines for research ethics in empirical research in the humanities and social and behavioural sciences have been carefully followed (National Advisory Board on Research Ethics 2009). These guidelines include three areas: 1) respecting the autonomy of research subjects, 2) avoiding harm, and 3) privacy and data protection (National Advisory Board on Research Ethics 2009).

Participation in the study was voluntary and based on informed consent. The study participants were given both oral and written information about the project prior to asking for their written consent. The information for the subjects described

the project and its benefits and possible risks, and their right to refuse to take part in or withdraw from the study at any stage without it affecting their future healthcare or military service. Study participants were treated with respect and findings reported in a respectful way. Since the results of quantitative research are reported statistically, there is no risk of identification of the research participants. Overall, informant privacy (anonymity) has been assured and personal data were protected using code numbers. The information gathered in the study was only used by the researchers of the MOPO study. The original data will be stored at the Department of Health Sciences, University of Oulu, Finland.

4 Results

4.1 Characteristics of the study population

The study participants were Finnish young men, most of them 18 years old, currently studying in either general or vocational track of upper secondary school, and living with one or both parents. The majority of the men's parents were working, most often in service and care (mothers), manual labour (fathers), or professional (both) occupations (Table 6).

Table 6. Socio-demographic characteristics of study participants.

Variable	Study I *n* (%)	Study II *n* (%)	Study III *n* (%)	Study IV *n* (%)	Study V *n* (%)
Total	616 (100)	525 (100)	630 (100)	1,870 (100)	1,040 (100)
Age					
17	147 (23.9)	149 (28.5)	167 (26.5)	375 (25.3)	242 (23.3)
18	419 (68.2)	348 (66.5)	428 (67.9)	1024 (69.1)	719 (69.2)
> 18	50 (8.1)	26 (5.0)	35 (5.6)	82 (5.5)	78 (7.5)
Education					
Compulsory	25(4.1)	11 (2.5)	23 (3.7)	67 (4.6)	72 (7.0)
Vocational upper secondary	263 (42.7)	199 (39.5)	272 (43.2)	633 (43.1)	451 (43.7)
General upper secondary	328 (53.2)	294 (58.3)	335 (53.2)	769 (52.3)	509(49.3)
Living arrangements					
With parents or one parent	477 (77.3)	445 (84.9)	521 (83.2)	1231 (83.1)	848 (81.8)
With someone else	84 (13.6)	51 (9.7)	59 (9.4)	144 (9.7)	111 (10.7)
Alone	56 (9.1)	28 (5.3)	46 (7.3)	106 (7.2)	78 (7.5)
Current occupation					
Student	558 (90.6)	488 (93.1)	584 (92.7)	1357 (91.9)	924 (88.8)
Employed	27 (4.4)	27 (5.1)	16 (2.5)	35 (2.4)	27 (2.6)
Unemployed	27 (4.4)	9 (1.7)	30 (4.8)	52 (3.5)	36 (3.5)
Other	4 (0.6)			33 (2.2)	53 (5.1)
Mother's occupation					
Manager or entrepreneur			26 (4.8)	60 (4.8)	
Professional			133 (24.4)	308 (24.5)	

Variable	Study I	Study II	Study III	Study IV	Study V
	n (%)	*n* (%)	*n* (%)	*n* (%)	*n* (%)
Associate professional			110 (20.2)	283 (22.5)	
Service or care occupation			208 (38.2)	465 (36.9)	
Manual labourer			13 (2.4)	26 (2.1)	
Not employed			55 (10.1)	117 (9.3)	
Father's occupation					
Manager or entrepreneur			54 (10.3)	145 (12.0)	
Professional			146 (27.8)	238 (19.6)	
Associate professional			68 (12.9)	222 (18.3)	
Service or care occupation			60 (11.4)	148 (12.2)	
Manual labourer			134 (25.5)	355 (29.3)	
Not employed			64 (12.2)	104 (8.6)	

Almost 80% of the respondents[15] reported being physically active at least an hour daily and similar proportion of men were categorised to having at least medium low physical activity. Some 30% of the respondents evaluated that they sat more than eleven hours a day. Only approximately 10% of them ate fresh vegetables and 7% ate fruit or berries in most days of the week. Soft drinks were consumed by over 70% and energy drinks by 35% of the respondents at least once a week. One third of them said they did not eat sweets in a typical week (29.5%). Less than half of the respondents reported to brush their teeth twice a day or more. One in four of them smoked and one in five used snuff. Almost 80% of them drank more than six portions of alcohol at least once a month (Table 7).

Table 7. Self-reported health behaviours among the study participants (*n* = 1,481) (Study IV).

Health behaviour	*n* (%)	Health behaviour	n (%)
Hours spent on physical activities		Eating fresh vegetables	
< 1 hour	323 (22.2)	None	218 (15.4)
1 to 2 hours	746 (51.3)	1 to 2 times a week	604 (42.6)
> 2 hours	385 (26.5)	3 to 5 times a week	447 (31.5)
		6 to 7 times a week	150 (10.6)
Daily physical activity		Eating fruit or berries	

[15] Based on data in study IV

Health behaviour	*n* (%)	Health behaviour	n (%)
Low	272 (18.6)	None	348 (24.6)
Medium low	436 (29.8)	1 to 2 times a week	675 (47.7)
Medium high	545 (37.3)	3 to 5 times a week	296 (20.9)
High	208 (14.2)	6 to 7 times a week	97 (6.9)
Sitting time		Drinking soft drinks	
< 8 hours	395 (28.1)	None	388 (27.5)
8 to 9 hours	287 (20.4)	1 to 2 times a week	722 (51.1)
10 to 11 hours	306 (21.8)	3 to 5 times a week	254 (18.0)
> 11 hours	418 (29.7)	6 to 7 times a week	49 (3.5)
Tooth brushing		Drinking energy drinks	
Never	16 (1.1)	None	917 (64.8)
Couple of times a week	106 (7.3)	1 to 2 times a week	397 (28.1)
Once a day	654 (45.0)	3 to 5 times a week	81 (5.7)
Twice a day	669 (46.0)	6 to 7 times a week	20 (1.4)
More than twice a day	9 (0.6)		
Alcohol use (≤ 6 drinks)		Eating sweets	
Never	338 (23.0)	None	419 (29.5)
< monthly	343 (23.3)	1 to 2 times a week	840 (59.2)
1 to 2 times a month	543 (36.9)	3 to 5 times a week	153 (10.8)
Once a week	201 (13.7)	6 to 7 times a week	8 (0.6)
2 to 3 times a week	41 (2.8)		
Daily	5 (0.3)		
Smoking		Use of snuff	
No	1,107 (74.9)	No	1,176 (79.9)
Yes	370 (25.1)	Yes	296 (20.1)

Table 8. Mean (*M*) and standard deviation (*SD*) values of anthropometric, aerobic fitness and muscle strength measurements of the study participants (*n* = 1,074) (Study IV).

Variable	*M* (*SD*)	Min–max
BMI	23.0 (4.3)	14.7–45.2
Waist (cm)	81.8 (10.4)	63.0–134.0
Body fat (%)	16.3 (8.3)	3.0–51.0
Aerobic fitness (VO2max, ml/kg/min)	52.9 (7.2)	26.0–74.0
Muscle mass (%)	47.1 (4.8)	27.3–55.4
Grip strength (kg)	45.3 (7.7)	23.0–72.5

On average, the participants were normal weight with mean BMI of 23.0, mean body fat of 16.3%, and mean waist circumference of 81.8 cm. Furthermore, their

aerobic fitness, muscle mass, and grip strength measures were of adequate level. However, the variation was wide, ranging from 14.7 to 45.2 in BMI, 3.0 to 51.0 percentages body fat, and 23.0 to 72.5 kg in grip strength, for example (Table 8).

4.2 Health information behaviour in the context of physical activity and exercise (Studies I and II)

4.2.1 Information needs and practices to aquire and avoid information

More than half of the respondents reported that they were never or rarely interested in physical activity or exercise information, or felt that they should know more about this topic. Furthermore, more than 70% of them had never or rarely had questions on physical activity or exercise they would like to have had answers to. Almost 15% of the respondents, on the other hand, were at least sometimes interested in physical activity information (Figure 7, Table 9).

Over half of the respondents had *actively sought* information on physical activity or exercise at least sometimes. A slightly larger percentage of them reported receiving physical activity or exercise related information through the practice of *active scanning*. However, a large proportion of the respondents reported not acting upon this practice: 46.1% reported never or rarely following physical activity related content from the media, and 37.1% reported talking with other people about this subject. However, over sixty percent of the men had at least sometimes obtained information through the practice of *non-directed monitoring* from media sources or from other people (Figure 7, Table 9).

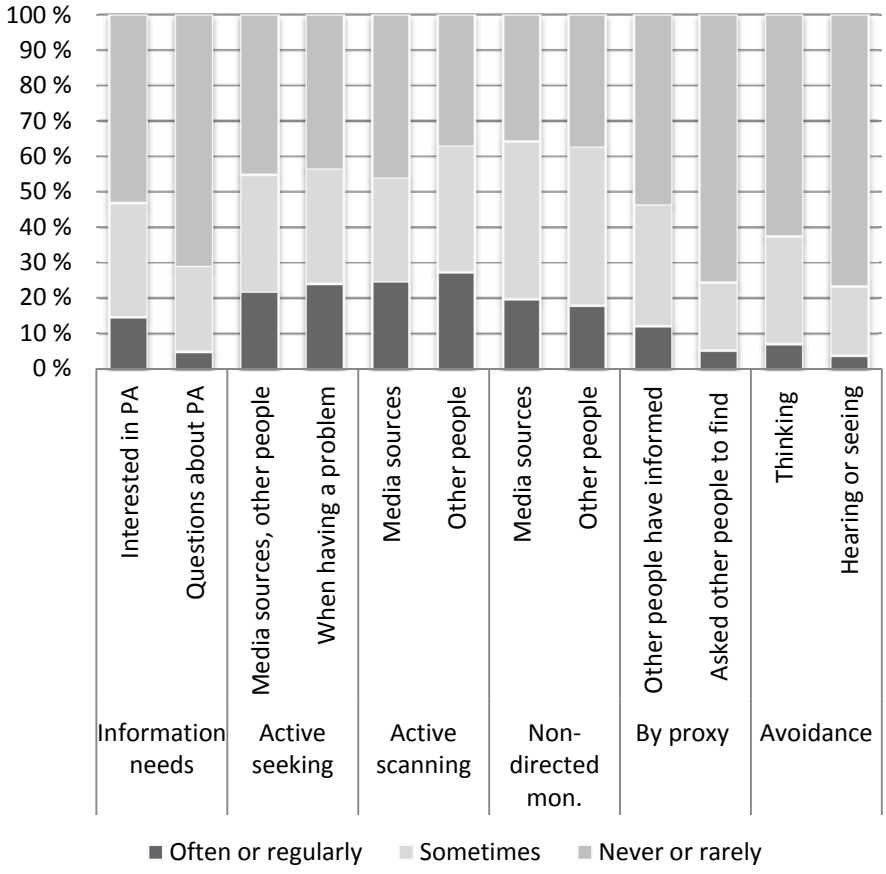

Fig. 7. Responses to statements about needs for and practices to acquire and avoid physical activity information.

More than half of the respondents had never or rarely received information from other people or received recommendations of sources of exercise information, and a little over 75% had never or rarely asked others to find them information. More than one third of the respondents reported *avoiding* thinking about exercise at least sometimes, and more than one fifth had at least sometimes avoided hearing or seeing information concerning exercise or physical activity (Figure 7, Table 9).

Table 9. Responses to statements about needs for and practices to acquire and avoid physical activity information.

Response	Never or rarely	Sometimes	Often or regularly	Total[1]
	n (%)	n (%)	n (%)	N (100%)
Information needs				
I am interested in information concerning physical activity (PA) or feel like I should know more about it.	312 (53.15)	189 (32.20)	86 (14.65)	587
I have questions concerning PA or exercise that I would like to have answers to.	408 (71.08)	138 (24.04)	28 (4.88)	574
Active seeking				
I look for information when I have a problem or a question about exercise or PA.	249 (43.53)	185 (32.34)	138 (24.13)	572
I look for information for example on the Internet or ask questions about it from other people.	258 (45.18)	189 (33.10)	124 (21.72)	571
Active scanning				
I follow exercise-related shows on television or other media sources, or browse books, magazines or the Internet for exercise information.	270 (46.08)	172 (33.10)	144 (24.57)	586
I talk with other people about exercise or PA.	216 (37.11)	207 (35.57)	159 (27.32)	582
Non-directed monitoring				
I receive exercise information by chance when reading the paper, watching the television or surfing the Internet	209 (35.85)	259 (44.43)	115 (19.73)	583
I received exercise information by change from other people	217 (37.41)	260 (44.83)	103 (17.76)	580
By proxy				
Other people have informed me about exercise or PA or recommended sources that contain exercise information, such as web pages, magazines, or information leaflets.	314 (53.68)	200 (34.19)	71 (12.14)	585
I have asked other people to find me information about exercise.	439 (75.56)	112 (19.28)	30 (5.16)	581
Avoidance				
I don't want to think about exercise.	362 (62.63)	176 (30.45)	40 (6.92)	578
I avoid hearing or seeing exercise-related information.	440 (76.79)	111 (19.37)	22 (3.84)	573

[1]numbers do not match due to missing data

Correlation analyses were conducted to investigate the relationships between the different information behaviour variables. They revealed relatively strong ($rs > .5$) significant ($p < .01$) correlations between information needs and each of the investigated information practice[16], except for avoidance of information which was very weakly ($rs = .115$, $p < .01$) correlated with information needs. Furthermore, there were relatively strong correlations (from $rs = .514$, $p < .01$ to $rs = .630$, $p < .01$) between the different practices of obtaining information, except for information avoidance. The correlations between avoidance of information and other practices were very weak or non-existent (Appendix 8).

4.2.2 Feedback preferences

The majority of the participants thought that ipsative comparison—that is, comparison of an individual's current and prior states—would be motivational in the context of physical activity. Over 70% of them either strongly agreed or agreed with this statement (Table 10).

Table 10. Responses to statements concerning preference for ipsative, normative and theoretically driven message tactics (*n* = 492).

Feedback message type	Response						
	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Not sure	Total
	n (%)	*n* (%)	*n* (%)	*n* (%)	*n* (%)	*n* (%)	*N* (%)
Ipsative	206 (41.9)	145 (29.5)	75 (15.2)	27 (5.5)	26 (5.3)	13 (2.6)	492 (100)
Normative	138 (28.0)	170 (34.6)	105 (21.3)	38 (7.7)	23 (4.7)	18 (3.7)	492 (100)
Theoretical	25 (5.1)	51 (10.4)	192 (39.3)	121 (24.7)	76 (15.5)	24 (4.9)	489 (100)

A slightly smaller proportion, around 60% of the men, thought that normative comparison—comparison of an individual's behaviour or prior state to that of peers—would motivate them to be more physically active. Around 40% of the participants were interested in theoretically driven health information[17] (Table 10).

Men who found ipsative feedback motivational were also likely to be motivated by normative feedback ($rs = .590$, $p < .001$). The association between

[16] Corelations between information needs and active seeking (rs = .674), active scanning (rs = .628), non-directed monitoring (rs = .501), and obtaining information by proxy (rs = .646).
[17] Note that the statement is reversed

preference for theoretically-driven health information and normative (rs = .134, p < .001) or ipsative (rs = .029, p = ns) feedback were weak or non-existing.

4.2.3 Physical activity information needs and practices in stages of exercise behaviour change (Study I)

Of the respondents in Study I, 18.9% (n = 114) reported being physically active daily for less than an hour, 55.0% (n = 332) from one to two hours, and 26.2% (n = 158) more than two hours. Of them, 10.5% (n = 63) were categorised into precontemplation, 13.0% (n = 78) into contemplation, 14.5% (n = 87) into preparation, 13.0% (n = 78) into action, and 49.0% (n = 294) into maintenance stage of exercise behaviour change. Thus, 62.0% of the respondents reported exercising three or more times a week for at least 20 min at a time (action, maintenance), and 38.0% reported not meeting these criteria of regular exercise (precontemplation, contemplation, preparation). ANOVA's showed significant differences in all of the fitness measures based on stage of exercise behaviour change. Men in maintenance stage were likely to have high aerobic fitness, low body fat percentage, and good grip strength. Men in precontemplation stage were likely to have low aerobic fitness and grip strength, but low BMI, waist circumference, and body fat percentage. Men in action stage, in turn, were likely to have high BMI, waist circumference, and body fat percentage (see Appendix 6).

Kruskal-Wallis test followed by pairwise multiple comparisons were conducted to study whether men's physical activity levels and their stage of exercise behaviour change were associated with needs for or practices of acquiring physical activity and exercise information. The analyses revealed that daily physical activity and engagement in regular exercise were associated with the activity of information acquisition. Men who were physically active less than an hour a day were significantly (p < .05) less active in their information behaviours (based on the information behaviour sum variable), than those reporting being active for one to two hours a day. Likewise, those reporting being physically active over two hours a day were significantly more active in their information behaviours than those in the less active groups. Correspondingly, those reporting to exercise regularly (respondents in action and maintenance) were more likely to be active in their information behaviours than those not engaging in regular exercise (respondents in precontemplation, contemplation, or preparation) (Table 11).

Table 11. Mean scores, Kruskal-Wallis test results, and pairwise multiple comparisons results for information behaviour variables across stages of change among respondents (*n* = 600).

Variable	Stage of change					p^1	Pairwise multiple comparisons ($p < .05$)
	PC 10.5 % (n = 63)	C 13.0 % (n = 78)	P 14.5 % (n = 87)	A 13.0 % (n = 78)	M 49.0 % (n = 294)		
Information need	1.4	1.85	1.96	2.17	2.52	< .001	PC < C, P, A, M; C, P < M
Active seeking	1.77	2.21	2.30	2.77	2.97	< .001	PC, C < A, M; P < M
Active scanning	1.73	2.21	2.40	2.43	3.26	< .001	PC < P, A, M; PC, C, P, A < M
Non-directed monitoring	2.07	2.47	2.60	2.61	3.02	< .001	PC < P, A, M; PC, C, P, A < M
By proxy	1.63	1.88	2.00	2.05	2.36	< .001	PC < A, M; C, P < M
Avoidance	1.91	1.65	1.60	1.77	1.81	.217	Ns
Information behaviour sum	1.06	1.44	1.54	1.66	2.04	< .001	PC < C, P, A < M

[1]*p* values of Kruskal-Wallis test; $p < .05$ is considered statistically significant; PC = precontemplation, C = contemplation, P = preparation, A = action, M = maintenance

Furthermore, the mean scores of physical activity related information behaviour variables increased across all five stages, with the exception of avoidance of information. Those categorised into the precontemplation stage reported recognizing the least information needs on physical activity and having actively sought, actively scanned, monitored non-directly, or obtained by proxy information related to physical activity least frequently. By contrast, avoidance of information was more common among individuals in this stage than among individuals in the other four stages of change, but the difference was not statistically significant. Non-directed monitoring was the most often applied practice to obtain information among precontemplators (Table 11).

In the contemplation stage the mean scores of all the information behaviour variables were higher than in the precontemplation stage, except for the avoidance of information. Similarly to those in the precontemplation stage, non-directed monitoring was also reported to be the most frequently used practice to obtain

information among those categorised into the contemplation stage. Again, in the preparation stage the mean scores of all the information behaviour variables were higher than in the previous stage, except for avoidance of information. Non-directed monitoring was the most frequently used practice to obtain information (Table 11).

In the action stage the mean scores of all of the information behaviour variables were higher than in the previous stages. In this stage the mean scores of the practice of active seeking exceeded non-directed monitoring scores. In the maintenance stage the mean scores of all the information behaviour variables were the highest when compared to other stages, except for the avoidance of information. In this stage the mean scores of the practice of active scanning was higher than those of active seeking (Table 11, Figure 8).

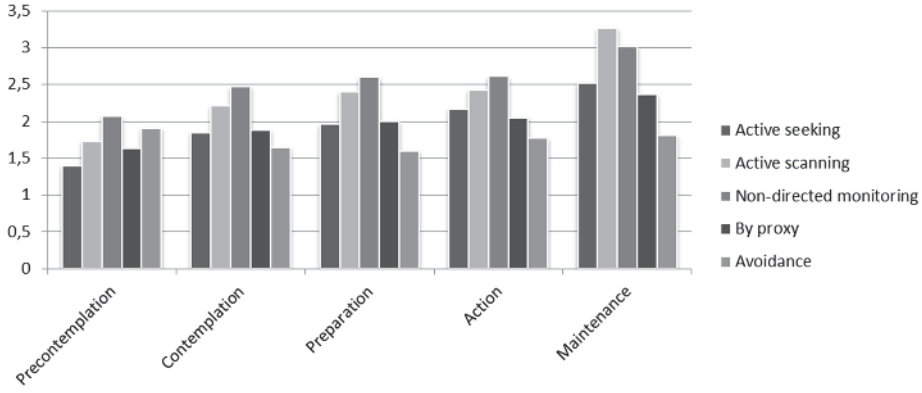

Fig. 8. Mean scores of information behaviour variables across stages of exercise behaviour change among young men (*n* = 600).

The mean scores of decisional balance pros, self-efficacy, and cognitive and behavioural process increased, and decisional balance cons decreased, across the five stages of exercise behaviour change (Table 12). Correlation analyses were conducted to investigate the relationships between these facors and the information behaviour variables.

Table 12. Mean scores, Kruskal-Wallis test results, and pairwise multiple comparisons results for self-efficacy, decisional balance and change process variables across stages of change (*n* = 600).

Variable	Stage of change					p^1	Pairwise multiple comparisons ($p < .05$)
	PC 10.5% (*n* = 63)	C 13.0% (*n* = 78)	P 14.5% (*n* = 87)	A 13.0% (*n* = 78)	M 49.0% (*n* = 294)		
Self-efficacy	29.81	38.04	43.79	48.30	57.10	< .001	PC < P, A, M; C < A, M; PC, C, P, A < M
Decisional balance pros	36.24	40.16	44.09	46.86	48.95	< .001	PC < P, A, M; C < A; PC, C, P < M
Decisional balance cons	38.05	35.25	30.76	30.36	24.78	< .001	PC < P, A, M; C < A, M; C, P, A < M
Cognitive processes	18.78	22.00	25.46	27.07	30.92	< .001	PC < P, A, M; C < A, M; P < M
Behavioural processes	19.37	23.00	26.48	28.01	30.92	.< .001	PC < P, A < M; C < A, M

[1]*p* values of Kruskal-Wallis test; $p < 0.05$ is considered statistically significant; PC = precontemplation, C = contemplation, P = preparation, A = action, M = maintenance

Both cognitive and behavioural processes were relatively strongly ($rs > .5$) correlated with information needs, as well as with each of the information practices except for the avoidance of information. Exercise self-efficacy was significantly ($p < .01$) and relatively strongly correlated with active scanning ($rs = .523$), and moderately correlated with information needs ($rs = .424$) and information seeking ($rs = .450$). In general, high exercise self-efficacy was associated with more active information seeking. Correlations between decisional balance pros and information needs and seeking were relatively strong as well. Decisional balance cons, in contrast, was only weakly associated with any information behaviour variable. Of the information behaviour variables the avoidance of information stands out as an exception as it was only weakly or not at all associated with the other variables (see Appendix 8).

The men's educational level was associated both with the stage of exercise behaviour change and with their information behaviour in physical activity and

exercise context. Relatively more of those with a general upper secondary school education were categorised into the higher stages of exercise behaviour change (preparation, action, maintenance), when compared to those with vocational upper secondary or compulsory school education. For example, of men with only a compulsory school education 28.0% (n = 7) were in precontemplation, while the proportions were 13.2% (n = 33) for vocational upper secondary school students and 6.5% (n = 21) for general upper secondary school students (see Table 13).

Table 13. Distribution of respondents at stages of exercise behaviour change according to education (n = 597).

Education	Stage of change					Total
	PC	C	P	A	M	*N* (100%)
	n (%)	*n* (%)	*n* (%)	*n* (%)	*n* (%)	
Comprehensive school	7 (28.0)	5 (20.0)	4 (16.0)	5 (20.0)	4 (16.0)	25
Vocational upper secondary	33 (13.2)	41 (16.3)	43 (17.1)	31 (12.4)	103 (41.0)	251
General upper secondary	21 (6.5)	32 (10.0)	40 (12.5)	41 (12.8)	187 (58.3)	321

PC = precontemplation, C = contemplation, P = preparation, A = action, M = maintenance

Moreover, respondents with only a compulsory school education reported experiencing information needs related to physical activity and exercise less frequently than those with higher education. Of those with a compulsory school education 75.0% (n = 18) were never or very rarely interested in exercise-related information or thought they should know more about exercise. Conversely, the figures were 54.6% (n = 136) for those with a vocational, and 50.3% (n = 152) for those with an upper secondary school education (Table 14).

Table 14. Mean scores, Kruskal-Wallis test results, and pairwise multiple comparisons results for information behaviour variables across educational groups (*n* = 580).

Variable	Education			*p*[1]	Pairwise multiple comparisons (*p* < .05)
	Compulsory school	Vocational upper secondary	General upper secondary		
	4.1 % (*n* = 24)	42.4% (*n* = 246)	53.4% (*n* = 310)		
Information needs	1.77	2.12	2.27	.018	C < GU1
Active seeking	2.05	2.38	2.83	< .001	C, VU < GU
Active scanning	2.30	2.56	2.91	< .001	C, VU < GU
Non-directed monitoring	2.29	2.53	2.93	< .001	C, VU < GU
By proxy	1.85	2.10	2.16	.244	Ns
Avoidance	1.73	1.89	1.68	.062	Ns

[1]*p* values of Kruskal-Wallis test; $p < 0.05$ is considered statistically significant; C = Compulsory school, VU = Vocational upper secondary education, GU = General upper secondary education

Men with an upper secondary education reported to obtain information through active seeking, active scanning, and non-directed monitoring significantly more frequently than men in the other educational groups (Table 14).

4.2.4 Physical activity feedback preference in stages of exercise behaviour change (Study II)

Preferences for ipsative, normative, and theoretically-driven message tactics were studied in relation to the stage of exercise behaviour change, physical activity, exercise self-efficacy, educational background, and physical fitness (BMI, percentage body fat, grip strength, aerobic fitness) of the men. Cross-tabulations as well as Kruskall-Wallis tests (Tables 15 and 16) indicate that the stage of exercise behaviour change and education were both associated with preference for ipsative and normative feedback.

Table 15. Mean scores, Kruskal-Wallis test results, and pairwise multiple comparisons results for feedback preference variables across stages of change (*n* = 558).

Feedback message type	Stage of change					p^1	Pairwise multiple comparisons (p < .05)
	PC 10.5% (*n* = 43)	C 13.0% (*n* = 62)	P 14.5% (*n* = 66)	A 13.0% (*n* = 74)	M 49.0% (*n* = 313)		
Ipsative	2.79	3.48	3.52	3.69	4.07	< .001	PC, C, P < M; PC < A
Normative	2.72	3.21	3.33	3.42	3.75	< .001	PC, C < M
Theoretically-driven	2.70	2.56	2.59	2.36	2.46	.658	Ns

[1]*p* values of Kruskal-Wallis test; $p < 0.05$ is considered statistically significant; PC = precontemplation, C = contemplation, P = preparation, A = action, M = maintenance

Results of Kruskall-Wallis analysis show that the scores indicating preference for ipsative and normative comparison increase across the five stages of exercise behaviour change (Table 15). Furthermore, general upper secondary school students were more likely to consider normative and ipsative comparison as motivational in the context of physical activity when compared to their peers (Table 16).

Table 16. Mean scores, Kruskal-Wallis test results, and pairwise multiple comparisons results for information behaviour and feedback preference variables across educational groups (*n* = 555).

Feedback message type	Education			p^1	Pairwise multiple comparisons (p <.05)
	Compulsory school 3.2% (*n* = 18)	Vocational upper secondary 38.7% (*n* = 215)	General upper secondary 58.0% (*n* = 322)		
Ipsative	3.00	3.39	4.07	< .001	C, VU < GU [1]
Normative	2.72	3.23	3.74	< .001	C, VU < GU
Theoretically-driven	2.44	2.51	2.48	0.885	Ns

[1] *p* values of Kruskal-Wallis test; $p < 0.05$ is considered statistically significant; C = Compulsory school, VU = Vocational upper secondary education, GU = General upper secondary education

Moreover, those who did not prefer ipsative and normative message tactics had significantly ($p < .001$) lower self-efficacy scores than those who preferred them or responded neutrally; group means (M) for those indicating and not-indicating preference were 53.4 (SD = 13.7) and 46.0 (SD = 20.0) for ipsative comparison, and 53.2 (SD = 13.9) and 47.8 (SD = 19.1) for normative comparison, respectively. Moreover, aerobic fitness was significantly poorer in those who did not prefer normative comparison (M = 54.4, SD = 7.5 and M = 51.9, SD = 7.6). A preference for theoretically driven health information was not associated with the stage of change, exercise self-efficacy, aerobic fitness, or education.

Since education, self-efficacy, and the stage of change were all associated with a preference for ipsative and normative message tactics, they were included in the multivariate logistic regression analyses. These analyses demonstrated that education and the stage of exercise behaviour change, but not self-efficacy, were independently associated with a preference for ipsative as well as normative comparison. Men in the precontemplation stage were significantly less likely to prefer ipsative comparison than men in the maintenance stage (OR = 5.8, 95% CI [2.1, 15.6]). Men in the contemplation stage and (OR = 3.3, 95% CI [1.4, 7.9]) men in the precontemplation stage (OR = 3.0, 95% CI [1.1, 8.2]) were less likely to prefer normative comparison than men in the maintenance stage Moreover, the odds of men who had attended a vocational track of upper secondary school were almost 5 to 1 (OR = 4.9, 95% CI [2.4, 10.1]) for preference of ipsative comparison and 3 to 1 (OR = 2.7, 95% CI [1.5, 5.1]) for preference of normative comparison when compared to men studying in the general track of upper secondary school.

4.3 Everyday health information literacy (Studies III and IV)

Around half of the men thought that it is important to be informed about health issues. The majority of the men were confident that they knew where to look for health information. Only approximately 5% of them disagreed with the statement concerning knowing where to seek health information. However, 18% of the participants found it difficult to find health information from print sources, and 12% from the Internet. Over 16% of the men found it difficult to understand health-related terminology, and approximately 13% thought that it is difficult to know who to believe on health issues. Of the men 39% thought that they liked getting health information from a variety of sources, and around one third thought that the reliability of health information from print as well as Internet sources was easy to

assess. A slightly larger proportion, approximately 36%, said they applied health information to their own lives and/or that of people close to them (Table 17).

Table 17. Responses to individual statements concerning everyday health information literacy among respondents (*n* = 1,633).

Statement	Response					Total
	Strongly agree *n* (%)	Agree *n* (%)	Neutral *n* (%)	Disagree *n* (%)	Strongly disagree *n* (%)	*N (100%)*
It is important to be informed about health issues.	589 (36.1)	441 (15.6)	463 (28.4)	78 (4.8)	62 (3.8)	1,633
I know where to seek health information.	642 (39.4)	510 (31.3)	387 (23.8)	55 (3.4)	34 (2.1)	1,628
I like to get health information from a variety of sources.	283 (17.8)	338 (21.2)	677 (42.5)	203 (12.7)	92 (5.8)	1,593
It is difficult to find health information from printed sources (magazines and books).	111 (7.0)	170 (10.7)	643 (40.3)	409 (25.6)	263 (16.5)	1,596
It is difficult to find health information from the Internet.	82 (5.2)	121 (7.7)	381 (24.3)	325 (20.8)	656 (41.9)	1,565
It is easy to assess the reliability of health information in printed sources (magazines and books).	219 (13.7)	323 (20.2)	774 (48.3)	203 (12.7)	82 (5.1)	1,601
It is easy to assess the reliability of health information on the Internet.	188 (11.8)	323 (20.3)	727 (45.7)	248 (15.6)	106 (6.7)	1,592
Health related terminology and statements are often difficult to understand.	82 (5.2)	177 (11.1)	740 (46.5)	388 (24.4)	205 (12.9)	1,592
I apply health related information to my own life and/or that of people close to me.	148 (9.3)	423 (26.5)	773 (48.4)	176 (11.0)	77 (4.8)	1,597

It is difficult to know who to believe in health issues.	89 (5.2)	132 (8.2)	667 (41.6)	424 (26.5)	290 (18.1)	1,602

Dyslexia, n = 137 (8.2%)

Everyday health information literacy sum variable: *M* = 34.7 (*SD* = 5.0); range = 16—50.

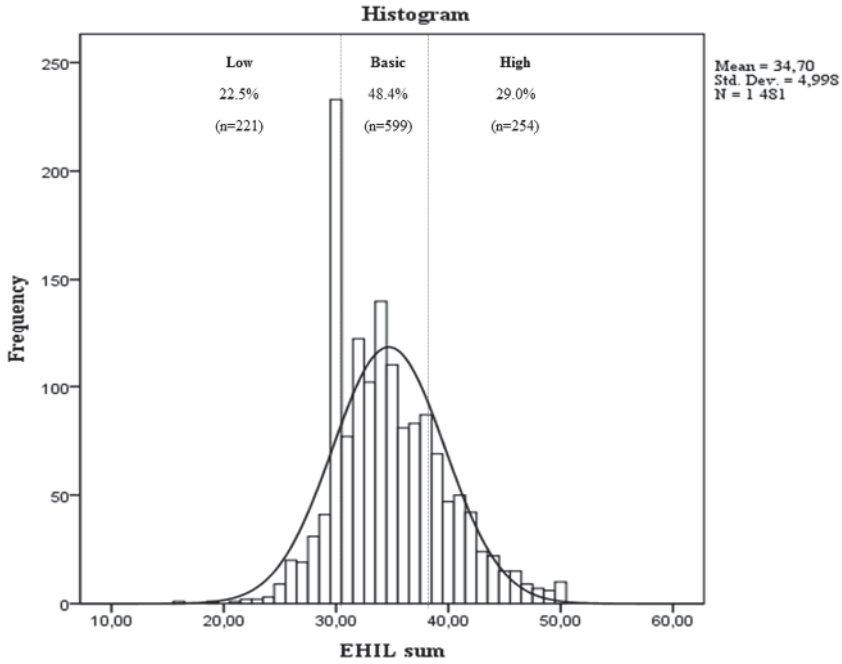

Fig. 9. Distribution of everyday health information literacy (EHIL) scores among young men (*n* = 1,481).

The individual statements were aggregated to form a sum variable for everyday health information literacy (EHIL). The total scores of the EHIL sum variable ranged from 16 to 50 (Figure 9). The sample followed a normal distribution where the mean value was 34.7, the median value 34.0 and the standard deviation 5.0. The internal consistency of the scale was measured by Chronbach's alpha (α). The α for the scale was 0.7, which is above the commonly accepted minimum (Hays & Revicki 2005). For further analysis, the EHIL sum variable was divided into three categories: low (≤ 30 points), basic (31–38 points) and high (≥ 39 points) (see Figure 9).

4.3.1 Everyday health information literacy and sociodemoraphic background (Study III)

The associations between everyday health information literacy and socio-demographic characteristics (age, education, living arrangements, current occupation, occupational status of both of parents) were first studied by cross-tabulation (EHIL in three categories). These analyses showed that the age of the men, their educational background, living arrangements and the occupational status of both parents were associated with the men's everyday health information literacy (Table 18).

Table 18. Socio-demographic information of respondents (*n* = 630) in categories of everyday health information literacy (EHIL).

Variable	EHIL			Total	*p*[1]
	Low	Basic	High		
	n (%)	*n* (%)	*n* (%)	*N (100 %)*	
	142 (22.5)	305 (48.4)	183(29.0)	*630*	
Age					.005
17	40 (24.0)	72 (43.1)	55 (32.9)	167	
18	86 (20.1)	220 (51.4)	122 (28.5)	428	
> 18	16 (45.7)	13 (37.1)	6 (17.1)	35	
Education					< .001
Compulsory	9 (39.1)	11 (47.8)	3 (13.0)	23	
Vocational school	86 (31.6)	136 (50.0)	50 (18.4)	272	
Upper secondary school or higher	47 (14.0)	158 (47.2)	130 (38.8)	335	
Living arrangements					.020
With parents/a parent	109 (20.9)	250 (48.0)	162 (31.1)	521	
With someone else	27 (28.8)	28 (47.5)	14 (23.7)	59	
Alone	16 (34.8)	25 (54.3)	5 (10.9)	46	
Current occupation					Ns[2]
Student	128 (21.9)	279 (47.8)	177 (30.3)	584	
Employed	5 (31.2)	8 (50.0)	3 (18.8)	16	
Unemployed	9 (30.0)	18(60.0)	3 (10.0)	30	
Mother's occupation					.019
Manager or entrepreneur	5 (19.2)	12 (46.2)	9 (34.6)	26	

Variable	EHIL			Total	p^1
	Low	Basic	High		
	n (%)	*n* (%)	*n* (%)	*N (100 %)*	
	142 (22.5)	305 (48.4)	183(29.0)	*630*	
Age					.005
Professional	17 (12.8)	57 (42.9)	59 (44.4)	133	
Associate professional	18 (16.4)	63 (57.3)	29 (26.4)	110	
Service or sales worker	51 (24.5)	104 (50.0)	53 (25.5)	208	
Manual labourer	3 (23.1)	6 (46.2)	4 (30.8)	13	
Other	14 (25.5)	28 (50.9)	13 (23.6)	55	
Father's occupation					.003
Manager or entrepreneur	9 (16.7)	23 (42.6)	22 (40.7)	54	
Professional	23 (15.8)	68 (46.6)	55 (37.7)	146	
Associate professional	9 (13.2)	35 (51.5)	24 (35.3)	68	
Service or sales worker	14 (23.3)	30 (50.0)	16 (26.7)	60	
Manual labourer	39 (29.1)	73 (54.5)	22 (16.4)	134	
Other	18 (28.1)	27 (42.2)	19 (29.7)	64	

[1]Pearson Chi-Squared [2]Fisher's exact

Those studying in a general upper secondary school were more likely to score higher on the everyday health information literacy scale than those studying in a vocational pathway of upper secondary school, or those who only had a compulsory education. Men's current occupation was not associated with everyday health information literacy scores, whereas the occupation of their father and mother was: those whose parents had a managerial/entrepreneurial or professional occupation were likely to have high scores. Moreover, high scores were more likely among men living with one or two parents when compared to those living alone or with someone else.

Multinomial regression analysis revealed that a compulsory or a vocational education, a manual labourer father, and being older than 18 years at military conscription increased the odds of having low everyday health information literacy. The odds of those with only a compulsory education were over fourteen to one (OR = 14.03) to have low everyday health information literacy, when compared to those with an upper secondary school or higher education. However, the confidence interval was wide (95% CI [1.34, 146.95]). A vocational education (OR = 3.77, 95% CI [1.99, 7.17]) and father's manual labour occupation (OR = 2.33, 95% CI [1.01,

5.40]) increased the odds of having low everyday health information literacy (Table 19).

Table 19. Characteristics associated with having low and basic everyday health information literacy in multinomial regression analysis among respondents (*n* = 630).

Variable (reference category)	Category	OR	95% CI	*p*[1]
Characteristics associated with low health information literacy				
Education (upper secondary school or higher)				
	Compulsory	14.03	1.34–146.95	.028
	Vocational	3.77	1.99–7.17	< .001
Age (>18)	17 years	0.11	0.02–0.75	.025
	18 years	0.10	0.02–0.67	.017
Father's occupation (professional)	Manual labourer	2.33	1.01–5.40	*.049*
Characteristics associated with basic health information literacy				
Education (upper secondary school or higher)				
	Vocational	2.01	1.21–3.32	*.007*
Mother's occupation (professional)				
	Associate professional	1.99	1.05–3.75	*.034*

OR = Odds Ratio, CI = Confidence Interval; [1]multivariate logistic regression analysis; the reference category is high information literacy

When compared to the over 18-year-old men, a younger age decreased the odds of having low everyday health information literacy. Moreover, a vocational education (OR = 2.01, 95% CI [1.21, 3.32]) and mother's associate professional occupation (OR = 1.99, 95% CI [1.05, 3.75]) increased the odds of having basic, and not high, everyday health information literacy (Table 19).

4.3.2 Everyday health information literacy and health behaviours (Study IV)

To investigate how everyday health information literacy is associated with health behaviours cross-tabulations with EHIL in three categories as well as an analysis

of variance (ANOVA) with EHIL as a continuous variable were conducted. Both analyses showed similar associations: low everyday health information literacy scores were more likely with men who were physically inactive, smoked, binge-drank frequently, brushed their teeth less than twice a day, and had eating habits that can be considered unhealthy (skipping breakfast, infrequent vegetable, fruit and berry consumption, consumption of soft and energy drinks) (Table 20).

Table 20. Everyday health information literacy (EHIL) scores (mean, *M* and standard deviation, *SD*) in categories of self-reported health behaviours among respondents (*n* = 1,481).

Health behaviour	EHIL *M* (*SD*)	*p*[1]	Health behaviour	EHIL *M* (*SD*)	*p*[1]
Hours spent on physical activities		.029	Eating breakfast		< .001[2]
< 1 hour (*n* = 323)	34.1 (5.2)		Yes (n = 1093)	35.1 (5.0)	
1 to 2 hours (*n* = 746)	34.8 (4.9)		No (n = 380)	33.5 (4.7)	
> 2 hours (*n* = 385)	35.1 (5.1)		Eating fresh vegetables		< .001
Daily physical activity		< .001	None (n = 218)	33.3 (4.8)	
Low (n = 272)	33.0 (4.6)		1 to 2 times a week (n = 604)	34.1 (4.8)	
Medium low (n = 436)	34.2 (4.8)		3 to 5 times a week (n = 447)	35.6 (5.0)	
Medium high (n = 545)	35.6 (5.0)		6 to 7 times a week (n = 150)	37.2 (5.1)	
High (n = 208)	35.7 (5.3)		Eating fruit or berries		< .001
Sitting time		Ns	None (n = 348)	33.6 (4.5)	
< 8 hours (n = 395)	34.3 (4.8)		1 to 2 times a week (n = 675)	34.6 (5.0)	
8 to 9 hours (n = 287)	35.0 (5.0)		3 to 5 times a week (n = 97)	35.3 (5.1)	
10 to 11 hours (n = 306)	35.2 (5.0)		6 to 7 times a week (n = 296)	36.4 (4.9)	
> 11 hours (n = 418)	34.6 (5.2)		Drinking soft drinks		.003
Smoking		< .001[2]	None (n = 388)	35.4 (5.2)	
No (n = 1,107)	35.3 (5.1)		1 to 2 times a week (n = 722)	34.7 (5.1)	
Yes (n = 370)	33.0 (4.4)		3 to 5 times a week (n = 254)	34.3 (4.4)	
Use of snuff		Ns[2]	6 to 7 times a week (n = 49)	33.0 (4.7)	
No (n = 296)	34.7 (5.0)		Drinking energy drinks		.002
Yes (n = 1,176)	34.7 (5.0)		None (n = 917)	35.1 (5.0)	
Alcohol consumption (≥ 6 drinks)		< .001	1 to 2 times a week (n = 397)	34.1 (5.0)	
None (n = 338)	34.8 (5.0)		3 to 5 times a week (n = 81)	34.4 (5.4)	
< monthly (n = 343)	35.0 (5.2)		6 to 7 times a week (n = 20)	33.3 (4.1)	
1–2 times a month (n = 543)	35.0 (5.0)		Eating candy		*Ns*

Health behaviour	EHIL *M* (*SD*)	*p*[1]	Health behaviour	EHIL *M* (*SD*)	*p*[1]
Once a week (n = 201)	33.6 (4.7)		None (n = 419)	34.9 (5.1)	
2–3 times a week (n = 41)	32.4 (3.8)		1 to 2 times a week (n = 840)	34.7 (4.9)	
Daily (n = 5)	33.0 (7.3)		3–5 times a week (n = 153)	34.9 (5.3)	
Tooth brushing		< .001	6–7 times a week (n = 8)	33.6 (4.3)	
None (n = 16)	32.1 (6.0)				
Couple of times a week (n = 106)	33.2 (4.8)				
Once a day (n = 654)	34.4 (5.0)				
Twice a day (n = 669)	35.4 (5.0)				
> twice a day (n = 9)	35.8 (3.5)				

[1]ANOVA [2]Student's t-test

Health behaviours were also significantly associated with socio-demographic characteristics, most significantly the education of the men and the occupation of their mother and father (*data not shown*). For example, men in a general upper secondary school were more likely to exercise and eat fresh vegetables frequently than the vocationally educated men or men with a compulsory education.

Multivariate logistic regression analyses showed that the associations between everyday health information literacy and health behaviours were independent of socio-demographic characteristics for all other health behaviours, except for the consumption of energy drinks (Table 21).

Table 21. Factors associated with different health behaviours in multivariate logistic regression analysis among respondents (*n* = 1,130).

Variable (reference category)	Category	OR	95% CI	*p*[1]
Eating fruit or berries (< 2 days a week)				
EHIL (high)	Low	2.68	1.76–4.08	< .001
	Basic	1.59	1.16–2.19	.004
Education (general upper secondary)				
	Vocational upper secondary	1.47	1.07–2.00	.016
Mother's occupation (professional)				
	Manual labourer	4.51	1.01–20.22	.049
Eating fresh vegetables (< 2 days a week)				
EHIL (high)				

Variable (reference category)	Category	OR	95% CI	p^1
	Low	3.24	2.20–4.77	< .001
Father's occupation (professional)				
	Basic	2.10	1.54–2.88	< .001
Mother's occupation (professional)				
	Not employed	2.17	1.25–3.79	.006
	Service or sales worker	1.51	1.06–2.14	.023
Drinking soft drinks (> once a week)				
EHIL (high)				
	Low	1.68	1.05–2.69	.032
	Basic	1.71	1.14–2.57	.010
Alcohol use (≤6 drinks) (> 2 times a month)				
EHIL (high)				
	Low	2.95	1.70–5.13	< .001
	Basic	1.87	1.12–3.14	.017
Education (general upper secondary)				
	Compulsory school	2.60	1.29–5.22	.007
	Vocational upper secondary	1.63	1.12–2.37	.010
Smoking (Yes)				
EHIL(high)				
	Low	1.87	1.18–2.96	*.007*
Education (general upper secondary)				
	Compulsory school	11.08	5.64–21.76	*< .001*
	Vocational upper secondary	4.08	2.88–5.77	*< .001*
Mother's occupation (professional)				
	Not employed	2.77	1.58–4.87	*< .001*
Daily physical activity (Not attending to exercise)				
EHIL (high)				
	Low	*2.46*	*1.69–3.59*	*< .001*
	Basic	*1.57*	*1.14–2.17*	*.001*
Father's occupation (professional)				
	Manager or entrepreneur	*1.60*	*1.01–2.55*	*.048*
	Not employed	*2.32*	*1.36–3.94*	*.002*
	Associate professional	*1.72*	*1.14–2.58*	*.010*
	Service and sales worker	*1.62*	*1.01–2.59*	*.044*
	Manual labourer	*1.54*	*1.04–2.28*	*.033*
Mother's occupation (professional)				
	Not employed	*1.93*	*1.17–3.18*	*.010*
	Service or sales worker	*1.49*	*1.05–2.11*	*.028*
Education (general upper secondary)				

Variable (reference category)	Category	OR	95% CI	p^1
	Compulsory school	*4.14*	*2.02–8.49*	*< .001*
	Vocational upper secondary	*1.63*	*1.24–2.14*	*.001*
Hours spent on physical activities (< 2)				
EHIL				
	Low	*2.07*	*1.37-3.13*	*.001*
	Basic	*1.69*	*1.20-2.37*	*.002*
Education (general upper secondary)				
	Vocational upper secondary	*0.38*	*0.28-0.52*	*< .001*
Tooth brushing (< twice a day)				
EHIL				
	Low	1.75	1-21–2.53	.003
Education (general upper secondary)				
	Compulsory school	*2.62*	*1.35–5.09*	*.005*
	Vocational upper secondary	*1.82*	*1.38–2.39*	*< .001*
Father's occupation				
	Manual labourer	*1.60*	1.09–2.35	.017
Eating breakfast (No)				
EHIL				
	Low	*1.59*	*1.04–2.45*	*.034*
Education (general upper secondary)				
	Compulsory school	*3.79*	*2.00–7.17*	*< .001*
	Vocational upper secondary	*1.74*	*1.27–2.39*	*.001*
Mother's occupation (professional)				
	Not employed	*2.53*	*1.46–4.40*	*.001*
	Service or sales worker	*1.77*	*1.15–2.72*	*.009*
Use of snuff (Yes)				
Mother's occupation (professional)				
	Unemployed	*1.90*	*1.07–3.37*	*.028*
	Manual labourer	*3.28*	*1.31–8.25*	*.012*
Sitting time (> 10 hours)				
Education (general upper secondary)				
	Vocational upper secondary	*0.58*	*0.44–0.77*	*< .001*
Drinking energy drinks (> 2 times a week)				
Education (general upper secondary)				
	Compulsory school	*0.26*	*0.10–0.67*	*.005*
Eating sweets (> 2 times a week)				

Variable (reference category)	Category	OR	95% CI	p^1
Father's occupation (professional)				
	Manual labourer	1.97	1.06–3.69	.033

[1]Multivariate logistic regression analysis; enter-method was used by inserting the following variables in each model: everyday health information literacy, education, mother's occupation, father's occupation

In general, higher scores in the everyday health information literacy scale increased the odds of self-reported health-promoting behaviours, such as not smoking, eating vegetables frequently and exercising regularly. Strongest associations were found between everyday health information literacy and eating fresh vegetables and fruit, daily physical activity and exercise, and binge drinking.

4.3.3 Everyday health information literacy and physical fitness (Study IV)

Correlation analyses were conducted to investigate the relationship between everyday health information literacy and physical fitness measures. They showed significant, but rather weak associations between everyday health information literacy and aerobic fitness ($r = .119$, $p < .01$), muscle mass ($r = .095$, $p < .01$), and grip strength ($r = .065$, $p < .05$), and an inverse, but weak association between everyday health information literacy and body fat percentage ($r = -.083$, $p < .01$).

However, analysis of variance (ANOVA) with everyday health information literacy in three categories demonstrated that men with high everyday health information literacy were significantly more likely to have better aerobic fitness, higher muscle mass, and lower body fat percentage than those with low or basic literacy. Based on this analysis, body mass index or grip strength were not associated with everyday health information literacy among young men (Table 22).

Table 22. Mean (*M*) and standard deviation (*SD*) values of physical fitness measures of respondents (*n* = 1,074) across the different categories of everyday health information literacy (EHIL).

Variable	EHIL			Total	p^1
	Low	Basic	High		
	M (*SD*)	*M* (*SD*)	*M* (*SD*)	*M (SD)*	
	n = 221	*n* = 599	*n* = 254	*n = 1,074*	
BMI	23.5 (5.0)	22.9 (4.3)	22.6 (3.6)	23.0 (4.3)	Ns

Variable	EHIL			Total	p^1
	Low	Basic	High		
	M (*SD*)	*M* (*SD*)	*M* (*SD*)	*M (SD)*	
	n = 221	*n* = 599	*n* = 254	*n = 1,074*	
Aerobic fitness (VO2max, ml/kg/min)	51.6 (7.4)	52.7 (7.1)	54.4 (7.1)	52.9 (7.2)	< .001
Muscle mass (%)	46.2 (5.5)	47.1 (4.8)	48.0 (4.2)	47.1 (4.8)	< .001[2]
Body fat (%)	17.8 (9.7)	16.4 (8.3)	14.8 (7.4)	16.3 (8.3)	.003
Waist (cm)	83.1 (12.3)	81.8 (10.2)	80.4 (8.7)	81.8 (10.4)	.026
Grip strength (kg)	44.5 (7.3)	45.2 (7.8)	46.0 (7.9)	45.3 (7.7)	Ns

[1]ANOVA [2]Kruskal-Wallis

The respondents' educational background was also associated with their physical fitness (see Appendix 7)[18]. Therefore, the analyses (ANOVA) were conducted separately for the three educational groups. The results of these separate analyses indicate that everyday health information literacy is associated with aerobic fitness, muscle mass percentage, body fat percentage, and waist circumference among the general upper secondary school students, but only with aerobic fitness among the vocational upper secondary school students. No significant associations were found in everyday health information literacy and fitness measures among the small (n = 33) group of men with only a compulsory education (Appendix 7).

4.4 Everyday health information literacy and the stage of change in relation to information seeking and avoidance in the context of physical activity (Study V)

Correlation analyses showed that everyday health information literacy was insignificantly or relatively weakly associated with information needs on physical activity (r = .003, p = ns), and the practices to obtain information (active seeking r = .089, p < .01; active scanning r = .106, p < .01; non-directed monitoring r = .058, p = ns; by proxy r = -.151, p < .01). The strongest correlation (r = -.309, p < .01)

[18] For example, vocationally educated men were more likely to have higher BMI and waist circumference, and grip strength when compared to the other educational groups while general upper secondary school students had lower body fat and aerobic fitness levels than their peers.

was found between everyday health information literacy and the avoidance of physical activity information (Appendix 8).

A closer look was taken on the relationship between everyday health information literacy and active seeking and avoidance of physical activity and exercise information. Kruskal-Wallis analysis with EHIL in three categories showed that it was associated with the avoidance of information, but not with information seeking. Pairwise multiple comparisons indicate that there were significant differences in mean avoidance scores between each everyday health information literacy category (low > basic > high) (Table 23).

Table 23. Mean scores, Kruskal-Wallis test results, and pairwise multiple comparisons results for information seeking and avoidance across everyday health information literacy categories among respondents (*n* = 769).

Variable	EHIL			p^1	Pairwise multiple comparisons ($p < .05$)
	Low 32.8% (*n* = 252)	Basic 38.0% (*n* = 292)	High 29.6% (*n* = 225)		
Seeking	5.06	5.34	5.50	Ns	-
Avoidance	4.83	4.11	3.61	< .001	Low > Basic > High

[1]*p* values of Kruskal–Wallis test

Table 24. Mean scores, Kruskal-Wallis test results, and pairwise multiple comparisons results for information seeking and avoidance across stages of exercise behaviour change (*n* = 845).

Variable	Stage of change					p^1	Pairwise multiple comparisons ($p < .05$)
	PC 6.5% (*n* = 55)	C 12.0% (*n* = 101)	P 16.1% (*n* = 137)	A 16.2% (*n* = 136)	M 49.2% (*n* = 416)		
Seeking	3.20	4.35	4.74	5.52	5.96	< .001	Pc < P, C < M, A
Avoidance	4.49	4.73	4.13	4.56	3.88	< .001	C, A > M

[1]*p* values of Kruskal–Wallis test; PC = precontemplation, C = contemplation, P = preparation, A = action, M = maintenance

Moreover, Kruskal-Wallis analysis showed that physical activity information seeking was associated with the stage of exercise behaviour change: the men in the maintenance stage were most likely to seek and least likely to avoid information on

physical activity and exercise. Men in precontemplation were least likely to seek, and men in the contemplation and action stages most likely to avoid information on physical activity and exercise (Table 24, see also Subchapter 4.2.3).

When the individual statements on seeking and avoiding exercise information were cross-tabulated with the stage of exercise behaviour change and everyday health information literacy in three categories, associations emerged between each of these variables. Therefore, multivariate logistic regression analyses were conducted with both variables included (Table 25).

Table 25. Factors associated with information seeking and avoidance in multivariate logistic regression analysis (*n* = 781).

Variable (reference category)	Category	OR	95% CI	*p*[1]
Characteristics associated with information seeking 'I look for information when I have a problem or a question about exercise or physical activity' (never or rarely)				
Stage of change (maintenance)				
	Preparation	2.72	1.80–4.13	< .001
	Contemplation	3.54	2.23–5.61	< .001
	Precontempl.	8.57	4.31–17.04	< .001
Characteristics associated with information seeking 'I look for information for example on the Internet or ask questions about it from other people' (never or rarely)				
Stage of change (maintenance)				
	Action	1.61	1.04–2.48	.032
	Preparation	3.19	2.09–4.86	< .001
	Contemplation	3.14	1.98–4.99	< .001
	Precont.	9.58	4.88–18.80	< .001
Characteristics associated with information avoidance 'I don't want to think about exercise' (at least sometimes)				
EHIL (high)				
	Low	2.69	1.82–3.96	< .001
	Basic	1.58	1.08–2.31	.019
Stage of change (maintenance)				
	Action	1.85	1.22–2.80	.004
	Contemplation	3.38	2.11–5.41	< .001
	Precontempl.	1.83	1.01–3.31	.047
Characteristics associated with information avoidance 'I avoid hearing or seeing exercise-related information'(at least sometimes)				

Variable (reference category)	Category	OR	95% CI	p^1
EHIL (high)				
	Low	3.78	2.51–5.70	< .001
	Basic	1.66	1.10–2.51	.015

[1]Multivariate logistic regression analysis; enter-method was used by inserting everyday health information literacy and change of change into each model.

These analyses (see Table 25) showed that responses to both statements on active seeking of information (looking for information when having a problem or a question about exercise or physical activity; looking for physical activity or exercise information on the Internet or asking questions about it from other people) were associated with the stage of exercise behaviour change. For example, the odds of a precontemplator never or rarely looking for information on exercise or physical activity were more than eight to one when compared to men in the maintenance stage (OR = 8.57, 95%CI [4.31, 17.04], $p < .001$). Moreover, being in the precontemplation, contemplation and action stages of exercise behaviour change, in contrast to maintenance, increased the odds of not wanting to think about exercise. Everyday health information literacy was also associated with avoidance of thinking about exercise: the odds of avoiding thinking about exercise were almost three to one for men categorised into the low everyday health information literacy category in comparison to men who had high everyday health information literacy (OR = 2.69, 95% CI [1.82, 3.96] $p < .001$).

The avoidance of hearing or seeing exercise information was associated with everyday health information literacy; being in the low (OR = 3.78, 95% CI [2.51, 5.70], $p < .001$) or basic (OR = 1.66, 95% CI [1.10, 2.51], $p = .015$) everyday health information literacy category increased the odds of avoidance when compared to being in the high everyday health information literacy category (Table 25).

5 Discussion

5.1 Discussion on main results

The results of this study indicate that information needs and the frequency of information acquisition through different practices, but not the avoidance of information, are associated with the stage of behaviour change in the context of physical activity and exercise. In a broader health context it was discovered that men who feel able to find, evaluate and use health information are likely to engage in a variety of health promoting behaviours, including physical activity and exercise, and are also likely to have good aerobic fitness and body composition. Furthermore, the results indicate that perceived low health information literacy is linked to the avoidance of information.

Moreover, the men's socio-economic characteristics, education in particular, are connected to their health behaviours, readiness to change their exercise behaviour, physical fitness, information behaviour, as well as their everyday health information literacy. The overall tendency seems to be that men studying in general upper secondary school are more likely than their peers to engage in health promotive behaviours, be in a good physical fitness, acquire physical activity information, and assess their health information literacy to be at a high level. Nevertheless, when these socio-economic characteristics were taken into account in the statistical analyses, the associations remained significant between everyday health information literacy and most health behaviours and aerobic fitness, as well as between the stage of exercise behaviour change and frequency of exercise and physical activity information acquisition.

5.1.1 Young men's needs for, preferences of and practices to obtain and avoid physical activity information (RQ's 1.1 and 1.2)

Overall, there was relatively little interest in physical activity or exercise information among the young men, with around 50% of the men reporting never or rarely being interested in information concerning physical activity or exercise, and around 70% never or rarely having questions about this topic. Approximately 40 % of the men were interested in scientific health facts (see Subchapter 4.2.2), and some 50% of the men considered it important to be informed about health issues in general (see Subchapter 4.3). Based on previous studies, the slight interest in health information

could be expected since young people in general (Ek & Heinström 2011), and men in particular (Ek 2013, Ek *et al*. 2011, Ek & Heinström 2011), have been found to often lack interest in health topics. However, the majority of the men found physical activity feedback based on ipsative (approx. 70% of the men) or normative comparison (approx. 60% of the men) as motivational (see Subchapter 4.2.2).

Non-directed monitoring was regognised as the most commonly used information practice with over 60% of the men having at least sometimes obtained physical activity and exercise information through it. This result is in line with the findings of Askola *et al*. (2010), Baxter *et al*. (2008) and Pálsdóttir (2010), suggesting that health information is encountered more often than it is actively sought. In contrast, in Yeoman's (2010) study among women in menopause transition hardly any examples of non-directed monitoring were found. While menopause as a health topic may be rather invisible to the outside world (Yeoman 2010), physical activity and exercise represent topics that are clearly present in the information environments of many young people.

Despite their rather slight interest in physical activity and exercise information, more than half of the young men had acted upon the practices of active scanning and active seeking. In this study, information needs were operationalised as an overall interest in information on physical acticity and having specific questions on the topic (see Appendix 2). Since the young men reported much more frequent information seeking activities than experienced information needs it may be that these descriptions do not encompass the reasons and motivations men may have on acquiring information on physical activity and exercise. Moreover, the search for information is not necessarily purposive or related to problem-solving or even information needs; people may, for example, watch television to be enterntained and happen to aquire information by chance (see Case 2007, 109–110).

Associations were found between the recognised information needs regarding physical activity and exercise and all the practices for obtaining information, but not between information needs and the avoidance of information. Similarly, Yang and Kahlor (2013) noticed a positive association with information needs[19] and information seeking, but not with needs and avoidance of information. The associations were relatively strong between information needs and non-directed monitoring and needs and active information seeking. Moreover, those who were active in purposive information seeking also encountered information more

[19] 'Information sufficiency' in their study; estimation of current knowledge and how much knowledge a person thinks he/she needs on the same topic (Yang & Kahlor 2013).

frequently. This is in line with Pálsdóttir's (2010) findings, which indicate that active health information seekers tend to often discover information serendipitously as well.

Nearly one fourth of the men had at least sometimes avoided information on physical activity and exercise. Interestingly, avoidance of physical activity information had a very weak or non-existing relationship to information needs as well as practices to acquire information. It seems, therefore, that both active and inactive information seekers may avoid information. If information seeking and avoidance are seen as ways to manage uncertainty, these actions can be seen as complementary; an individual may in some situations seek, and in others avoid information in an attempt to achieve and maintain an optimal level of uncertainty (Brashers 2001, Sairanen & Savolainen 2010). Moreover, the reasons for avoidance may vary in different situations (Sairanen & Savolainen 2010, Sweeny *et al*. 2010).

5.1.2 Young men's information behaviour and readiness to change exercise behaviour (RQ's 1.3 and 1.4)

Information behaviour in the stages of exercise behaviour change

Earlier studies indicate that those who are not 'health-oriented' are more likely to obtain health information from passive media sources whereas more 'health-oriented' individuals use active sources (Dutta-Bergman 2004). In the context of physical activity, the active obtaining of information from various sources has been found to be positively associated with physical activity behaviours (Plotnikoff *et al*. 2010). This study focused on information aquisition rather than on the use of information sources. Sharing some common ground with these previous results, however, the results of this study indicate that individuals who do not exercise regularly are passive in obtaining information on this issue, whereas people who engage in regular exercise use multiple practices to obtain information on physical activity and exercise. Furthermore, differences were found within these active and passive groups according to the self-reported measure of the stage of exercise behaviour change, which reflects their exercise behaviour as well as the *intentions* to change it (Marcus & Simkin 1994). In earlier studies, the intention to be physically active has been found to be associated with searching for information related to physical activity (Berry *et al.* 2011).

The stage distributions found in this study (see Subchapter 4.2.3) are fairly similar to those found in earlier studies on physical activity and exercise (Marshall & Biddle 2001), although proportionately more individuals were categorised into the maintenance stage and fewer into the preparation stage in this study. Interestingly, the distributions of men between the stages were found to be rather similar across different data sets although the criterion for regular exercise was changed. In Studies I and II exercise was defined as 20 min or more of continuous physical activity performed at a vigorous pace three or more times a week and in Study V as at least 1.5 hours of daily physical activity half of which should be performed at a vigorous pace. While in Study V the criterion was rather strict, a smaller proportion, 6.7%, of men were categorised into the precotemplation stage and a larger proportion of men, 15.9%, into the action stage than with the looser criterion (10.5% in precontemplation, 13.0% action).

Also in previous studies a comparably strict criterion for exercise has been found to result in more than average proportion of individuals in the later stages (Marshall & Biddle 2001), which raises questions on what this measure actually indicates (see Subchapter 5.2). Fallon *et al*. (2005) suggest, that self-report data of the stage of exercise behaviour change should be verified with objective physiological measures of health, such as body composition and physical fitness testing. Since physiological measurement data were available, additional analyses (ANOVA) were conducted to find out if self-reported stage of exercise behaviour change was associated with physical fitness among the men. These analyses show that men in later stages are in a better physical condition than those categorised into earlier stages (Appendix 6).

The results of this study indicate that a more advanced stage was associated with greater use of cognitive and behavioural processes, higher self-efficacy, and more positive perception of the advantages of exercise behaviour to outweigh the disadvantages with different patterns of significant differences. This was expected given the postulations of the Transtheoretical Model (Prochaska & DiClemente 1983), and the results are to some extent in line with those of previous studies (Adams & White 2002, Buxton *et al*. 1996, Hutchison *et al*. 2009, Marshall & Biddle 2001, Nigg *et al*. 2011, Spencer *et al*. 2006). It must be noted, however, that in this study the actual change process was not studied. Men were categorised into stages of change categories based on their own reports.

In general, the TTM proposes that cognitive processes are used mainly at early stages of change, and that in later stages their use decreases and behavioural processes are being used (Nigg *et al*. 2011). This notion was not supported in this

study; higher use of behavioural, as well as cognitive processes of change, was reported in maintenance stage than in any other stage including action. Rosen (2000), for example, has reported similar findings for physical activity and dietary behaviours: both cognitive and behavioural processes of change increased by stage. In contrast, for smoking seccation[20], the original pattern of use of change processes was supported in Rosen's (2000) study.

A novel finding in this study was that information behaviour also varied by the stage of exercise behaviour change. In the earlier stages (precontemplation, contemplation, preparation), where individuals do not exercise regularly and are uninformed or lack the motivation, commitment, or skills to change behaviours, information was most often encountered through the passive practice of non-directed monitoring. In the action stage, where individuals have recently changed their exercise behaviours, information was obtained most frequently by active seeking. In the maintenance stage, where individuals maintain earlier adopted behaviours, information was obtained through various practices, most frequently through active scanning. The patterns were similar to the change processes in that highest scores were found in the maintenance stage and lowest in the precontemplation stage.

In this study, individuals categorised into the three 'non-exercise' stages of change (precontemplation, contemplation, preparation) reported to obtain information most often through non-directed monitoring; however, the frequency of obtaining information across the various practices increased by the stage also within these groups. Furthermore, those who had recently adopted regular exercise behaviours differed in their information behaviour from those maintaining these behaviours: In the action stage, information was obtained most often by active seeking, and in the maintenance stage, by active scanning. In the maintenance stage, all practices of obtaining information were more frequent than for other groups (see Subchapter 4.2.3).

According to Prochaska (2008), individuals may be at the precontemplation stage because they are 'uninformed or underinformed' about the consequences of a behaviour. Individuals may also be 'demoralised' about their ability to change behaviour after previous, failed attempts. Either way, the precontemplators are suggested to *avoid* reading, talking or thinking about the behaviour in question (Prochaska 2008). In this study, however, avoidance was not significantly associated with the stage of behaviour change; avoidance of information occurred at each stage. However, the precontemplators experienced information needs

[20] In which context the TTM was originally developed.

concerning physical activity and exercise significantly less frequently than all other groups who either already exercised regularly or intended to start in the future (see Subchapter 4.2.3). Moreover, individuals in the precontemplation stage were found to be unlikely to consider physical activity feedback as motivational (see Subchapter 4.2.4), which may be indicative of information avoidance.

Dutta-Bergman (2013) states that individuals in the contemplation and preparation stages are considered to be most likely to seek information related to the behaviour in question. This assumption was not supported by the results of this study either. The contemplators and preparators were more likely to seek out information than the precontemplators, but men in the action and maintenance stages acted upon these practices most often. Moreover, the contemplators were found to be likely to find ipsative, but not normative comparison as motivational. In the later stages, including preparation, either type of feedback was likely to be preferred (see Subchapter 4.2.4).

In most health behaviour models the role of information is stressed at the early phases of behaviour change, where communication is seen to convey a threat or an opportunity to an individual (Janis & Mann 1977) or 'trigger' behaviour change (see e.g. the Health Belief Model, Rosenstock 1974). The role of information is also acknowledged in the following stages when individuals concider relevant goals or alternatives (Janis & Mann 1977) and the costs and benefits of actions. In the later stages of behaviour change, cognitive processes are in general not considered as relevant (see Prochaska & DiClemente 1983, Prochaska 2008). However, studies on health information seeking show that information seeking on a specific topic (wellness information) is strongly linked to that behaviour: for example, physically active people are likely to also seek for physical activity information (Plotnikoff *et al*. 2010). This, along with the results of this study, suggests that information is acquired and used throughout the process of behaviour change, also, and especially, in the maintenance stage, to support healthy behaviour.

Information may have different roles in different stages of behaviour change (Bar-Ilan *et al*. 2006, see also Askola *et al*. 2014). Information on the advantages of healthy lifestyle and health risks may be relevant in some stages whereas in others individuals' may seek information that would support and motivate them (Bar-Ilan *et al*. 2006). Niemelä (2006) points out that information may also serve as enactment, meaning direct or indirect impulses and inspiration for physical activity and exercise in everyday life (Niemelä *et al*. 2012b, Zhang 2012). Moreover, Case (2007, 110) notes that entertainment seeking (as opposed to

seeking information to a specific need) in often *ritualised* behaviour, that is, less goal-directed and more habitual than using media to instrumental purposes.

It must be noted that in health behaviour models information is usually seen as 'facts' as opposed to opinions and entertainment. Further, many health behaviour models treat information and knowledge as interchangeable concepts (Greyson & Johnson 2015). Moreover, information behaviour in relation to 'ongoing' behaviours such as physical activity and weight maintenance (Bar-Ilan *et al*. 2006, Askola *et al*. 2014) may differ from 'single-time' behaviours such as attending to cancer screening (Anker *et al*. 2011) or quitting smoking (Johnston *et al*. 2009).

Threat and self-efficacy

Both avoidance and seeking of information has been associated with individuals' experience of a *threat* (Steele 1988, Hartoonian *et al*. 2014, Case *et al*. 2005, Johnson & Meischke 1993) at least when it comes to disease-related topics. With regard to health topics such as exercise, perceived health threat may not be the most relevant antecedent for seeking or avoidance of information. Overall, the motivations to exercise and engage in physical activities include motives related to, for example, social life, enjoyment, and achievement, in addition to health-related motives (Iannotti *et al*. 2012). Among young people, boys in particular, health motivations are found to be inconsistently related with physical activity (Iannotti *et al*. 2012).

Feedback on own physical activity behaviour or performance may entail a threat to individuals' *self-image* (Steele 1988, Sherman *et al*. 2000). Although the questions concerning ipsative and normative comparison in this study were positively framed and emphasised improvement in the individual's performance ('Information about improvement in my physical fitness motivates me', 'I get motivated when I have done better than others'), they may entail a threat especially to individuals with low exercise self-efficacy. Overall, people are considered to be motivated to possessing, enhancing, and maintaining a positive self-image (Steele 1988). If individuals' anticipate that the feedback they receive will be negative, that information may pose a threat to the receiver's self-image and can lead to processing the threatening information defensively (Sherman *et al*. 2000), for instance, to avoiding the information altogether.

Previous research suggests that those who believe they can perform well (people with high self-efficacy) are more likely to view difficult tasks as something to be mastered rather than something to be avoided (Ek & Heinström 2011). High

health self-efficacy has been associated with active health information seeking (Banas 2008, Pálsdóttir 2008, Rimal 2001, Wilson 2007). Based on the results of this study, young men with high exercise self-efficacy were likely to acquire information on physical activity, and perceive ipsative and normative physical activity feedback as motivational. In turn, men with low self-efficacy were unlikely to actively seek for physical activity information and may not find ipsative or normative feedback as motivational. Exercise self-efficacy and avoidance of information (as not wanting to think about exercise or avoidance of seeing or hearing exercise-related information') were only weakly connected. Yet, avoidance was linked to everyday health information literacy, which could be seen as an indicator for self-efficacy for health information related behaviours (Kurbanoglu *et al*. 2006, see Subchapter 5.1.3).

It has been suggested that individuals with different self-efficacy levels would have differing information needs and that self-efficacy has an impact on the persuasiveness of messages (Van 't Riet *et al*. 2008). For example, those with low self-efficacy may need help in restructuring their belief system (e.g. overcoming their feelings of inadequacy) before information (e.g. feedback) can have an effect, whereas those with high self-efficacy need encouragement (Murray-Johnson & Witte 2003, 482). Self-efficacy has been shown to be positively affected when individuals are provided with ipsative and normative feedback (Ashford *et al*. 2010). However, based on the results of this study, people with low self-efficacy may not find these feedback types as motivational. It must be noted, however, that self-efficacy beliefs are interwined with other important factors that can explain individuals' relationship with information. For example, exercise self-efficacy is positively associated with physical activity, both of which are associated with socio-economic status.

5.1.3 Young men's everyday health information literacy (RQ 2.1)

Around half of the men thought that it is important to be informed about health issues, and less than 40% of them reported to apply this information to their own life or that of others. In general, the men seemed to be rather confident in their abilities to assess, evaluate and use health information. Only approximately five percent of the men felt that they have difficulties in knowing where to seek for health information, and 15% of the men thought it is difficult to find health information from printed sources and 12% from the Internet. Of the men 16% found it to be difficult to know who to believe in health issues. Almost one in five men

found that they often have difficulties in understanding health related terminology, and a similar proportion of men found it difficult to assess the reliability of health information from printed sources. A larger proportion of the men, one in four, found it difficult to assess the reliability of health information on the Internet.

The everyday health information literacy screening tool used in this study was piloted among general upper secondary school students (Niemelä *et al*. 2012) and further tested among people with high risk for metabolic syndrome (Enwald *et al*. 2015b). In the study by Niemelä and colleagues (2012), responses to each of the statements are not provided. However, responses to the statement on the ability to understand health terminology—which the authors see as a fundamental health information literacy—were described. In that study, of the respondents more than 20% agreed (2.3% totally agreed; 18.4% agreed) with this statement whereas in the present study a slighty smaller proportion of respondents, around 15%, agreed (5.2% strongly agreed, 11.1% agreed). In contrast, of individuals with high risk for metabolic syndrome over 40% found health related terminology and statements often difficult to understand (Enwald *et al*. 2015b).

Comparison of responses to each statement indicate clear differences between young men and people with high risk for metabolic syndrome also in other ways: For example, individuals with high risk for metabolic syndrome seemed to value health information more than young men; 96.1% of them and only 51.7% of young men thought that it is important to be informed about health issues (Enwald *et al*. 2015b). Moreover, 39.0% of the men and 86.8% of the individuals with high risk for metabolic syndrome liked to get information from a variety of sources. However, young men seem to be more confident in their ability to know who to believe in health issues. Only 13.4% of the young men found it difficult to know who to believe while the percentage was 45.1% for high risk individuals (Table 17, Enwald *et al*. 2015b).

These groups are different from each other in terms of age, gender, and health status. People with high risk for metabolic syndrome were from 20 to 60 years old, of both genders, overweight or obese, and had at least one other risk factor of metabolic syndrome (Enwald *et al*. 2015b) whereas young men are homogenous in terms of ender and age, and represent a generally healthy population. It may be that the young men haven't had experiences on serious health conditions or diseases that would have 'forced' them to seek information on complex health issues. Overall, low level of health information literacy has been associated with poorer health (see Subchapter 2.5.3).

It must be noted, that most of the current health information literacy studies, as well as the present study, focus on self-rated literacy skills which probably reflect confidence in one's own abilities rather than their 'actual' skills (see also Subchapter 5.2). In that sense the screening tool used in this study can be understood as a type of self-efficacy measure (see Kurbanoglu *et al*. 2006, DuBenske *et al*. 2009)

5.1.4 The association between health information literacy, health behaviour and physical fitness (RQ's 2.3 and 2.4)

The results of this study indicate that everyday health information literacy is positively associated with various health-promoting behaviours such as physical activity, healthy eating habits, and abstinence from smoking and binge drinking. These associations remained significant when controlling for relevant socio-demographic variables. The physical fitness measures give further validation to these results: good aerobic fitness and body composition were more likely among men with high everyday health information literacy. Based on the results, everyday health information literacy is not associated with sitting time, use of snuff, eating sweets, or consumption of energy drinks, nor with body mass index or grip strength (see Subchapter 4.3.2).

These results give support to previous findings of the association between competencies related to health information and health behaviours (Pálsdóttir 2008). People who are better equipped to cope in the complex health information environment, may be better able to make health promoting decisions. However, as was discussed earlier, individuals' health status, for example, can also influence the way they interact with health information (Johnson & Case 2012). Based on the results of this study, the direction of the association between health information literacy and health behaviours or physical fitness cannot be determined. Overall, the underpinnings of the connections between everyday health information literacy and health behaviours are not clear.

Each health behaviour is suggested to have a specific set of determinants important to that particular behaviour (see Noar *et al*. 2008). Accordingly, the role of information and knowledge may vary with regard to different health behaviours. In this study everyday health information literacy was found to be most strongly associated with eating vegetables, and fruit and berries, and attending to physical activity and exercise. Interestingly, non-existing or weak associations were found

between health information literacy and consumption of sugary products (energy drinks, soft drinks, and sweets), sitting time, and use of snuff.

Health literacy is suggested to influence health knowledge, and through it, other key determinants of health behaviours such as attitudes, social norms, self-efficacy, and skills which all contribute to the development of an intention to change health behaviours (Berkman *et al*. 2011). This may be a likely route to health outcomes also in the case of health information literacy.

5.1.5 The role of socio-economic position (RQ's 1.5, 2.2 and 2.4)

The study corroborates previous findings on the differences in health and health related behaviours based on socio-economic position, and specifically between educational groups (Martelin *et al*. 2005, Bingham *et al*. 2010). The respondents' socio-demographic characteristics—education in particular—were connected to their stage of exercise behaviour change (Studies I and II), health behaviours in general (Study IV), physical fitness (Study IV), information behaviour (Studies I and V) as well as everyday health information literacy (Studies III and IV).

Associations between educational attainment and health information literacy (Eriksson-Backa *et al*. 2012, Ivanitskaya *et al*. 2006) as well as functional health literacy (Paasche-Orlow & Wolf 2007), and health in general (Lahelma *et al*. 2004) have been reported in earlier research as well. However, usually education is divided into hierarchical levels based on years of schooling.

In Finland, the majority (around 95%) of those who complete compulsory education continue their studies to either general or vocational education at upper secondary level (see Subchapter 1.2). Accordingly, within the population of this study a small minority of the men only had compulsory education and the majority of men were studying either in the vocational or general track of upper secondary school.

Earlier Finnish studies indicate that students in the vocational education engage in significantly more health-compromising actions than the general upper secondary school students (Luopa *et al*. 2010, Luopa *et al*. 2014). Also, a Swedish study found that academic orientation was positively linked to subjective health as well as health-related behaviour (Hagquist 2007). This study infers that these educational differences are evident in young men's health behaviour, physical fitness as well as everyday health information behaviour and literacy. Men in the general upper secondary education were more likely to eat fresh vegetables, fruit and berries, and breakfast daily, brush their teeth twice a day and less likely to

smoke (as was reported in the Finnish School Health Promotion study as well, see NIHW 2013). Snuff use was slightly more common among the vocationally educated men. Also in line with the Finnish School Health Promotion study (NIHW 2013) men in the general upper secondary school were more likely to exercise than the vocationally educated men or men with a compulsory education. They were also more likely to be in the higher stages of exercise behaviour change. However, the vocationally educated were more likely to spend over two hours a day on physical activities and less likely to sit more than ten hours a day when compared to the general upper secondary school students (see Subchapter 4.3.2).

In line with the study by Martelin and colleagues (2005), binge drinking was found to be most common among young men with only a compulsory school education. Furthermore, in this study clear differences were found also between the general and vocational upper secondary school students with the latter being more likely to drink more than six portions of alcohol more than twice a month. This is in line with the results of the Finnish School Health Promotion study (NIHW 2013). Also in accordance with that study, based on the results of the present study, the vocationally educated men are more likely to have higher BMI than the students in upper secondary school, and also the men with only a compulsory school education. Similar association was seen also in waist circumference which was largest, on average, among the vocationally educated. However, the body fat percentages of the vocationally educated did not significantly differ from the men with only a compulsory school education. The compulsory school educated had, on average, the lowest muscle mass and aerobic fitness. This indicates that the vocationally educated are more likely to be overweight (based on BMI) but the compulsory school educated show other signs of poor physical fitness (relatively high body fat, low muscle mass, poor aerobic fitness). On average, men in the general upper secondary school had significantly better aerobic fitness than the other educational groups. The vocationally educated men, however, had significantly better mean grip strength than the other two groups.

It has been shown that among Finnish working-aged adults, there is a link between obesity and overall worse physical fitness, and a lower education (Valkeinen *et al*. 2013). Based on the results of this study, clear differences in the physical health of men can be seen already at early adulthood, although for example Martelin and colleagues (2005) did not find an association between education and obesity among young men. However, in their study, education was categorised into hierarchical categories.

Previous studies clearly indicate that among adults the more highly educated (Anker *et al*. 2011, Cotten & Gupta 2004, Ek &Widén-Wulff 2008, Niedzwiedzka *et al*. 2014) and individuals with greater income (Ayers & Kronenfeld 2007, Cotten & Gupta 2004, Dutta-Bergman 2003, Pandey *et al*. 2003) are more active when it comes to seeking health information. With regard to adolescents health information seeking and use, however, the results have been somewhat conflicting (Borzekowski & Rickert 2001a, Borzekowski & Rickert 2001b, Zhao 2009). The results of this study indicate that men with a general upper secondary education had obtained information trough active seeking, active scanning, and non-directed monitoring significantly more frequently that men in the other educational groups (Study I), and were also more likely to consider normative and ipsative comparison as motivational (Study II). Men with only a compulsory school education reported experiencing information needs and acted upon information practices related to physical activity and exercise less frequently than those with higher education.

Furthermore, a compulsory and a vocational education as well as father's manual labour occupation and mother's associate professional occupation decreased the odds of having high everyday health information literacy (Study III, Study IV). Parents' occupational status also reflects their educational background. Mother's associate professional occupation (when compared to a professional occupation) decreased the odds of scoring high in the everyday health information literacy scale. Associate professional occupations typically require post-secondary education (Bachelor's degree in Finland) whereas professional occupations usually require tertiary education (Master's degree in Finland). Service and sales occupations as well as manual labour occupations generally require an upper secondary education (UNESCO 2011).

Sons of fathers with manual labour occupations were significantly more likely to score low on the everyday health information literacy scale. This relationship may be traced to educational differences between the occupational categories. However, father's service and sales occupation did not show similar associations with the health information literacy levels of the men, although these occupations require a similar level of education. Also, as already noted, the men's own vocational orientation significantly increased the odds of being in the low everyday health information literacy category.

These associations may be explained by the differences between the so-called working-class and middle-class cultures, for instance in communication styles (see e.g. Linkon 1999) or conceptions of masculinity (Dolan 2011). Hoikkala and Hakkarainen (2005) argue that, among boys, weaker health literacy may express

traditional values of masculinity, which, for example, encourage emotional and physical strength and reject weakness or vulnerability. These conceptions have been found to be prevalent especially among manual labourers (working class) (Dolan 2011). According to Drummond and Drummond (2010), masculinity plays an important role in men's health by influencing how they recognise, interpret, and act upon health information. Aspects of masculinity and socio-economic or class position together may structure men's health seeking behaviour (Dolan 2011) and possibly also their relationship to health information.

Previous studies also suggest that people may have 'informational subjective norms'. This concept refers to peoples' tendency to actively seek information if they believe that other people expect them to have knowledge on a particular issue (Griffin *et al*. 1999). Therefore, 'people's willingness to fulfill others' expectations about their own information level could motivate more active information seeking'; people may seek information to maintain a socially desirable image such as being able to discuss about a particular health topic (Yang & Kahlor 2013).

The connections between socio-economic status, health information behaviour, health information literacy, and health behaviours are complex. Individual characteristics and peer and parental influences as well as structural systems such as media, education, and health care all serve as potential contributors to the development of health information literacy skills (Manganello 2008), and also influence health behaviour through other routes (Pampel *et al*. 2010). The results of this study provide clues to the role of health information literacy in building or reinforcing these behavioural differences in peer and parental relationships and within educational settings. Clearly, health information behaviour and literacy are not only 'individual achievements' but tied to the socio-cultural surroundings of people (see Budd & Lloyd 2014).

5.1.6 Health information behaviour and literacy (RQ's 3.1 and 3.2)

The results of this study indicate that low health information literacy is linked to avoidance of information. Further, the results suggest that frequent health information seeking is not necessarily associated with high level of health information literacy. These results are in line with Yang and Kahlor's (2013) findings on seeking and avoidance of climate change information; they showed that people who were confident in their abilities to engage in information seeking were not likely to *avoid* information whereas the connection between information

seeking and 'perceived information-gathering capacity' was not as evident (Yang & Kahlor 2013).

The results of this study point in the same direction as the findings of an earlier study on young men's perceptions of *fear appeals* (Enwald *et al*. 2015a). Fear appeals, that is, persuasive communication that attempt to arouse fear in order to promote self-protective action, are widely used in health promotion to motivate behaviour change, although their efficacy has been questioned (Ruiter *et al*. 2014). Enwald *et al*. (2015a) found that men with low everyday health information literacy were unlikely to select a fear appeal message alternative from a message pair concerning physical inactivity. This finding indicates that those assuming that their skills may be inadequate may be less open to threatening information.

According to Brashers (2001, 478) 'uncertainty exists when details of situations are ambiguous, complex, unpredictable, or probabilistic; when information is unavailable or inconsistent; and when people feel insecure in their own state of knowledge or the state of knowledge in general.' Confidence in one's own state of knowledge, but also in the skills needed to acquire and use new information, might help people to reduce, or cope with, the feeling of uncertainty in health settings.

As was discussed in Subchapter 5.1.2 the study lends further support to the findings that information seeking may be associated with stage of behaviour change in a physical activity and exercise context (see also Enwald *et al*. 2015a). Avoidance of information, in turn, was only vaguely associated with stage of change although, according to the Transtheoretical model (Prochaska 2008), avoidance would be expected especially among precontemplators. The results indicate that information seeking and avoidance may be influenced by different factors.

5.2 Evaluation of the methodology

Conventionally, concepts of *validity* and *reliablility* have been used when evaluating the quality of quantitative research. Roughly, validity refers to the extent we are measuring what we are meant to measure and reliability to the extent of the measure to produce similar result each time (Trochim 2006). In this study a critical realist perspective was taken with the ontological understanding that there is a mind-independent reality, and that this reality composes of different levels (empirical, actual, real). This perspective has implications for evaluation of validity

and reliability of a study different from those typical in empiricism (Johnston & Smith 2010).

5.2.1 Construct validity and reliability

Evaluation of validity is often further divided into *internal*, *construct* and *external validity*. Evaluation of internal validity is relevant in studies that attempt to establish a causal relationship and is therefore not discussed in the present study. Construct validity typically refers to the relationship between data and theoretical concepts, and external validity to applicability or generalizability of the results (Trochim 2006). *Reliability* of an instrument is linked to construct validity: a valid instrument measures what it is ment to measure, and if it is reliable it is also consistent. A highly reliable instrument produces consistent findings; however, if the construct validity is low the instrument does not capture what it is meant to measure (Trochim 2006). This study employed both previously developed questionnaires (e.g. everyday health information literacy screening tool) and questionnaires designed specifically for this study (e.g. health information behaviour questionnaire). Moreover, physical fitness measures were utilised.

Usually, measures such as Chronbach's alpha are used to study the correspondence between an unobservable concept and its measurable indicators (Johnston & Smith 2010). Internal consistency can be seen as an indicator of reliability of the scale (Santos 1999). Chronbach's alphas were calculated also for the measures used in this study and they indicated high internal consistency (see Appendix 5). All physical fitness measures were validated in earlier studies (see e.g. Han *et al*. 2006, Jurca *et al*. 2005, Lee *et al*. 2010), as were the English versions of some of the questionnaires (exercise self-efficacy scale, the stage of exercise behaviour change).[21] Some distributions were notably skewed and may have resulted in scale attenuation effects (ceiling or floor effects). These effects occur when a measure possesses a distinct upper or lower limit for potential responses and a large concentration of participants score at or near this limit (Hessling *et al.* 2004a, 2004b). Hours spent on physical activities (< 1 hour, 1–2 hours, > 2 hours; Study IV) and the stage of exercise behaviour change (Studies I, II and V), in particular, are examples of measures where these effects may have occurred.

[21] These questionnaires were translated by the author and modified to better fit the overall questionnaire. Therefore they are not necessarily comparable with the original measures.

When studying individual experiences the concept of construct validity is problematic since there is no way to assess the correspondence between a 'measure' and experience (Johnston & Smith 2010, Williams 2003). From a critical realist point of view, research should aim to reveal the actual events and 'generative mechanisms' behind them (Delanty 1997, see also Table 26). Accordingly, from this perspective, construct validity is concerned with whether empirical data can be seen as 'empirical traces of the actual events . . . that operate below the empirical surface' (Johnston & Smith 2010, 39) or if this data gives 'valid knowledge about the actual manifestation of the purported generative mechanism' (Johnston & Smith 2010, 34).

Table 26. Reliability and construct validity; conventional and critical realist definitions (adapted from Zachariadis *et al*. 2013).

Validity type	Conventional description	Critical realism
Reliability	The variables used in the model do not have measurement error.	The measurements used in the extensive methods do not have measurement error.
Construct validity	The variables indicate what they are intended to measure (consistent with the theoretical descriptions).	Whether data that are empirically available give valid knowledge about the alleged generative mechanism in the field.

When the actual events occure in the natural world, their association with 'empirical traces' is an issue of physical measurement (Johnston & Smith 2010). When compared to 'measuring' behaviours (e.g. physical activity) with questionnaire methods, physical characteristics, such as cardiorespiratory fitness or body fatness, can be rather objectively measured (Ferreira *et al*. 2005). However, each fitness measurement method has advantages and disadvantages. For example, BMI can be considered to be an unspecific measure and particularly in young men it may reflect the amount of muscle mass rather than body fat. A BMI higher than 30 has been found to be a reliable indicator of a large amount of body fat (Reunanen & Rissanen 2005). On the other hand, bioelectrical impedance is highly dependent of body hydration status (Han *et al*. 2006). It must also be noted that not all young men at the age of 18 have completed puberty or reached their final height. Therefore body composition at this age is not equivalent to that of adults, mainly due to muscle mass being lower than that of adults (Tirosh *et al*. 2011).

The focus of this study was on individuals' experiences on their behaviours and competencies. Overall, simplified behaviour measures can not accurately reflect

the full scope of a behaviour. Moreover, people may have difficulties in evaluating or recalling their behaviour, they may believe themselves to be and report being, for example, more physically active than they actually are (Corder *et al*. 2011), or they may report according to expected rather than their actual behaviour (Gorber *et al*. 2009, Westerterp & Goris 2002). This applies to studying health behaviour as well as information behaviour and literacy with survey methods. The general limitation concerning questionnaire surveys — that respondents may interpret the questions differently — also applies to this study. In particular, the concepts of 'physical activity and exercise information' and 'health information' may be interpreted differently by different respondents. Some questionnaires were incompletely filled in, resulting in different response rates to different questions. This may indicate that some questions were difficult to comprehend and were therefore left unanswered.

In this study, the physical fitness measures could be used to complement the more subjective health behaviour measures. The 'empirical traces' of both self-reported health behaviour measures and more objective physical fitness measures point to the same direction. This can be seen as an indicator of the construct validity of the health behaviour measures. Furthermore, the results are in line with previous studies on the health beaviours of young men.

Evaluation of the construct validity of the health information behaviour and health information literacy questionnaires is more challenging. The key difference between the critical realist and the empiristic conceptions of construct validity is that in critical realism, the 'empirical traces' are perceived as being related to real events (possibly socially constructed, experiental), rather than theoretical ideas. Thus, according to Johnston and Smith (2010), in terms of studying social constructions it should be established that what is being measured corresponds to actual occurrences in the particular community. In future studies (see Subchapter 5.4), the health information behaviour and literacy questionnaires could be subjected to construct validation procedures (e.g. interviews) to evaluate the correspondence with responses to questionnaire items and other 'empirical traces' of individual experiences (see Johnston & Smith 2010).

In terms of evaluating everyday health information literacy, self-reports could be complemented with more objective evaluation as well. Self-reports may not reflect 'tested' literacy levels, as a study by Ivanitskaya and colleagues (2006) suggests. In their study, college students' self-reported research skills were only weakly correlated with their tested skill levels: The majority of the students assessed their research skills as good or excellent. However, many of them were

unable to conduct advanced information searches, judge the trustworthiness of health-related websites and articles, and differentiate between various information sources (Ivanitskaya *et al*. 2006). It is possible that the everyday health information literacy screening tool employed in this study indicates individuals' *self-efficacy* and *confidence* in finding, evaluating and using health information rather than their actual competencies.

5.2.2 External validity

External validity usually refers to applicability or relevance of the research in practical contexts (generalisability of the results). From a critical realist perspective, it refers to the evaluation of whether the established generative mechanism that explains events in the 'laboratory' is the mechanism that causes the actual phenomena in the 'real world' (see Table 27). To achieve this, both the 'treatments' and the people should be good surrogates for the real-world phenomenon (Johnston & Smith 2010).

In the present study, the study participants can be seen as a representative sample of young Finnish men. However, although the response rate of this survey was quite high, participation was voluntary. Comparison of the respondents to the total population (see Appendix 9) shows that there is an over-representation of young men with general upper secondary education among respondents. Moreover, respondents were found to have a slightly lower mean BMI than the non-respondents. Yet, a more important question in terms of external validity in this study is whether the surveyed measures reflect actual behaviours and experiences of people.

Table 27. External validity; conventional and critical realist definitions (adapted from Zachariadis *et al*. 2013).

Validity type	Conventional description	Critical realism
External validity	The cause-effect relationship goes beyond the variation of samples, settings, and treatment variables, thus results can be generalised.	The likelihood that similar or related events that occur in other settings are caused by the generative mechanism that caused the actual events in the field.

According to Anker *et al.* (2011), cross-sectional studies may be useful for drawing associations between predisposing factors and health information seeking

behaviours, whereas observational studies would be more useful for characterizing aspects of the search itself (e.g. time spent in search, websites accessed). Furthermore, they note that a cross-sectional design is typically used, and self-report formats of inquiry applied; this combination of methods and measures, according to the authors, could be more suitable in studying health information seeking behaviours for single-time behaviours (such as finding information about a vaccine) (Anker *et al.* 2011). In this study, the interest was in a person's tendency to seek information on the topic in question, rather than in actual incidents of information acquisition. For this purpose, the survey approach seemed suitable although it naturally has its limitations. In terms of the modes of information acquisition, the results point to the same direction than the ones on studies conducted with diary methods (Baxter *et al.* 2008).

Furthermore, as the objective was to reveal 'predisposing' characteristics behind information behaviour and literacy, the quantitative approach seems essential; associations between socio-economic characteristics and health information behaviour and literacy, for example, could not have been studied in a qualitative design. As Hjørland (2000) points out, individuals might not know about all the prevailing cultural, structural, or institutional constraints they are exposed to, but these do exist nevertheless, and influence information behaviour. Wikgren (2005) notes that it is the task of the researcher to *explain the mechanisms* that influence information seeking, not only by observing the behaviour of individuals, but also by revealing possible underlying causes for their actions. Because of the nature of the present study, causal relationships of the investigated factors or 'generative mechanisms' could not be studied as such. However, the results of this study may be discussed in terms of possible mechanisms that may link information seeking and use to health behaviour and health.

The results of this study indicate that socio-economic factors are tightly related with the behaviours, abilities, and characteristics under study (health information behaviour, health information literacy, health behaviour, physical fitness). Therefore, it is difficult to distinguish the independent 'effect' of health information behaviour or health information literacy from the complex relationships known between the interrelated socio-economic indicators such as educational attainment (see also Paasche-Orlow & Wolf 2007).

5.3 Practical implications

5.3.1 Stage-tailored health communication

Health promoters and campaign designers may take account of the results of this study by considering tailored communications, where the contents of the intervention (Ivanov 2012, Noar *et al*. 2009) as well as the delivery channels are tailored to match individuals' stage of change. As studies by Yates (2013) and Marshall *et al.* (2012) indicate, individuals express a desire for information that is personally relevant and suitable for their needs and situation. People may therefore be more receptive to information that is 'tailored' to individuals' goals and circumstances, rather than to generic information concerning healthy living (Marshall *et al.* 2012).

Health-promotion strategies increase the opportunities for people to encounter health information by chance rather than rely on them to actively seek information (Pálsdóttir 2008). However, the uninformed and unmotivated group of people that health promoters attempt to influence with health messages may be difficult to reach, at least through conventional health-promotion channels, because they are likely to be passive in all practices of obtaining information. For these people, there may be a mismatch between their readiness to change and the action-oriented health promotion programs (Marcus & Simkin 1994), which are likely better suited to those who already intend to change their behaviour. The results of this study support the Transtheoretical Model in its postulation that individuals in different stages of change most probably benefit from dissimilar, stage-targeted, or tailored health communication strategies. Unfortunately, there is still little knowledge on how exactly the intervention contents should be designed for people in different stages of change, especially when it comes to complex health behaviours such as physical activity (Brug *et al.* 2005).

The lack of awareness is a potential barrier in physical activity promotion (van Sluijs *et al.* 2007). People who fail to recognise themselves as sedentary are unlikely to perceive a need to change (Corder *et al.* 2011, De Bourdeaudhuij *et al.* 2005) and may, therefore, be less receptive to health promotion strategies. Such people may be regarded as being in the maintenance stage, while, in fact, their actions do not match recommendations and they express no motivation to change (Brug *et al.* 2005). Feedback can be used to increase awareness and motivate individuals to increase their physical activity levels. However, it should be noted that based on the results of this study, especially people at early stages of change

and with low self-efficacy levels may not consider specific types of feedback as motivational.

Feedback messages may entail a threat especially to individuals with low self-efficacy. Overall, people are considered to be motivated to possess, enhance and maintain a positive self-image (Steele 1988) and if an individual anticipates that the feedback he or she will be receiving will be negative, this threatening information may be processed defensively (Sherman *et al.* 2000). Although there is evidence that individuals' self-efficacy may be positively influenced by normative and ipsative feedback (Ashford *et al.* 2010), practitioners should carefully consider providing negative feedback, as it may erode self-efficacy (Bandura 1989). Instead, the focus should be placed on increasing the self-efficacy of participants early in the intervention (Hankonen 2011). Furthermore, information may be tailored to match individuals' perceived self-efficacy levels (Bandura 1997).

It should be noted, however, that high level of self-efficacy does not necessarily result in high level of performance (Vancouver *et al.* 2002), and over-confidence can result in less motivation and contributing less effort to a task (Stone 1994). Overall, it is suggested that relatively accurate self-efficacy appraisal would be important since excessively high self-efficacy can also lead to the feeling that not much invest in effort is needed (Bandura 1986). According to Bandura (1997), the most influential source of self-efficacy information is the authentic mastery experience.

According to the results of this study, socio-economic factors, education in particular, are connected to individuals' health behaviour, readiness to change behaviour, as well as health information behaviour and literacy. This should be taken into account in designing the contents of tailored health interventions. The results of this study could be applied especially in finding novel heath promotion efforts targeted at passive, vocationally educated young people. For this population, health communication should be designed in a way where information may be obtained without actively seeking it. Multi- or interdisciplinary efforts in health promotion are called for to reach passive groups of people. Interventions should address both the individual as a decision-maker and the wider social context in which they live. Thus, it is likely that multiple interventions are required for the effective promotion of behaviours (Morris *et al.* 2012).

5.3.2 Health information literacy education

The everyday health information literacy screening tool deployed in this study can be further developed and used as the basis for tailoring and targeting information contents, presentation, and delivery channels to better match the needs and skill levels of individuals (see Enwald 2013). As such, this tool can be used as a basis for health counselling (Niemelä *et al.* 2012), especially in preventive health care and among populations with a generally high literacy rate. Moreover, health information literacy education could be included as an element of health promotion interventions (see Huotari *et al.* 2015).

Earlier studies demonstrate that individuals with poor skills in a particular domain may overestimate their own skills and have trouble recognising proficiency in others (Kruger & Dunning 1999). 'Skillful' individuals, on the other hand, are more likely to be able to realistically estimate their performance and compare it to peers (Kruger & Dunning 1999). This should be taken into account when developing health information literacy instruction (Gross & Latham 2007, Kruger & Dunning 1999). One option would be to provide health information literacy assessment and feedback to reveal skill gaps (Ivanitskaya *et al.* 2012), or help individuals' evaluate their competencies (Rosman *et al.* 2015) in relation to specific tasks.

As well as in education, the differing abilities people have in finding and using health information could also be taken into consideration in designing information contents. One area of health literacy research has been to investigate the ways of making health information more accessible, the alternative approaches for communicating health information, and the impact of information modification on people's comprehension of health related materials (Berkman *et al.* 2010).

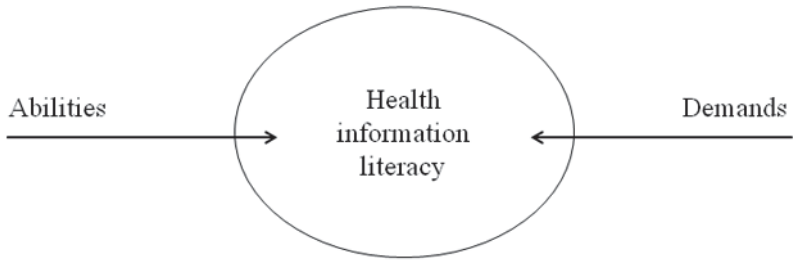

Fig. 10. Approaches to health information literacy promotion (adapted from Parker & Razan 2010).

According to Parker and Ratzan (2010), health literacy occurs when the abilities of individuals are aligned with the complexity of information (demands). This notion could be applied to health information literacy as well (see Figure 10). Individuals' abilities may be promoted through educational efforts, but another approach would be to try to increase the navigability and understandability of health information. From this perspective, one option could be to tailor information contents (see Enwald 2013) in a way that they would better match individual abilities.

5.4 Future research

5.4.1 Ideas for future studies

Future studies should focus on the mechanisms that connect health information literacy and behaviour to health behaviour and health. Longitudinal or qualitative methods may be valuable in investigating health information behaviour in different stages of change. By investigating the role of information behaviour in the process of behaviour change more thoroughly, more light can be shed on how to design effective health communication, interventions, and health information systems for addressing the public health concern related to lifestyle diseases. The impact of information on health behaviours, such as physical activity, could be investigated in health intervention settings, where, for example, the persuasive impact of different message types, along with the structure and arguments in messages, can be scrutinised. Moreover, further research on the relationships between health

information literacy and behaviour and physical health may help understand whether vital people are generally more likely to be engaged in all aspects of their lives, including their information environments. Overall, multi- and interdisciplinary efforts can prove to be fruitful in investigating health information literacy and behaviour (see Grayson & Johnson 2015).

Different aspects of health information literacy (e.g. motivation, skills, confidence) (Niemelä *et al.* 2012) should be investigated separately, but in parallel, to better understand how they connect to health behaviour. Further, the practices through which everyday health information literacy is acquired in different social contexts during the life course of people could be investigated. Lloyd *et al.* (2013, 1) understand health information literacy as 'a socially derived *health information practice* that connects people to ways of knowing, and enables them to draw from a range of information sources to inform the decisions that they make'. Papen (2009), too, argues that health literacy should be understood as a situated social practice rather than an ability possessed by individuals. From a critical realist standpoint both individual and social levels of health information may be investigated in parallel.

The everyday health information literacy screening tool used in this study needs further validation and development. It is quite possible that the screening tool indicates individual's confidence or self-efficacy in finding, evaluating, and using health information rather than actual skills. Jordan *et al.* (2011) identified three approaches for measuring health literacy: direct testing of individuals' abilities, self-report of abilities, and population-based proxy measures (e.g. socio-demographic indicators). Instruments that aim at directly testing health literacy have mainly focused on basic health literacy skills rather than communicative or critical literacy. On the other hand, a variety of both direct and indirect tests for the assessment of information literacy have been developed (Beile 2008, Blevens 2012), but these focus on competencies that are relevant in educational contexts and are not well applicable to research on everyday-life. Previous findings on information literacy (Ivanitskaya *et al.* 2006, Rosman *et al.* 2015) suggest, that self-assesments do not, as a rule, reflect directly tested abilities. Future studies should investigate how the everyday health information literacy screening tool reflects more directly measurable health information literacy skills, such as the abilities to find relevant health information or evaluate the credibility of health information sources. On the other hand, the construct validity of this measure could be evaluated with interview methods (see also Subchapter 5.3.1).

Another demand for developing the tool arises from the dramatic changes that have occurred in individuals' information environment during the recent years. The competencies that were relevant in relation to health information seeking and use ten years ago may have already changed. Already a decade ago, ubiquitous multi-tasking, instant messaging, and peer monitoring, for example, were stated to cause people to lose focus and interrupt the flow of work (Cameron & Webster 2005). Information overload is suggested to lead to ineffective interpretation of messages (Su *et al.* 2010). Zhang's (2012) study on the use of social networking sites, for example, indicates that these technological tools have brought toward information practices such as information sharing. Lloyd and colleagues (2013) argue that information production is one part of information literacy. Overall, emerging perspectives from the new literacies studies (Lankshear & Knobel 2011) to health information literacy research could provide interesting avenues for research.

Finally, health information behaviour (information acquisition, avoidance, and use) should be investigated in connection to health information literacy. According to Johnson (2014) information-seeking behaviour is often idealised. It is seen as a process that leads to improved decision-making and enhanced literacy (Johnson 2014). However, at least in health settings it is evident that information seeking itself may not result merely in positive outcomes (Johnson & Case 2012). The relationships between the concepts of information literacy, information behaviour, and information practices should be more rigorously studied both theoretically and empirically also in the context of health and wellbeing.

5.4.2 A propsosed conceptual model for future research

Based on the results of this study a modified conceptual framework for future studies is proposed (Figure 11). The framework resembles Longo's (Longo *et al.* 2010) conceptual model on health information seeking, receipt, and use in diabetes. In the present framework, however, a variety of modes of information acquisition (McKenzie 2003) and avoidance (Niemelä 2006) are included under the broader concept of health information behaviour. Moreover, information use in this framework is represented as a separate element while in Longo's framework information use is included within the categories of active information seeking and passive receipt of information.

Similarly to Longo's model, in this framework contextual and personal factors are seen to influence an individual's information behaviour. Both rather stable 'trait' and more temporary 'state' characteristics are seen to contribute to actions to seek

for and avoid information. In the framework of this study, these are referred to as personal (e.g. demographic characteristics) and contextual factors (e.g. stage of behaviour change).

As the results of this study show that health information literacy is associated with health information behaviour (avoidance), health information literacy is included in the framework. Different aspects of health information literacy, such as motivation, skills, and confidence (Niemelä *et al*. 2012) should be investigated separately, but in parallel, to better understand how they connect to health information behaviour and information outcomes. Health information literacy could be studied in connection to both 'phases' of information acquisition (see McKenzie 2003), namely connecting and interacting (see Figure 11). Savolainen (2015) conducted a conceptual analysis on the 'cognitive barriers' to information seeking and stated that its results could be used in developing information literacy instruction. These barriers refer to poor qualities of cognitive factors such as memory, understanding language, planning, evaluating, and decision-making (Savolainen 2015). He notes that the characteristics of these barriers may vary in different stages of an information seeking process (in his categorisation identifying and articulating information needs, and selecting and accessing information sources) (Savolainen 2015). This could be a fruitful approach in studying the connections between health information literacy and behaviour. Furthermore, the information needs and preferences of an individual should be taken into account when investigating their information acquisition and avoidance.

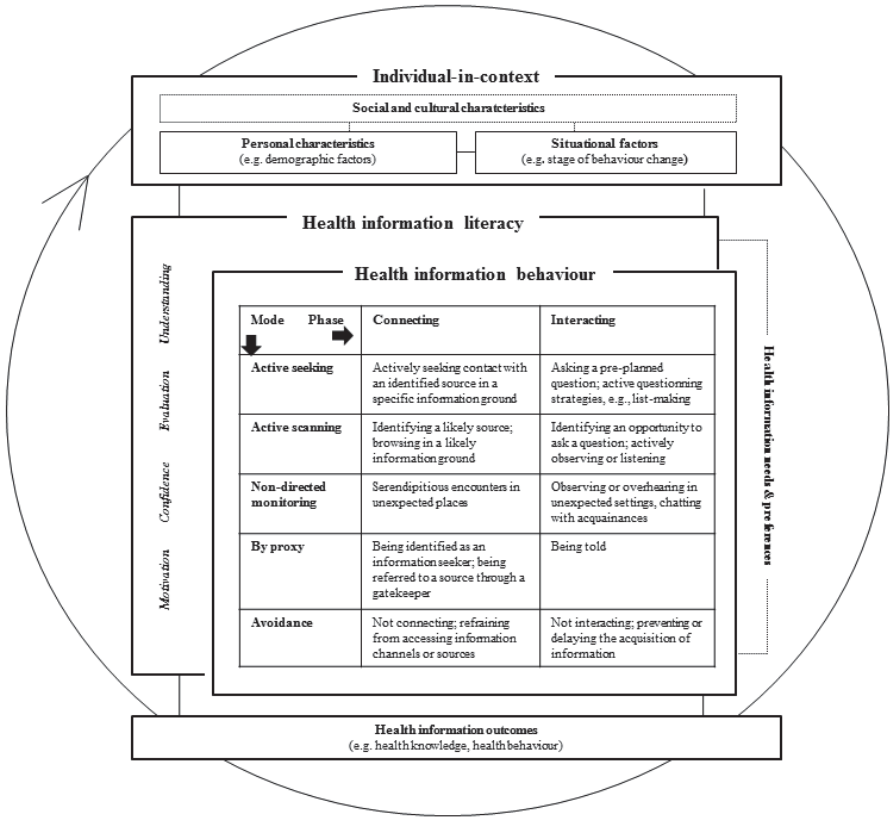

Fig. 11. A proposed framework for studying health information literacy and behaviour in relation to health information outcomes.

By definition, health information literacy is connected to information acquisition but also to *information outcomes*. Empirical studies link health information literacy to health knowledge (Yang & Kahlor 2013), health promoting behaviours (Pálsdóttir 2008), and good physical health (Eriksson-Backa *et al.* 2012), which may be seen as its possible outcomes. At the same time, frequency of health information acquisition has been connected to health promoting behaviour and good health (Ek & Heinström 2011, Jung 2014, Pálsdóttir 2008, Shim *et al.* 2006) but also to adverse health outcomes (Johnson & Case 2012). It can be expected that both the frequency of information acquisition, as well as the abilities to evaluate and understand this information, together influence 'information outcomes'. Moreover, the extent to which information 'matches' the needs and preferences of an individual may influence these outcomes.

People who are active in acquiring health information, and able to find, evaluate and use it, may also be expected to be better equipped to make decisions that positively influence their health. Personal characteristics as well as situational factors may influence both information behaviour and literacy in everyday life contexts. Furthermore, people's cultural and socio-economic background is evidently strongly associated with their health-related behaviour. The proposed framework (Figure 11) may be used in future studies investigating the relationship between health information behaviour and health information literacy, and how they may produce health information outcomes.

6 Conclusion

This population-based, cross-sectional study aimed at increasing the understanding of the everyday health information literacy and behaviour of young men. More specifically, information behaviour was investigated in a physical activity and exercise context, and in relation to men's readiness to change behaviour. Health information literacy, in turn, was investigated in a general health context by focusing on its relationship with health behaviour and physical fitness. Moreover, health information behaviour and literacy were studied in relation to each other. Questionnaire and physiological measurement data were used. Data were analysed with statistical methods, and a critical realist approach was adopted in interpreting the results.

The results show that, in general, young men are rather confident in their abilities to find, evaluate and use health information, but may lack motivation to do so. In an exercise and physical activity context, little interest in information is expressed. Yet, young men utilise various information practices to obtain physical activity and exercise information. This health information behaviour and health information literacy are connected to the men's health behaviour and physical fitness, and to both their personal and socio-economic characteristics.

The frequency of information acquisition varies based on the men's stage of readiness to change exercise behaviour; the further the stage, the more often information is acquired. Yet, contrary to expectations, the frequency of information avoidance was found to be only vaguely associated with the stage of change. In turn, everyday health information literacy is associated with avoidance of physical activity and exercise information and not with information seeking on the topic. Men who had trouble finding, evaluating and understanding health information are likely to avoid information. Furthermore, everyday health information literacy was found to be positively associated with a variety of health promoting behaviours including physically activity, abstinence from smoking and binge drinking, tooth brushing, and healthy eating habits. The results were further supported with physical fitness measures, which point to similar associations.

The results indicate that readiness to change, health behaviour in general, physical fitness, health information behaviour, and everyday health information literacy are all linked to the men's socio-economic position, education in particular. Men studying in general upper secondary school seem to have a more active and confident relationship to health information when compared to their peers with a

vocational upper secondary or compulsory school education. Health information behaviour and literacy may contribute to socio-economic inequalities in health.

The results of this study corroborate previous findings on the association between competencies and behaviour related to health information and health behaviours and physical health. The study focuses on generally healthy individuals in non-medical, everyday life settings which has been rare. Further, it makes a novel contribution to current research by providing knowledge on young people's health information behaviour and literacy in relation to ongoing health behaviours such as physical activity and nutrition, and by including also objective measures of physical health. Moreover, it is among the first to examine health information behaviour in the stages of behaviour change and in relation to health information literacy.

The results of this study may be utilised when designing health promotion activities, tailored health communications and health information literacy education in particular. The contents of health communication as well as its delivery channels may be tailored to match individuals' stage of change, self-efficacy, and everyday health information literacy levels. Feedback on one's own behaviour or performance may be a feasible way of motivating and educating individuals. Yet, health promotion efforts should not focus solely on individuals as decision-makers but also to the wider social context in which they live.

A critical realist approach proved to be suitable in a study that attempted to combine ideas and empirical findings of different fields; heath-related research is predominanty based on approaches from the natural sciences, whereas in the field of information studies interprevistic approaches are widely adopted. Further research is needed to understand the mechanisms through which health information literacy and behaviour may influence health outcomes. By investigating the role of information literacy and behaviour in the process of behaviour change more thoroughly, more light can be shed on how to design effective health communication, interventions, and health information systems for addressing the public health concern related to lifestyle diseases.

References

Adams J & White M (2002) Are activity promotion interventions based on the Transtheoretical Model effective? A critical review. British Journal of Sports Medicine 37(2): 106–114.

Ahlström S, Bloomfield K & Knibbe R (2001) Gender differences in drinking patterns in nine European countries: descriptive findings. Substance Abuse 22(1): 69–85.

Ahola R, Pyky R, Jämsä T, Mäntysaari M, Koskimäki H, Ikäheimo TM, Huotari M-L, Röning J, Heikkinen HI & Korpelainen R (2013) Gamified physical activation of young men—a multidisciplinary population-based randomized controlled trial (MOPO study). BMC Public Health 13(32). doi: 10.1186/1471-2458-13-32.

Albright K (2010) Multidisciplinarity in information behavior: expanding boundaries or fragmentation of the field. Libri 60(2): 98–106.

Alvesson M & Sköldberg K (2009) (Post-)positivism, social constructionism, critical realism: three reference points in the philosophy of science. In: Alvesson M & Sköldberg K (eds) Reflexive methodology: new vistas for qualitative research (2nd ed). London, SAGE: 15–52.

American College of Sports Medicine, ACSM (2014) ACSM's health-related physical fitness assessment manual (4th ed). Baltimore MD, Lippincott Williams & Wilkins.

American Library Association (1989) Presidential Committee on Information Literacy: final report. URI: http://www.ala.org/acrl/publications/whitepapers/presidential. Cited 2015/01/01.

Ancker MPH & Kaufman D (2007) Rethinking health numeracy: a multidisciplinary literature review. Journal of the American Medical Informatics Association 14(6): 713–721.

Andreassen HK, Bujnowska-Fedak MM, Chronaki CE, Dumitru RC, Pudule I, Santana S, Voss H & Wynn R (2007) European citizens use of e-health services: a study of seven countries. BMC Public Health 7(53).

Andrews JE, Johnson JD, Case DO, Allard S & Kelly K (2005) Intention to seek information on cancer genetics. Information Research 10(4): paper238.

Anker AE, Reinhart AM & Feeley TH (2011) Health information seeking: a review of measures and methods. Patient Education and Counseling 82(3): 346–354.

Appelqvist-Schmidlechner K (2011) Time Out! Getting life back on track. A psychosocial programme targeted at young men exempted from compulsory military or civil service. Tampere, Tampere University Press. Diss.

Appelqvist-Schmidlechner K, Upanne M, Henriksson M, Parkkola K, Stengård E (2010) Young men exempted from compulsory military or civil service in Finland—a group of men in need of psychosocial support? Scandinavian Journal of Public Health 38(2), 168–176.

Archer M (1995) Realist social theory: the morphogenetic approach. New York, Cambridge University Press.

Archer M (1998) Introduction: realism in the social sciences. In: Archer M, Bhaskar R, Collier A, Lawson T & Norrie A (eds) Critical realism: essential readings. London, Routledge.

Armitage CJ (2009) Is there utility in the Transtheoretical Model? British Journal of Health Psychology 14(2): 195–210.

Arora NK, Hesse BW, Rimer BK, Viswanath K, Clayman ML & Croyle RT (2008) Frustrated and confused: the American public rates its cancer-related information-seeking experiences. Journal of General Internal Medicine 23(3): 223–228.

Ashford S, Edmunds J & French DP (2010) What is the best way to change self-efficacy to promote lifestyle and recreational physical activity? A systematic review with meta-analysis. British Journal of Health Psychology 15: 265–288.

Askola K, Känsäkoski H & Huotari ML (2014) Knowing and actional information in web based weight maintenance services. Journal of Documentation 70(5): 759–781.

Askola K, Toshimori A & Huotari M-L (2010) Cultural differences in the health information environments and practices between Finnish and Japanese university students. Information Research 15 (4): paper 451.

Ayers SL & Kronenfeld JJ (2007) Chronic illness and health-seeking information on the Internet. Health (London) 11(3): 327–347.

Baker DW (2006) The meaning and the measure of health literacy. Journal of General Internal Medicine 21(8): 878–883.

Baker DW, Wolf MS, Feinglass J, Thompson JA, Gazmararian JA & Huang J (2007) Health literacy and mortality among elderly persons. Archives of Internal Medicine 167(14): 1503–1509.

Banas J (2008) A tailored approach to identifying and addressing college students' online health information literacy. American Journal of Health Education 39(4): 228–236.

Bandura A (1977) Self-efficacy: toward a unifying theory of behavior change. Psychological Review 84: 191–215.

Bandura A (1986) Social foundations of thought and action: a social cognitive theory. Engelwood Cliffs, NJ: Prentice Hall.

Bandura A (1989) Social cognitive theory. In: Vasta R (ed) Annals of child development: six theories of child development (vol. 6). Greenwich CT, JAI Press: 1–60.

Bandura A (1997) Self-efficacy: the exercise of control. New York, WH Freeman and Company.

Bandura A (2004) Health promotion by social cognitive means. Health Education & Behavior 31(2): 143–164.

Bandura A (2006) Guide for creating self-efficacy scales. In: Pajares F & Urdan T (eds) Self-efficacy beliefs of adolescents. Greenwich CT, Information Age: 307–337.

Barbour J, Rintamäki L & Brashers DE (2005) Health information avoidance: health information avoidance as uncertainty management. Annual conference of the International Communication Association (ICA), conference papers. New York: 1–15.

Barbour JB, Rintamaki LS, Ramsey JA & Brashers DE (2012) Avoiding health information. Journal of Health Communication 17(2): 212–229.

Bar-Ilan J, Shalom N, Shoham S, Baruchson-Arbib S & Getz I (2006) The role of information in a lifetime process: a model of weight maintenance by women over long time periods. Information Research 11(4): Paper 263.

Barry MJ & Edgman-Levitan S (2012) Shared decision making—the pinnacle of patient-centered care. New England Journal of Medicine 366: 780–781.

Barry VW, Baruth M, Beets MW, Durstine JL, Liu J & Blair SN (2014) Fitness vs. fatness on all-cause mortality: a meta-analysis. Progress in Cardiovascular Diseases 56(4): 382–390.

Basic J & Erdelez S (2014) Active and passive acquisition of health-related information on the web by college students. Proceedings of the American Society for Information Science and Technology 51(1). Seattle WA: 1–5.

Bates MJ (2010) Information behavior. In: Bates J & Maack MN (eds) Encyclopedia of library and information sciences, 3rd ed. New York, CRC Press: 2381–2391.

Bawden S & Robinson L (2009) The dark side of information: overload, anxiety and other paradoxes. Journal of Information Science 35: 180–191.

Baxter L, Egbert N & Ho E (2008) Everyday health communication experiences of college students. Journal of American College Health 56(4): 427–435.

Beaudoin CE & Hong T (2011) Health information seeking, diet and physical activity: An empirical assessment by medium and critical demographics. International Journal of Medical Informatics 80(8): 586–595.

Beile P (2008) Information literacy assessment: a review of objective and interpretive measures. Society for Information Tehcnology & Teacher Education International Conference (SITE) 1. Las Vegas NV, US: 1860–1867.

Berkman ND, Sheridan SL, Donahue KE, Halpern DJ & Crotty K (2011) Low health literacy and health outcomes: an updated systematic review. Annals of Internal Medicine 155: 97–107.

Berry T, Spence J, Plotnikoff R & Bauman A (2011) Physical activity information seeking and advertising recall. Health Communication 26: 246–254.

Beverley CA, Bath PA & Berber R (2007) Can two established information models explain the information behaviour of visually impaired people seeking health and social care information? Journal of Documentation 63(1): 9–32.

Bhaskar R (1975) Forms of realism. Philosophica 15(1): 99–127.

Bingham CML, Jallinoja P, Lahti-Koski M, Absetz P, Paturi M, Pihlajamäki H, Sahi T & Uutela A (2010) Quality of diet and food choices of Finnish young men: a sociodemographic and health behaviour approach. Public Health Nutrition 13(6a): 980–986.

Blevens CL (2012) Catching up with information literacy assessment. Resources for program evaluation. College & Research Libraries News 73(4): 202–206.

Bohannon RV, Peolsson A, Massy-Westropp N, Desrosiers J & Bear-Lehman J (2006) Reference values for adult grip strength measured with a Jamar dynamometer: a descriptive meta-analysis. Physiotherapy 92(1): 11-15.

Booker CL, Skew AJ, Kelly YJ & Sacker A (2015) Media use, sports participation, and well-being in adolescence: cross-sectional findings from the UK Household Longitudinal Study. American Journa of Public Health 105(1): 173-179.

Borodulin K, Mäkinen TE, Leino-Arjas P, Tammelin TH, Heliövaara M, Martelin T, Kestilä L & Prättälä R (2012) Leisure time physical activity in a 22-year follow-up among Finnish adults. International Journal of Behavioral Nutrition and Physical Activity 9(12).

Borzekowski DLG & Rickert VI (2001a) Adolescents cybersurfing for health information. A new resource that crosses barriers. Archives of Pediatrics & Adolescent Medicine 155(7): 813–817.

Borzekowski DLG & Rickert VI (2001b) Adolescents, the Internet, and health: issues of access and content. Journal of Applied Developmental Psychology 22(1): 49–59.

Brashers DE (2001) Communication and uncertainty management. Journal of Communication 51: 477–497.

Brashers DE, Goldsmith DJ & Hsieh E (2002) Information seeking and avoiding in health contexts. Human Communication Research 28(2): 258–271.

Brashers DE, Neidig JL, Haas SM, Dobbs LK, Cardillo LW & Russell JA (2000) Communication in the management of uncertainty: the case of persons living with HIV or AIDS. Communication Monographs 67: 63–84.

Brown A (2004) Reference services for children: information needs and wants in the public library. The Australian Library Journal 53(3): 261–274.

Brug J, Conner M, Harré N, Kremers S, McKellar S & Whitelaw S (2005) The Transtheoretical model and stages of change: a critique. Observations by five commentators on the paper by J. Adams and M. White (2004), Why don't stage-based activity promotion interventions work? Health Education Research 20(2): 244–258.

Buchan DS, Ollis S, Thomas NE & Baker JS (2012) Physical activity behaviour: an overview of current and emergent theoretical practices. Journal of Obesity 2012, Article ID 546459. doi: http://dx.doi.org/10.1155/2012/546459

Buckland M (1991) Information as thing. Journal of the American Society of Information Science 42(5): 351–360.

Budd J (2010) Roy Bashkar's critical realism. In: Leckie GJ,Given LM & Buschman J (eds) Critical theory for library and information science: exploring the social fom across the disciplines. Santa Barbara CA, Libraries Unlimited, 29–40.

Budd JM & Lloyd A (2014) Theoretical foundations of information literacy: a plan for action. Proceedings of the American Society for Information Science and Technology 51(1): 1–5.

Buxton K, Wyse J & Mercer T (1996) How applicable is the stages of change model to exercise behavior? A review. Health Education Journal 55: 239–257.

Cameron AF & Webster J (2005) Unintended consequences of emerging communication technologies: instant messaging in the workplace. Computers in Human Behavior 21(1): 85–103.

Capurro R & Hjørland B (2003) The concept of information. In: Cronin B (ed) Annual Review of Information Science and Technology 37: 343–411.

Cardinal BJ (1995) The stages of exercise scale and stages of exercise behavior in female adults. Journal of Sports Medicine and Physical Fitness 35: 87–92.
Case DO (2007) Looking for information: a survey of research on information seeking, needs and behaviour (2nd ed). Amsterdam, Elsevier.
Case DO (2012) Looking for information: a survey of research on information seeking, needs and behaviour (3rd ed). UK, Emerald Group Publishing.
Case DO, Andrews JE, Johnson JD & Allard S (2005) Avoiding versus seeking: the relationship of information seeking to avoidance, blunting, coping, dissonance and related concepts. Journal of the Medical Libraries Association 93(3): 353–362.
Case DO & O'Connor LG (2015) What's the use? Measuring the frequency of studies of information outcomes. Journal of the Association for Information Science and Technology. Early view.
Cederberg M & Hartsmar N (2013) Some aspects of early school leaving in Sweden, Denmark, Norway and Finland. European Journal of Education 48(3): 378–389.
Chaffee SH & Schleuder J (1986) Measurement and effects of attention to media news. Human Communication Research 13(1): 76–107.
Chang LC (2011) Health literacy, self-reported status and health promoting behaviours for adolescents in Taiwan. Journal of Clinical Nursing 20: 190–6.
Chaplin WF, John OP & Goldberg LR (1988) Conceptions of states and traits: dimensional attributes with ideals as prototypes. Journal of Personality and Social Psychology 54(4): 541–557.
Chinn D (2011) Critical health literacy: a review and critical analysis. Social Science & Medicine 73(1): 60–7.
Chinn D & McCarthy C (2013) All Aspects of Health Literacy Scale (AAHLS): developing a tool to measure functional, communicative and critical health literacy in primary healthcare settings. Patient Education and Counseling 90(2): 247–253.
Chisolm DJ (2010) Does online health information seeking act like a health behavior? A test of the behavioral model. Telemedicine Journal and E-Health 16(2):154–60.
Clark NM & Janevic MR (2014) Theoretical models of health behaviour change. Individual theories. In: Riekert KA, Ockene JK & Pbert L (eds) The handbook of health behavior change. 4th ed. New York US, Springer Publishing Company: 3–26.
Connell CM & Crawford CO (1988) How people obtain their health information: a survey in two Pennsylvania counties. Public Health Reports 103: 189–195.
Corder K, van Sluijs EMF, Goodyer I, Ridgway CL, Steele RM, Bamber D, Dunn V, Griffin SJ & Ekelund U (2011) Physical activity awareness of British adolescents. The Archives of Pediatrics & Adolescent Medicine 165(7): 603–609. doi: 10.1001/archpediatrics.2011.94
Cortese J & Lustria ML (2012) Can tailoring increase elaboration of health messages delivered via an adaptive educational site on adolescent sexual health and decision making? Journal of the American Society for Information Science and Technology 63(8): 1567–1580.

Cotten SR & Gupta SS (2004) Characteristics of online and offline health information seekers and factors that discriminate between them. Social Science & Medicine 59(9): 1795–1806.

Courtenay WH (2000) Constructions of masculinity and their influence on men's well-being: a theory of health and gender. Social Science & Medicine 50(10): 1385–1401.

Cristancho S, Peters K, & Garces M (2014) Health information preferences among Hispanic/Latino immigrants in the U.S. rural Midwest. Global Health Promotion 21(1): 40–49.

Croezen S, Visscher TLS, ter Bogt NCW, Veling ML & Haveman-Nies A (2009) Skipping breakfast, alcohol consumption and physical inactivity as risk factors for overweight and obesity in adolescents: results of the E-MOVO project. European Journal of Clinical Nutrition 63: 405–412.

Cullen R (2005) Empowering patients through health information literacy training. Library Review 54: 231–244.

Cunningham CE, Deal K, Rimas H, Buchanan DH, Gold M, Sdao-Jarvie K & Boyle M (2014) Modeling mental health information preferences during the early adult years: a discrete choice conjoint experiment. Journal of Abnormal Child Psychology 36(7): 1123–1138.

Danemark E, Ekström M, Jakobsen L & Karlsson J Ch (2002) Explaining society: critical realism and the social sciences. London, Routledge.

Darnton A (2008) Reference report: an owerview of behaviour change models and their used. Government Social Research (GSR) behaviour change knowledge review. London, University of Westminster.

De Bourdeaudhuij I, Philippaerts R, Crombez G, Matton L, Wijndaele K, Balbuck AL & Lefevre J (2005) Stages of change for physical activity in a community sample of adolescents. Health Education Research 20(3): 357–366.

De Vleminck A, Pardon K, Roelands M, Houttekier D, Van den Block L , Vander Stichele R & Deliens L (2015) Information preferences of the general population when faced with life-limiting illness. The European Journal of Public Health 25(3): 532–538.

Delanty G (1997) Social science: beyond constructivism and realism. Buskingham, Open University Press.

Dervin B (1983) An overview of sense-making research: concepts, methods and results. The annual meeting of the International Communication Association. Dallas TX: 1–72. URI: http://faculty.washington.edu/wpratt/MEBI598/Methods/An%20Overview%20of%20Sense-Making%20Research%201983a.htm. Cited 2015/1/1.

DiClemente CC, Marinilli AS, Singh M & Bellino LE (2001) The role of feedback in the process of health behavior change. American Journal of Health Behavior 25(3): 217–227.

Dolan A (2011) 'You can't ask for a Dubonnet and lemonade!': working class masculinity and men's health practices. Sociology of Health & Illness 33(4): 586–601.

Drentea P, Goldner M, Cotten S & Hale T (2008) The association among gender, computer use and online health searching, and mental health. Information, Communication and Society 11: 509–25.

Drummond M & Drummond C (2010) Interviews with boys on physical activity, nutrition and health: implications for health literacy. Health Sociology Review 19(4): 491–504.

DuBenske LL, Beckjord EB, Hawkins RP & Gustafson DH (2009) Psychometric evaluation of the Health Information Orientation Scale: a brief measure for assessing health information engagement and apprehension. Journal of Health Psychology 14(6): 721–730.

Dutta-Bergman MJ (2004) Primary sources of health information: comparisons in the domain of health attitudes, health cognitions, and health behaviors. Health Communication 16(3): 273–288.

Dutta-Bergman MJ (2013) Media use theory and Internet use for health care. In: Murero M & Rice RE (eds) The Internet and health care: theory, research, and practice. Mahwah NJ, Lawrence Erlbaum Associates.

Ek S (2005) Om information, media och hälsa i en samhällelig kontext: en empirisk och analytisk studie [On information, media and health in societal context: an empirical and analytic study]. Åbo, Åbo Akademi University Pres. Diss.

Ek S (2013) Gender differences in health information behaviour: a Finnish population-based survey. Health Promotion International [Epub ahead of print] doi: 10.1093/heapro/dat063

Ek S, Eriksson-Backa K, Niemelä R & Huotari M-L (2011) Patterns of gender differences in health information behaviour and body mass index (BMI): findings from a Finnish population-based study. In: Papanikos GT (ed) Health economics, management & policy. Abstract book from the 10th annual international conference on health economics, management & policy. Athens Institute for Education and Research, Athens, Greece: 17–18. URI: http://www.atiner.gr/abstracts/2011HEA-ABST.pdf Cited 2015/01/01.

Ek S & Heinström J (2011) Monitoring or avoiding health information—the relation to inner inclination and health status. Health Information and Libraries Journal 28(3): 200–209.

Ek S & Niemelä R (2010) Onko Internetistä tullut suomalaisten tärkein terveystiedon lähde? Deskriptiivistä tutkimustietoa vuosilta 2001 ja 2009 [Has the Internet become the Finns' most important source of health information? Descriptive data from the years 2001 and 2009]. Informaatiotutkimus 29(4): 67–75.

Ek S & Widén-Wulff G (2008) Information mastering, perceived health and societal status: an empirical study of the Finnish population. Libri: International Journal of Libraries and Information Services 58(2): 74–81.

Enwald H (2013) Tailoring health communication. The perspective of information users' health information behaviour in relation to their physical health status. Acta Universitatis Ouluensis B118. Oulu, University of Oulu. Diss. URI: http://jultika.oulu.fi/Record/isbn978-952-62-0279-2 Cited 2015/01/01.

Enwald H, Hirvonen N, Korpelainen R & Huotari ML (2015a) Young men's perceptions of fear appeal versus neutral health messages—associations with everyday health information literacy, education, and health. Information Research 20(1): isic22.

Enwald H, Hirvonen N, Korpelainen R, Pyky R, Savolainen M, Salonurmi T, Keränen A-M, Jokelainen T, Niemelä R & Huotari M-L (2015b) A comparative study of everyday health information literacy among young men and people with high risk for metabolic syndrome. Information: interactions and impact (i3) conference. Aberdeen, Scotland: 33–35.

Enwald HPK, Niemelä RM, Keinänen-Kiukaanniemi S, Leppäluoto J, Jämsä T, Herzig KH, Oinas-Kukkonen H & Huotari MLA (2012) Human information behaviour and physiological measurements as a basis to tailor health information. An exploratory study in a physical activity intervention among prediabetic individuals in Northern Finland. Health Information & Libraries Journal 29(2): 131–140.

Erdelez S (1999) Information encountering: it's more than just bumping into information. Bulletin of the American Society for Information Science and Technology 25(3): 26–29.

Eriksson-Backa K (2003) In sickness and in health. How information and kowledge are related to health behaviour. Åbo, Åbo Akademi University Press. Diss.

Eriksson-Backa K (2005) Active acquisition or passive reception: health information literacy among fifty Finns in differing health situations. Studies in Communication Sciences 5(2): 57–74.

Eriksson-Backa K (2014) Health information literacy and demographic background in relation to health risks, diabetes and heart disease among older Finnish adults. Informaatiotutkimuksen päivät [Information studies days]. University of Oulu, Finland. Informaatiotutkimus 33(3). URI: http://ojs.tsv.fi/index.php/inf/article/view/48046/13879 Cited 2015/01/01.

Eriksson-Backa K, Ek S, Niemelä R & Huotari ML (2012) Health information literacy in everyday life: a study of Finns aged 65–79 years. Health Informatics Journal 18(2): 83–94.

Escoffery C, Miner K, Butler S, McCormick L & Mendell E (2005) Internet use for health information among college students. Journal of American College Health 53(4): 183–188.

Eysenbach G (2008) Credibility of health information and digital media: new perspectives and implications for youth. In: Metzger MJ & Flanagin AJ (eds) Digital media, youth and credibility. Cambridge MA, the MIT Press: 123–154.

Fallon EA, Hausenblas HA & Nigg CR (2005) The Transtheoretical Model and exercise adherence: examining construct associations in later stages of change. Psychology of Sport and Exercise 6: 629–641

Ferreira I, Twisk, JWR, van Mechelen W, Kemper HCG & Stehouwer CDA (2005) Development of fatness, fitness, and lifestyle from adolescence to the age of 36 years. Determinants of the metabolic syndrome in young adults: the Amsterdam Growth and Health Longitudinal Study. Archives of Internal Medicine 165(1): 42–48. doi: 10.1001/archinte.165.1.42.

Feufel MA & Stahl SF (2012) What do web-use skill differences imply for online health information searches? Journal of Medical Internet Research 14(3): e87. doi: 10.2196/jmir.2051

Finnish Defence Forces (2015) Conscript 2015. A guide for you who are preparing to carry out your military service. URI: http://www.puolustusvoimat.fi/wcm/20f2ae804718c5dcb3dfb3786bf3619b/Opas+variusmiespalvelus+englanninkielinen+2015+22012015.pdf?MOD=AJPERES Cited 2015/10/01.

Finnish Ministry of Education and Culture (2013) Education system in Finland. URI: http://www.minedu.fi/OPM/Koulutus/koulutusjaerjestelmae/?lang=en. Cited 2015/1/1.

Finnish National Board of Education (2015) Education system. URI: http://www.oph.fi/english/education_system Cited 2015/10/01

Fisher KE, Erdelez S & McKechnie L (eds) (2005) Theories of information behavior. Medford NJ, Information Today, Inc.

Fogelholm M (2005) Exercise. In: Koskinen S, Kestilä L, Martelin T & Aromaa A (eds) The health of young adults. Baseline results of the Health 2000 study on the health of 18 to 29 year olds and the factors associated with it. Publications of the National Public Health Institute B7/2005. Helsinki, the National Public Health Institute: 49–52 [in Finnish, abstract in English].

Fox S & Duggan M (2013) Health online 2013. Washington DC, Pew Research Center's Internet & American Life Project. URI: http://www.pewinternet.org/files/old-media//Files/Reports/PIP_HealthOnline.pdf. Cited 2015/01/01.

Fox S & Rainie L (2000) The online health care revolution: how the Web helps americans take better care of themselves. Washington DC, Pew Internet and American Life Project. URI: http://www.pewinternet.org/files/old-media//Files/Reports/2000/PIP_Health_Report.pdf.pdf Cited 2015/01/01.

Freimuth BJ, Stein JA & Kean TJ (1989) Searching for health information: the Cancer Information Service Model. Philadelphia, University of Pennsylvania Press.

Fujimori M & Uchitomi Y (2009) Preferences of cancer patients regarding communication on bad news: a systematic literature review. Japanese Journal of Clinical Oncolology 39(4): 201-216.

Furuya Y, Kondo N, Yamagata Z & Hashimoto H (2013) Health literacy, socioeconomic status and self-rated health in Japan. Health Promotion International [Epub ahead of print]. doi: 10.1093/heapro/dat071

Galobardes B, Shaw M, Lawlor DA, Lynch JW & Smith GD (2006) Indicators of socioeconomic position (part 1). Journal of Epidemiology & Community Health 60(1): 7–12.

Gazibara T, Kurtagic I, Kisic-Tepavcevic D, Nurkovic S, Kovacevic N, Gazibara T & Pekmezovic T (2015) Computer and online health information literacy among Belgrade citizens aged 66–89 years. Health Promotion International [Epub ahead of print].

Getchell B (1992) Physical fitness: a way of life. 4th ed. New York, Macmillian Publishig Co.

Godbold N (2006) Beyond information seeking: towards a general model of information behaviour. Information Research 11(4): paper 269.

Gorber SC, Schofield-Hurwitz S, Hardt J, Levasseur G &Tremblay M (2009) The accuracy of self-reported smoking: a systematic review of the relationship between self-reported and cotine-assessed smoking status. Nicotine & Tobacco Research 11(1): 12–24.

Gore FM, Bloem PJN, Patton GC, Ferguson J, Joseph V, Coffey C, Sawyer SM & Mathers CD (2011) Global burden of disease in young people aged 10–24 years: a systematic analysis. Lancet 377: 2093–102.

Grad R, Pluye P, Granikov V, Johnson-Lafleur J, Shulha M, Sridhar S B, Moscovici J L, Bartlett G, Vandal AC, Marlow B & Kloda L (2011) Physicians' assessment of the value of clinical information: operationalization of a theoretical model. Journal of the American Society for Information Science and Technology 62(10): 1884–1891.

Gray DE (2014) Doing research in the real world (3rd ed). London, Sage.

Gray NJ, Klein JD, Noyce PR, Sesselberg TS & Cantrill JA (2005a) Health information-seeking behaviour in adolescence: the place of the Internet. Social Science & Medicince 60(7): 1467–78.

Gray NJ, Klein JD, Noyce PR, Sesselberg TS & Cantrill JA (2005b) The Internet: a window on adolescent health literacy. Journal of Adolescent Health 37(3): 243.

Greyson DL &Johnson JL (2015) The role of information in health behavior: a scoping study and discussion of major public health models. Journal of the Association for Information Science and Technology, early view.

Griffin RJ, Dunwoody S & Neuwirth K (1999) Proposed model of the relationship of risk information seeking and processing to the development of preventive behaviors. Environmental Research 80(Suppl. 2): S230–S245.

Gross M & Latham D (2007) Attaining information literacy: an investigation of the relationship between skill level, self-estimates of skill, and library anxiety. Library & Information Science Research 29 (3): 332–353.

Hagquist CEI (2007) Health inequalities among adolescents—the impact of academic orientation and parents' education. European Journal of Public Health 17(1): 21–26.

Hall KL & Rossi JS (2008) Meta-analytic examination of the strong and weak principles across 48 health behaviors. Preventive Medicine 46: 266–274.

Hallows KM (2013) Health information literacy and the elderly: has the Internet had an impact? The Serials Librarian: From the Printed Page to the Digital Age 65(1): 39–55. doi: 10.1080/0361526X.2013.781978

Han TS, Sattar N & Lean M (2006) Assessment of obesity and its clinical implications. BMJ 333(7570): 695–698.

Hankonen N (2011) Psychosocial processes of health behaviour change in a lifestyle intervention—influences of gender, socioeconomic status and personality. Helsinki, Helsinki University Press. Diss. URI: https://helda.helsinki.fi/bitstream/handle/10138/24850/psychoso.pdf?sequence=3. Cited 2015/01/01.

Hanson MD & Chen E (2007) Socioeconomic status and health behaviors in adolescence: a review of the literature. Journal of Behavioral Medicine 30: 263–285.

Hardey M (1999) Doctor in the house: the Internet as a source of lay health knowledge and the challenge to expertise. Sociology of Health & Illness 21(6): 820–835.

Hartoonian N, Ormseth SR, Hanson ER, Bantum EO & Owen JE (2014) Information-seeking in cancer survivors: application of the Comprehensive Model of Information Seeking to HINTS 2007 data. Journal of Health Communication 19(11): 1308–25.

Hawkins RP, Kreuter M, Resnicow K, Fishbein M & Dijkstra A (2008) Understanding tailoring in communicating about health. Health Education Research 23(3): 454–466.

Hays R & Revicki D (2005) Reliability and validity (including responsiveness). In: Fayers P & Hays RD (eds) Assessing quality of life in clinical trials. Oxford UK, Oxford University Press: 25–39.

Heiskanen J, Kärkkäinen O-P, Hakonen H, Lindholm H, Eklund J, Tammelin T & Havas E (2011) Cardiorespiratory fitness of Finnish working age population. Current situation and prognoses [in Finnish, summary in English]. Jyväskylä, LIKES.

Helldán A, Helakorpi S, Virtanen S & Uutela A (2013) Health behaviour and healt among the Finnish adult population, Spring 2013 report. Helsinki, National Institute for Health and Welfare [in Finnish, abstract and captions in English].

Hepworth M, Almehmadi F & Maynard S (2014) A reflection on the relationship between the study of people's information behaviour and information literacy: changes in epistemology and focus. In: Bruce C, Davis K, Hughes H, Partridge H & Stoodley I (eds) Information experience: approaches to theory and practice (Library and Information Science 9). UK, Emerald Group Publishing Limited: 51–65.

Hessling R, Schmidt T & Traxel N (2004) Floor effect. In: Lewis-Beck M, Bryman A & Liao T (eds) Encyclopedia of social science research methods. Thousand Oaks CA, SAGE Publications Inc: 391–392. doi: http://dx.doi.org/10.4135/9781412950589.n344

Hessling R, Traxel N & Schmidt T (2004) Ceiling effect. In: Lewis-Beck M, Bryman A & Liao T (eds) Encyclopedia of social science research methods. Thousand Oaks CA, SAGE Publications Inc: 106–107 doi: http://dx.doi.org/10.4135/9781412950589.n102

Hjørland B (2000) Information seeking behaviour: what should a general theory look like? The New Review of Information Behaviour Research 1: 19–33.

Hoeger WWK & Hoeger SA (2011) Lifetime physical fitness and wellness: a personalized program (11th ed). Belmont CA, Wadsworth.

Hoikkala T & Hakkarainen P (2005) Small tales about health literacy. In: Hoikkala T, Hakkarainen P & Laine S (eds) Beyond health literacy: youth cultures, prevention and policy. Finnish youth research society publications 52. Helsinki, Finnish youth research network: 5–24.

Horgan A & Sweeney J (2012) University students' online habits and their use of the Internet for health information. Computers, Informatics, Nursing 30(8), 402–408

Huber M, Knottnerus JA, Green L, van der Horst H, Jadad AR, Kromhout D, Leonard B, Lorig K, Loureiro MI, van der Meer JWM, Schnabel P, Smith R, van Weel C & Smid H (2011) How should we define health? BMJ 343: d4163.

Huhtinen H, Lindfors P & Rimpelä A (2013) Adolescents' use of energy drinks and caffeine induced health complaints in Finland. The European Journal of Public Health 23(Suppl.1).

Huotari ML, Enwald H, Keränen AM, Jokealainen T, Hirvonen N & Niemelä R (2015) Everyday health information literacy in counselling on healthy eating. The case of PrevMetSyn. European Conference on Information Literacy. Tallinn, Estonia.

Husu P, Paronen O, Suni J & Vasankari T (2011) Physical activity and fitness of Finns in 2010. Current status and changes in health-enhancing physical activity. Publications 2011: 15. Helsinki, the Finnish Ministry of Education and Culture [summary in English].

Hutchison AJ, Breckon JD & Johnston LH (2009) Physical activity behavior change interventions based on the Transtheoretical Model: a systematic review. Health Education & Behavior 36(5): 829–845.

Huurre T, Aro H & Rahkonen O (2003) Well-being and health behaviour by parental socio-economic status. A follow-up study of adolescents aged 16 until age 32 years. Social Psychiatry and Psychiatric Epidemiology 38: 249–255.

Hyman HH & Sheatsley PB (1947) Some reasons why information campaigns fail. Public Opinion Quarterly 11 (3): 412–423.

Iannotti RJ, Chen R, Kololo H, Petronyte G, Haug E & Roberts C (2013) Motivations for adolescent participatin in leisure-time physical activity: international differences. Journal of Physical Activity and Health 10(1): 106–112.

Ivanitskaya L, Hanisko KA, Garrison JA, Janson SJ & Vibbert D (2012) Developing health information literacy: a needs analysis from the perspective of preprofessional health students. Journal of Medical Library Association 100(4): 277–283.

Ivanitskaya L, O'Boyle I & Casey AM (2006) Health information literacy and competencies of information age students: results from the interactive online Research Readiness Self-Assessment (RRSA). Journal of Medical Internet Research 8(2): e6.

Ivanov B (2012) Designing inoculation messages for health communication campaings. In H. Cho (ed). Health communication message design—theory and practice: 73–94. Thousand Oaks, CA: SAGE Publications.

Janis IL & Mann L (1977) Decision making: a psychological analysis of conflict, choice and commitment. New York, Free Press.

Jiménez-Pernett J, de Labry-Lima AO, Bermúdez-Tamayo C, García-Gutiérrez JF & del Carmen Salcedo-Sánchez M (2010) Use of the Internet as a source of health information by Spanish adolescents. BMC Medical Informatics and Decision Making 10:6

Johnson JD (1997) Cancer-related information seeking. Cresskill NJ, Hampton Press.

Johnson JD (2014) Health-related information seeking: is it worth it? Information Processing and Management: an International Journal 50(5): 708–717.

Johnson JD & Case D (2012) Health information seeking. New York, Peter Lang.

Johnson JD & Meischke H (1991) Women's preferences for cancer information from specific communication channels. American Behavioral Scientist 34: 742–755.

Johnson JD & Meischke H (1993) A comprehensive model of caner-related information seeking applied to magazines. Human Communications Research 19: 343–367.

Johnson JD, Meische H, Garu J & Johnson S (1992) Cancer-related channel selection. Health Communication 4: 183–196.

Johnston LH, Breckon JD & Hutchison AJ (2009) Influencing health behaviour: applying theory to practice. In: Dugdill L, Crone D & Murphy R (eds) Physical activity & health promotion. Evidence-based approaches to practice. UK, Wiley-Blackwell: 21–42.

Johnston RB & Smith SP (2010) How critical realism clarifies validity issues in theory-testing research: analysis and case. In: Hart DN & Gregor SD (eds) Information systems foundations: the role of design science. Camberra Australia, ANU E Press: 21–50.

Joinson AN & Banyard P (2003) Seeking alcohol information on the Internet. Aslib Proceedings 55(5/6): 313–319.

Jordan JE, Osborne RH & Buchbinder R (2011) Critical appraisal of health literacy indices revealed variable underlying constructs, narrow content and psychometric weaknesses. Journal of Clinical Epidemiology 64(4): 366–379.

Julien H & Williamson K (2011) Discourse and practice in information literacy and information seeking: gaps and opportunities. Information Research 16(1): paper 458.

Jung M (2014) Associations of self-rated health and socioeconomic status with information seeking and avoiding among post-treatment cacer patients. Asian Pacific Journal Cancer Prevention 15(5): 2231–8.

Jurca R, Jackson AS, LaMonte MJ, Morrow JR Jr, Blair SN, Wareham NJ, Haskell WL, van Mechelen W, Church TS, Jakicic JM & Laukkanen R (2005) Assessing cardiorespiratory fitness without performing exercise testing. American Journal of Preventive Medicine 29(3): 185–193.

Känsäkoski H (2014) Value creation in childhood obesity care and prevention. Acta Universitatis Ouluensis B119. Oulu, University of Oulu. Diss. URI: http://herkules.oulu.fi/isbn9789526204130/isbn9789526204130.pdf Cited: 2015/01/01.

Kari J (2010) Diversity in the conceptions of information use. Information Research 15(3): colis709.

Kari J & Savolainen R (2003) Toward a contextual model of information seeking on the web. The New Review of Information Behaviour Research 4: 155–175.

Kemp S & Holmwood J (2003) Realism, regularity and social explanation. Journal for the Theory of Social Behaviour 33(2): 165–187.

Kerka S (2003) Health literacy beyond basic skills. ERIC Digest: ED478948.

Kestilä L, Koskinen S, Martelin T, Rahkonen O, Pensola T, Aro H & Aromaa A (2006) Determinants of health in early adulthood: what is the role of parental education, childhood adversities and own education? European Journal of Public Health 16(6): 617-626.

Kestilä L & Salasuo M (2007) The alcohol use of young adults—experssion of social inequality? In: Tigerstedt C (ed) Young people and alcohol. Publications 75. Helsinki, the Finnish Society for Alcohol and Drug Research & the Finnish Youth Research Society/the Finnish Youth Research Network: 121–148 [in Finnish, summary in English].

Kim K, Lustria MLA, Burke D & Kwon N (2007) Predictors of cancer information overload: findings from a national survey. Information Research 12(4): paper 326.

Kinnunen J, Lidfors P, Pere L, Ollila H, Samposalo H & Rimpelä A (2013) The adolescent health and lifestyle survey 2013. Adolescent smoking, alcohol and substance use in 1977-2013. Reports and Memorandums of the Ministry of Social Affairs and Health 2013: 16. Helsinki, the Ministry of Social Affairs and Health [in Finnish, summary and captions in English].

Koski P (2006) Merkitysten ristiaallokossa – suhde terveyteen, alkoholiin ja liikuntaan rakentuu sosiaalisissa maailmoissa [People's relationships to health, alcohol, and exercise are constructed within social worlds]. In: Puuronen A (ed) Terveystaju – Nuoret, politiikka ja käytäntö [Health sense—youth, politics, and practice]. Helsinki, Finnish Youth Research Network: 23–32 [in Finnish].

Kreuter M, Farrell D, Olevitch L & Brennan L (1999) Tailoring health messages—customizing communication with computer technology. Mahwah NJ, Lawrence Erlbaum Associates.

Kröger H , Pakpahan E & Hoffmann R (2015) What causes health inequality? A systematic review on the relative importance of social causation and health selection. The European Journal of Public Health. First published online: 18 June 2015.

Krohne HW (1993) Vigilance and cognitive avoidance as concepts in coping research. In: Krohne HW (ed). Attention and avoidance: strategies in coping with aversiveness. Ashland OH, Hogrefe and Huber Publishers: 19–50.

Kruger J & Dunning D (1999) Unskilled and unaware of it: how difficulties in recognizing one's own incompetence lead to inflated self-assessments. Journal of Personality and Social Psychology 77(6): 1121–1134.

Kuhlthau CC (1991) Inside the search process: information seeking from the user's perspective. Journal of the American Society for Information Science 42(5): 361–371.

Kurbanoglu SS, Akkoyunly B & Umay A (2006) Developing the information literacy self-efficacy scale. Journal of Documentation 62(6): 730–743.

Lahelma E, Martikainen P, Laaksonen M & Aittomaki A (2004) Pathways between socioeconomic determinants of health. Journal of Epidemiology & Community Health 58(4): 327–332.

Lalazaryan A & Zare-Farashbandi FA (2014) A revirew of models and theories of health information seeking behavior. International Journal of Health System & Disaster Management 2: 193–203.

Lam LT & Lam MKP (2015) Competency of health information aquisition and intention for active health behaviour in children. International Arcives of Medicine 8(75).

Lambert SD & Loiselle CG (2007) Health information-seeking behavior. Qualitative Health Research 17(8): 1006–1019.

Lankshear C & Knobel M (2011) New literacies: everyday practices and social learning, 2nd ed. Berkshire UK, Open University Press.

Latvala A, Tuulio-Henriksson A, Perälä J, Saarni SI, Aalto-Setälä T, Aro H, Koronen T, Koskinen S, Lönnqvist J, Kaprio J & Suvisaari J (2009) Prevalence and correlates of alcohol and other substance use disorders in young adulthood: a population-based study. BMC Psychiatry 19(9): 73.

Lau J (2006) Guidelines on information literacy for lifelong learning. URI: http://www.ifla.org/files/assets/information-literacy/publications/ifla-guidelines-en.pdf. Cited 2015/01/01.

Lee D, Artero EG, Sui X & Blair SN (2010) Mortality trends in the general population: the importance of cardiorespitory fitness. Journal of Psychopharmacology 24(4): 27–35.

Lee JA & Lustria ML (2009) Measuring effects of web-based, tailored health intervention programs for nutrition and physical activity on clinical outcomes: a systemic review. Proceedings of the American Society for Information Science and Technology 46(1): 1–7.

Limberg L & Sundin O (2006) Teaching information seeking: relating information literacy education to theories of information behaviour. Information Research 12(1): paper280.

Limberg L, Sundin O & Talja S (2012) Three theoretical perspectives on information literacy. Human IT 11.2: 93–130.

Linkon SL (1999) Teaching working class. US, The University of Massachusetts Press.

Lippke S, Ziegelmann JP, Schwarzer R & Velicer WF (2009) Validity of stage assessment in the adoption and maintenance of physical activity and fruit and vegetable consumption. Health Psychology 28(2): 183–93.

Lloyd A (2005) Information literacy: different contexts, different concepts, different truths? Journal of Librarianship and Information Science 37(2): 82–88.

Lloyd A, Bonner A & Dawson-Rose C (2013) The health information practices of people living with chronic health conditions: Implications for health literacy. Journal of Librarianship and Information Science. Published online before print May 17, 2013, doi: 10.1177/0961000613486825.

Lloyd A & Williamson K (2008) Towards an understanding of information literacy in context. Implications for research. Journal of Librarianship and Information Science 40(1): 3–12.

Longo DR, Schubert SL, Wright BA, Lemaster J, Williams CD & Clore JN (2010) Health information seeking, receipt, and use in diabetes self-management. Annals of Family Medicine 8(4): 334–340.

Lorenc T, Petticrew M, Welch V & Tugwell P (2013) What types of intervntions generate inequalities? Evidence from systematic reviews. Journal of Epidemiology and Community Health 67(2): 190–3.

Luopa P, Kivimäki H, Matikka A, Vilkki S, Jokela J, Laukkarinen E & Paananen R (2014) Young people's well-being in Finland 2000–2013. Results of the School Health Promotion Study. Helsinki, National Institute for Health and Welfare [in Finnish].

Luopa P, Lommi A, Kinnunen T & Jokela J (2010) Young people's well-being in Finland in the 21st Century. School Health Promotion Study 2000–2009. Helsinki, National Institute for Health and Welfare [in Finnish].

Lustria MLA (2007) Can interactivity make a difference? Effects of interactivity on the comprehension of and attitudes toward online health content. Journal of the American Society for Information Science and Technology 58: 766–776.

Lustria ML, Cortese J, Noar SM & Glueckauf RL (2009) Computer-tailored health interventions delivered over the web: review and analysis of key components. Patient Education and Counseling 74(2): 156–173.

Lustria MLA, Noar SM, Cortese J, Van Stee SK, Glueckauf RL & Lee JA (2013) A meta-analysis of web-delivered, tailored health behavior change interventions. Journal of Health Communication 18(9): 1039–69.

Machenbach JP, Stirbu I, Roskam AJR, Schaap MM, Menvielle G, Leinsalu M & Kunst AE (2008) Socioeconomic inequalities in health in 22 European countries. New England Journal of Medicine 358: 2468–2481.

Maibach EW, Weber D, Massett H, Hancock GR & Price S (2006) Understanding consumers' health information preferences: development and validation of brief screening instrument. Journal of Health Communication 11(8): 717–736.

Mäkinen T, Kestilä L, Borodulin K, Martelin T, Rahkonen O & Prättälä R (2010) Effects of childhood socio-economic conditions on educational differences in leisure-time physical activity. European Journal of Public Health 20(3): 346–353.

Mancuso JM (2009) Assessment and measurement of health literacy: an integrative review of the literature. Nursing & Health Sciences 11(1): 77–89.

Manganello JA (2008) Health literacy and adolescents: a framework and agenda for future research. Health Education Research 23(5): 840–847.

Mansfield AK, Addis ME & Mahalik JR (2003) "Why won't he go to the doctor?": The psychology of men's help seeking. International Journal of Men's Health 2: 93–109.

Marcus BH & Simkin LR (1994) The transtheoretical model: applications to exercise behavior. Medicine and Science in Sports and Exercise 26(11): 1400–1404.

Marshall A, Henwood F & Guy ES (2012) Information and health literacy in the balance: findings from a study exploring the use of ICT's in weight management. Library Trends 60(3): 479–496.

Marshall SJ & Biddle SJH (2001) The transtheoretical model of behavior change: a meta-analysis of applications to physical activity and exercise. Annals of Behavioral Medicine 23(4): 229–246.

Martelin T, Koskinen S, Kestilä L & Aromaa A (2005) The variation in health and functioning based on residental area, education and household type. In: Koskinen S, Kestilä L, Martelin T & Aromaa A (eds) The health of young adults. Baseline results of the Health 2000 study on the health of 18 to 29 year olds and the factors associated with it. Publications of the National Public Health Institute B7/2005. Helsinki, the National Public Health Institute: 134–148 [in Finnish, abstract in English].

Matthews CE, George SM, Moore SC, Bowles HR, Blair A, Park Y, Troiano RP, Hollenbeck A & Schatzkin A (2012) Amount of time spent in sedentary behaviors and cause-specific mortality in US adults. The American Journal of Clinical Nutrition 95: 437–45.

Mattila VM, Raisamo S, Pihlajamäki H, Mäntysaari M & Rimpelä A (2012) Sports activity and the use of cigarettes and snus among young males in Finland in 1999–2010. BMC Public Health 12: 230.

McKenna J & Francis C (2003) Exercise contemplators: unravelling the processes of change. Health Education 103(1): 41–53.

McKenzie P (2003) A model of information practices in accounts of everyday-life information seeking. Journal of Documentation 59(1): 19–40.
Medical Library Association (2003) What is health information literacy? URI: http://www.mlanet.org/resources/healthlit/define.html. Cited 2015/01/01.
Merriam-Webster (2015) Medical dictionary. Diet. URI: http://www.merriam-webster.com/medical/diet. Cited 2015/06/06.
Miller AJ, Grais IM, Winslow E & Kaminsky LA (1991) The definition of physical fitness. Journal of Sports Medicine and Physical Fitness 31: 639–40.
Miller SM & Mangan CE (1983) Interesting effects of information and coping style in adapting to gynaecological stress: should a doctor tell all? Journal of Personality and Social Psychology 45: 223–236.
Millward P (2003) The 'grey digital divide': perception, exclusion and barriers of access to the Internet for older people. First Monday 8(7).
Ministry of Defence (2008) Conscription Act (1438/2007) Unofficial translation. URI: https://www.finlex.fi/fi/laki/kaannokset/2007/en20071438.pdf Cited 2015/10/01.
Ministry of Social Affairs and Health, MSAH (2008) National action plan to reduce health inequalities 2008–2011. Publications of the Ministry of Social Affairs and Health 2008: 25. Helsinki,
Ministry of Social Affairs and Health. Ministry of Social Affairs and Health, MSAH (2010) Health Care Act 1326/2010. URI: http://www.finlex.fi/en/laki/kaannokset/2010/en20101326.pdf Cited 2015/10/1.
Mitsutake S, Shibata A, Ishii K & Oka K, (2012) Association of eHealth literacy with colorectal cancer knowledge and screening practice among Internet users in Japan. Journal of Medical Internet Research 14(6): e153.
MOPO-study (2013) URI: http://www.tuunaamopo.fi/sivu/fi/mopo-study_in_english/. Cited 2013/02/01.
Morris J, Marzano M, Dandy N & O'Brien L (2012) Forestry, sustainable behaviours and behaviour change: theories. Theories and models of behaviour and behaviour change. Forest Research Franham. URI: http://www.forestry.gov.uk/pdf/behaviour_review_theory.pdf/$file/behaviour_review_theory.pdf. Cited 2015/01/01.
Morrison V & Bennett P (2009) What is health behaviour? In: An introduction to health psychology, 2nd ed.: 60–63.
Mõttus R, Johnson W, Murray C, Wolf MS, Starr JM & Deary IJ (2014) Towards understanding the links between health literacy and physical health. Health Psychology 33(2): 164–73.
Murray HA (1938) Explorations in personality. New York, Oxford University Press.
Murray KB (1991) A test of services marketing theory: consumer information acquisition activities. Journal of Marketing 55: 10–25.
Murray-Johnson L & Witte K (2003) Looking toward the future: health message design strategies. In: Thompson T, Dorsey A, Miller K & Parrott R (eds) Handbook of health communication. Mahwah, Lawrence Erlbaum Associates Inc: 473-495.

Mustonen H & Simpura J (2006) Alcohol use. In: Koskinen S, Aromaa A, Huttunen & Teperi J (eds) Health in Finland. Helsinki, National Public Healh Institute KTL/National Research and Development Centre for Welfare and Health STAKES/Ministry of Social Affairs and Health: 40–44.

Nash R (2005) Explanation and quantification in educational research: the arguments of critical and scientific realism. British Educational Research Journal 31(2): 185–204.

National Advisory Board on Research Ethics (2009) Ethical principles of research in the humanities and social and behavioural sciences and proposals for ethical review. Helsinki, National Advisory Board on Research Ethics. URI: http://www.tenk.fi/sites/tenk.fi/files/ethicalprinciples.pdf. Cited 2015/01/01.

National Institutes of Health/National Heart Lung and Blood Institute, North American Association for the Study of Obesity (2000) Practical guide to the identification, evaluation, and treatment of overweight and obesity in adults. National Institutes of Health. URI: http://www.nhlbi.nih.gov/files/docs/guidelines/prctgd_c.pdf. Cited 2015/01/01.

National Institute for Health and Welfare, NIHW (2013) The School Health Promotion study. Results [In Finnish]. URI: https://www.thl.fi/en/tutkimus-ja-asiantuntijatyo/vaestotutkimukset/kouluterveyskysely/tulokset. Cited: 2015/01/01.

National Institute for Health and Welfare, NIHW (2014a) Chronic diseases. URI: https://www.thl.fi/en/web/chronic-diseases. Cited 2015/01/01.

National Institute for Health and Welfare, NIHW (2014b) Health and welfare inequalities. URI: https://www.thl.fi/en/web/health-and-welfare-inequalities. Cited 2015/01/01.

National Institutes of Health Technology Assessment Conference Statement (1996) Bioelectrical impedance analysis in body composition measurement. American Journal of Clinical Nutrition 64: 524s-532S.

Nesset V (2014) Depicting the intersection between information-seeking behavior and information literacy in the research process: a model. In: Bilal D & Beheshti J (eds) New directions in children's and adolescents' information behavior research. UK, Emerald Group Publishing Limited: 39-66.

Niederdeppe J (2008) Beyond knowledge gaps: examining socioeconomic differences in response to cancer news. Human Communication Research 34 (3): 423–447. doi: 10.1111/j.1468-2958.2008.00327.x

Niedzwiedzka B (2003) A proposed general model of information behaviour. Information Research 9(1): paper164.

Niedzwiedzka B, Mazzocchi M, Aschemann-Witzel J, Gennaro L, Verbeke W & Traill WB (2014) Determinants of information behaviour and information literacy related to healthy eating among Internet users in five Europen countries. Information Research 19(3): paper 633.

Niemelä R (2006) Information behaviour of older adults. Qualitative study on information practices and enactment in everyday life. Acta Universitatis Ouluensis B74. Oulu, University of Oulu [in Finnish]. Diss. URI: http://herkules.oulu.fi/isbn9514282906/isbn9514282906.pdf. Cited 2015/01/01.

Niemelä R, Ek S, Eriksson-Backa K & Huotari ML (2012a) A screening tool for assessing everyday health information literacy. Libri 62(2): 125–134.
Niemelä R, Huotari M-L & Kortelainen T (2012b) Enactment and use of information and the media among older adults. Library and Information Science Research 34(3): 212–219.
Nigg CR & Corneya KS (1998) Transtheoretical Model: examining adolescent exercise behavior. The Journal of Adolescent Health 22(3): 214–124.
Nigg CR, Geller KS, Motl RW, Horwath CC, Wertin KK & Dishman RK (2011) A research agenda to examine the efficacy and relevance of the Transtheoretical Model for physical activity behavior. Psychology of Sport and Exercise 12(1): 7–12.
Nigg CR, Norman GJ, Rossi JS & Benisovich SV (1999) Processes of exercise behavior change: redeveloping the scale. Poster presented at the Society of Behavioral Medicine (SBM), San Diego CA.
Nigg CR, Rossi JS, Norman GJ & Benisovich SV (1998) Structure of decisional balance for exercise adoption. Annals of Behavioral Medicine 20: 211.
Noar SM, Benac CN & Harris MS (2007) Does tailoring matter? Meta-analytic review of tailored print health behaviour change interventions. Psychological Bulletin 133(4): 673–693.
Noar SM, Chabot M & Zimmerman RS (2008) Applying health behavior theory to multiple behavior change: considerations and approaches. Preventive Medicine 46(3): 275–280.
Noar SM, Harrington NG & Aldrich RS (2009) The role of message tailoring in the development of persuasive health communication messages. In: Beck CS (ed) Communication yearbook 33. New York, Routledge Communication: 73–133.
Noar SM & Van Stee SK (2012) Designing messages for individuals in different stages of change. In: Cho C (ed) Health communication message design: theory and practice. Thousand Oaks CA, Sage: 209–229.
Nölke L, Mensing M, Krämer A & Hornberg C (2015) Sociodemographic and health-(care-)related characteristics of online health information seekers: a cross-sectional German study. BMC Public Health 15: 31. Published online 2015 January 29. doi: 10.1186/s12889-015-1423-0
Norcross JC, Krebs PM & Prochaska JO (2011) Stages of change. Journal of Clinical Psychology 67(2): 143–154.
Nordic Medico-Statistical Committee, NOMESKO (2013) Health statistics for the Nordic countries. Copenhagen, Nordic Medico-Statistical Committee.
Norman CD & Skinner HA (2006) eHealth literacy: essential skills for consumer health in networked world. Journal of Medical Internet Research 8(2): e9.
Nutbeam D (2000) Health literacy as a public health goal: a challenge for contemporary health education and communication strategies in the 21st century. Health Promotion International 15: 259–267.
Nutbeam D (2008) The evolving concept of health literacy. Social Science & Medicine 67: 2072–2078.

Official Statistics of Finland, OSF (2012) Causes of death [e-publication]. Helsinki, Statistics Finland. URI: http://www.stat.fi/til/ksyyt/2012/ksyyt_2012_2013-12-30_kat_001_en.html. Cited 2015/01/01.

Official Statistics of Finland, OSF (2013) Tobacco statistics [e-publication]. Helsinki. National Institute for Health and Welfare. URI: http://www.stat.fi/til/tupk/index_en.html. Cited 2015/01/01.

Official Statistics of Finland, OSF (2014) Use of information and communications technology by individuals [e-publication]. Helsinki, Statistics Finland. URI: http://www.stat.fi/til/sutivi/index_en.html. Cited 2015/06/01.

Oh S (2012) The characteristics and motivations of health answerers for sharing information, knowledge, and experiences in online environments. Journal of the American Society for Information Science and Technology 63(3): 543–557.

Ong BN, Rogers A, Kennedy A, Bower P, Sanders T, Morden A, Cheraghi-Sohi S, Richardson JC & Stevenson F (2014) Behaviour change and social blinkers? The role of sociology in trials of self-management behaviour in chronic conditions. Sociology of Health & Illness 36(2): 226–238.

Ormandy P (2011) Defining information needs in health—assimilating complex theories derived from information science. Health Expectations 14(1): 92–104.

Ortega FB, Ruiz JR, Castillo MJ & Sjöström M (2007) Physical fitness in childhood and adolescence: a powerful marker of health. Interntional Journal of Obesity 32(1): 1–11.

Östlin P, Eckermann E, Mishra US, Nkowane M & Wallstam E (2006) Gender and health promotion: a multisectoral policy approach. Health Promotion International 21 (suppl 1): 25–35.

Owen N, Healy GN, Matthews CE & Dunstan DW (2010) Too much sitting: the population-health science of sedentary behavior. Exercise Sport Science Review 38(3): 103–113.

Paasche-Orlow MK & Wolf MS (2007) The causal pathways linking health literacy to health outcomes. American Journal of Health Behavior 31(Suppl 1): S19–S26.

Paek HJ & Hove T (2012) Social cognitive factors and perceived social influences that improve adolescent eHealth literacy. Health Communication 27(8): 727–37.

Pálsdóttir Á (2005) Health and lifestyle: Icelanders' everyday life information behaviour. Åbo, Åbo Akademi University Press. Diss.

Pálsdóttir Á (2008) Information behaviour, health self-efficacy beliefs and health behaviour in Icelanders' everyday life. Information Research 13(1): paper 334.

Pálsdóttir Á (2010) The connection between purposive information seeking and information encountering. Journal of Documentation 66(2): 224–244.

Pampel FC, Krueger PM & Denney JT (2010) Socioeconomic disparities in health behaviors. Annual Review of Sociology 36: 349–370.

Pandey SK, Hart JJ & Tiwary S (2003) Women's health and the Internet: understanding emerging trends and implications. Social Science & Medicine 56: 179–91.

Papen U (2009). Literacy, learning and health: a social practices view of health literacy. Literacy and Numeracy Studies 16(2): 19–34.

Parker R & Ratzan SC (2010) Health literacy: a second decade of distinction for Americans. Journal of Health Communication: International Perspectives 15(S2): 20–33.

Partridge H, Bruce C & Tilley C (2008) Community information literacy: developing an Australian research agenda. Information: interactions and impact. Libri 58 (2): 110-122.
Patten S, Vollman A & Thruston W (2000) The utility of the Transtheoretical model of behavior change for HIV risk reduction in injection drug users. Journal of the Association of Nurses in AIDS care 11(1): 57–66.
Pensola TH & Valkonen T (2000) Mortality differences by parental social class from childhood to adulthood. Journal of Epidemiology and Community Health 54: 525-529.
Percheski C & Hargittai E (2011) Health information-seeking in the digital age. Journal of American College Health 59(5): 379–386.
Pettigrew KE (1999) Waiting for chiropody: contextual results from an ethnographic study of the information behaviour among attendees at community clinics. Information Processing & Management 35(6): 801–817.
Physical Activity Guidelines Advisory Committee (2008) Part E: Integration and summary of the science. In: Physical Activity Guidelines Advisory Committee Report, 2008. Washington DC, Department of Health and Human Services. URI: http://www.health.gov/paguidelines/report/E_integration.aspx. Cited 2015/01/01.
Pirisi A (2000) Low health literacy prevents equal access to care. The Lancet 356: 1828
Pitel L, Gecková AM, Reijneveld SA & van Dijk JP (2013) Socioeconomic differences in adolescent health-related behavior differ by gender. Journal of Epidemiology 23(3): 211–218.
Pitts M (1998) Introduction. In: Pitts M & Phillips K (eds) The psychology of health. An introduction. 2nd edition. London, Routledge: 1–68.
Plotnikoff RC, Johnson ST, Karunamuni N & Boule NG (2010) Physical activity related information sources predict physical activity behaviors in adults with type 2 diabetes. Journal of Health Communication 15(8): 846–858.
Povey R, Conner M, Sparks P, James R & Shepherd R (1999) A critical examination of the application of the Transtheoretical Model's stages of change to dietary behaviours. Health Education Research 14(5): 641–651.
Powell KE, Paluch AE & Blair SN (2011) Physical activity for health: What kind? How much? How intense? On top of what? Annual Review of Public Health 32: 349–365.
Pratsche J (2003) Realistic models? Critical realism and statistical models in the social sciences. Philosophica 71: 13–38.
Prättälä R, Paalanen L, Grinberga D, Helasoja V, Kasmel A & Petkeviciene J (2007) Gender differences in the consumption of meat, fruit and vegetables are similar in Finland and the Baltic countries. European Journal of Public Health 17(5): 520–525.
Preedy & Watson (2010) Glossary. In: Preedy VR & Watson RR (eds) Handbook of disease burdens and quality of life measures. New York, Springer, 4133–4356.
President's Council on Physical Fitness and Sports Research (2000) Definitions: health, fitness, and physical activity. The President's Council on Physical Fitness and Sports Research Digest 3(9).
Prochaska JO (2008) Decision-making in the transtheoretical model of behavior change. Medical Decision Making 28: 845–894.

Prochaska JO & DiClemente CC (1983) Stages and processes of self-change of smoking: toward an integrative model of change. Journal of Consulting and Clinical Psychology 51(3): 390–395.

Prochaska JO, DiClemente CC & Norcross JC (1992) In search on how people change: applications to addictive behaviours. American Psychologist 47: 1102–1114.

Prochaska JO, Johnson SS & Lee P (2008) The transtheoretical model of behavior change. In: Shumaker SA, Ockene JK & Riekert KA (eds) The handbook of behavior change. 3rd ed. New York, Springer: 59–83.

Prochaska JO & Norcross JC (2013) Systems of psyhotherapy. A transthoretical analysis. 8th ed. Pacific Grove CA, Brooks/Cole.

Prochaska JO & Velicer WF (1997) The transtheoretical model of health behavior change. American Journal of Health Promotion 12: 38–48.

Prochaska JO, Velicer WF, DiClemente CC & Fava J (1988) Measuring processes of change: applications to the cessation of smoking. Journal of Consulting and Clinical Psychology 56(4): 520–528.

Radecki CM & Jaccard J (1995) Perceptions of knowledge, actual knowledge, and information search behaviour. Journal of Experimental Social Psychology 31: 107–138.

Rahkonen O, Arber S & Lahelma E (1995) Health inequalities in early adulthood: a comparison of young men and women in Britain and Finland. Social Science & Medicine 41(2): 163–171.

Rains SA (2008) Seeking health information in the information age: the role of Internet self-efficacy. Western Journal of Communication 72(1): 1–18.

Rakowski W, Assaf AR, Lefebvre RC, Lasater TM, Niknian M & Carleton RA (1990) Information-seeking about health in a community sample of adults: correlates and associations with other health-related practices. Health Education Quarterly 17(4): 379–93.

Ramanadhan S & Viswanath K (2006) Health and the information non-seeker: a profile. Health Communication 20(2): 131–139.

Reunanen A & Rissanen A (2005) Obesity and weight management. In: Koskinen S, Kestilä L, Martelin T & Aromaa A (eds) The health of young adults. Baseline results of the Health 2000 study on the health of 18 to 29 year olds and the factors associated with it. Publications of the National Public Health Institute B7/2005. Helsinki, the National Public Health Institute: 53-54 [in Finnish, abstract in English].

Rice RE (2006) Influences, usage, and outcomes of Internet health information searching: multivariate results from Pew surveys. International Journal of Medical Informatics 75(1): 8–28.

Rich RF (1975) Selective utilization of social science related information by federal policy-makers. Inquiry: a Journal of Medical Care Organization, Provision and Financing 13(3): 72–81

Rieh SY & Hilligoss B (2007) College students' credibility judgments in the information seeking process. In: Metzger M & Flanagin A (eds) Digital media, youth, and credibility. MacArthur Foundation Series on Digital Media and Learning. Cambridge MA, The MIT Press, 49–72.

Rimal RN (2001) Perceived risk and self-efficacy and motivators: understanding individuals' long-term use of health information. Journal of Communication 51(4): 633–654.
Rimer BK & Kreuter MW (2006) Advancing tailored health communication: a persuasion and message effects perspective. Journal of Communication 56(s1): S184–S201.
Rimpelä A, Rainio S, Pere L, Lintonen T & Rimpelä M (2006) Use of tobacco products, alcohol use and exposure to drugs in 1997-2005. Helsinki, Ministry of Social Affairs and Health.
Robins D, Holmes J & Stansbury M (2010) Consumer health information on the Web: the relationship of visual design and perceptions of credibility. Journal of the American Society for Information Science and Technology 61: 13–29.
Robinson ARL (2013) Building on models of information behaviour: linking information seeking and communication. Journal of Documentation 69(2): 169–193.
Rodgers S, Chen Q, Duffy M & Fleming K (2007) Media usage as health segmentation variables. Journal of Health Communication 12: 105–119.
Rosen CS (2000) Is sequencing of change processes by stage consistent across health problems? Health Psychology 19(6): 593–604.
Rosenstock IM (1974) The Health Belief Model and preventive health behavior. Health Education Monographs 2: 354–386.
Rosman T, Mayer AK & Krampen G (2015) Measuring psychology students' information seeking skills in a situational judgment test format: construction and validation of the PIKE-P test. European Journal of Psycological Assessment. Advance Online Publication.
Rothman AJ & Salovey P (1997) Shaping perceptions to motivate healthy behavior: the role of message framing. Psychological Bulletin 121(1): 3–19.
Ruiter RAC, Kessels LTE, Peters GJY & Kok G (2014) Sixty years of fear appeal research: current state of the evidence. International Journal of Psychology 49(2): 63–70.
Rutten LJF, Arora NK, Bakos AD, Aziz N & Rowland J (2005) Information needs and sources of information among cancer patients: a systematic review of research (1980–2003). Patient Education and Counseling 57: 250–261.
Sairanen A & Savolainen R (2010) Avoiding health information in the context of uncertainty management. Information Research 15(4): paper 443.
Saltin B & Grimby G (1968) Physiological analysis of middle-aged and old former athletes. Circulation 38: 1104–1115.
Santos JRA (1999) Cronbach's alpha: a tool for assessing the reliability of scales. Journal of Extension 37(2).
Santtila M, Kyröläinen H, Vasankari T, Tiainen S, Palvalin K, Häkkinen A & Häkkinen K (2006) Physical fitness profiles in young Finnish men during the years 1975–2004. Medicine & Science in Sports Exercise 38: 1990–1994.
Sarlio-Lähteenkorva S, Lissau I & Lahelma E (2006) The social patterning of relative body weight and obesity in Denmark and Finland. European Journal of Public Health 16(1): 36–40.

Savolainen R (2005) Everyday life information seeking. In: Fisher K, Erdelez S & McKechnie (eds) Theories of information behavior. Medford NJ, Information Today, Inc: 143–148.

Savolainen R (2008) Everyday information practices. A social phenomenological perspective. Lanham MD, the Scarecrow Press.

Savolainen R (2010) Dietary blogs as sites of informational and emotional support. Information Research 15(4): paper 438.

Savolainen R (2015) Cognitive barriers to information seeking: a conceptual analysis. Journal of Information Science (published online before print).

Sayer A (1992) Methdos in social science: a realist approach, 2nd ed. London, Routldge.

Sayer A (2000) Realism and social science. London, Sage.

Schmid D & Leitzmann MF (2014) Television viewing and time spent sedentary in relation to cancer risk: a meta-analysis. Journal of teh National Cancer Institute 106(7).

Sears DO & Freedman JL (1967) Selective exposure to information: a critical review. The Public Opinion Quarterly 31(2): 194–213.

Sherman DAK, Nelson LD & Steele CM (2000) Do messages about health risks threaten the self? Increasing the acceptance of threatening health messages via self-affirmation. Personality and Social Psychology Bulletin 26: 1046–1058.

Shim M, Kelly B & Hornik R (2006) Cancer information scanning and seeking behavior is associated with knowledge, lifestyle choices, and screening. Journal of Health Communication 11(Suppl 1): 157–72.

Shipman JP, Kurtz-Rossi S & Funk CJ (2009) The health information literacy research project. Journal of the Medical Library Association 97(4): 293–301.

Shvartz E & Reibold RC (1990) Aerobic fitness norms for males and females aged 6 to 75 years: a review. Aviation, Space, and Environmental Medicine 61: 3-11.

Sluijs EM van, McMinn AM & Griffin SJ (2007) A cross-sectional study of awareness of physical activity: associations with personal, behavioral and psychosocial factors. International Journal of Behavioral Nutrition and Physical Activity 4 (53).

Spencer L, Adams TB, Malone S, Roy L & Yost E (2006) Applying the transtheoretical model to exercise: a systematic and comprehensive review of the literature. Health Promotion Practice 7(4): 428–443.

Srikanthan P & Karlamangla AS (2011) Relative muscle mass is inversely associated with insulin resistance and prediabetes. Findings from the third National Health and Nutrition Examination Survey. Journal of Clinical Endorciniology and Metabolism 96(9): 2898–2903.

Statistics Finland (2013) Classification of occupations 2010. URI: http://tilastokeskus.fi/meta/luokitukset/ammatti/001-2010/koko_luokitus_en.html. Cited 2015/01/01.

Steele CM (1988) The psychology of self-affirmation: sustaining the integrity of the self. In: Berkowitz L (ed) Advances in experimental social psychology, vol 21. New York, Academic Press: 261–302.

Stone DN (1994) Overconfidence in initial self-efficacy judgments: effects on decision process and performance. Organizational Behavior and Human Decision Processes 59: 452–474.

Su C, Huang M & Contractor N (2010) Understanding the structures, antecedents and outcomes of organisational learning and knowledge transfer: a multitheoretical and multilevel network analysis. European Journal of International Management 4(6): 576–601.

Sweeny K, Melnyk D, Miller W & Shepperd A (2010) Information avoidance: who, what, when, and why. Review of General Psychology 14(4): 340–353.

Tammelin T & Karvinen J (eds) (2008) Recommendations for the physical activity of school-aged children. Helsinki, Ministry of Education and Young Finland Association [in Finnish, abstract in English].

Tanner T, Päkkilä J, Karjalainen K, Kämppi A, Järvelin M-R, Patinen P, Tjäderhane L & Anttonen V (2015) Smoking, alcohol use, socioeconomic background and oral health among young Finnish adults. Community Dentistry and Oral Epidemiology Early View (Online Version of Record published before inclusion in an issue).

Tardy RW & Hale C (1998) Getting ”plugged in”: A network analysis of health-information seeking among stay-at-home moms. Communication Monographs 65(4): 336–357.

Taylor RS (1986) Value-added processes in information systems. Norwood NJ, Ablex.

Teperi J, Porter ME, Vuorenkoski L & Baron JF (2008) The Finnish health care system: a value-based perspective. Sitra reports 82. Helsinki, Sitra. URI: https://www.sitra.fi/julkaisut/raportti82.pdf?download=Lataa+pdf Cited 2015/01/01.

Tirosh A, Shai I, Afek A, Dubnov-Raz G, Ayalon N, Gordon B, Derazne E, Tzur D, Shamis A, Vinker S & Rudich A (2011) Adolescent BMI trajectory and risk of diabetes versus coronary disease. The New England Journal of Medicine 364: 1315–1325.

Toch-Marquardt M, Menvielle G, Eikemo TA, Kulhánová I, Kulik MC, Bopp M … for the EURO-GBD-SE consortium (2014) Occupational class inequalities in all-cause and cause-specific mortallity among middle-aged men in 14 European populations during the Early 2000s. PLoS One 9(9): e108072.

Todd R (1997) Meeting drug information needs of adolescents. In: Information rich but knowledge poor? Emerging issues for schools and libraries worldwide. Research and professional papers presented at the annual conference of the International Association of School Librarianship held in conjunction with the Association for Teacher-Librarianship in Canada. Vancouver, Canada: 97–108.

Tong V, Raynor DK & Aslani P (2014) Gender differences in health and medicine information seeking behaviour—a review. Journal of Malta College of Pharmacy Practice 20: 14–16.

Toscos T & Connelly K (2010) Using behavior change theory to understand and guide technological interventions. In: Barbara M. Hayes and William Aspray (eds) Health informatics: a patient-centered approach to diabetes. Cambridge Massachusetts, MIT Press.

Trochim WMK (2006) Measurement. In: Research methods knowledge base. URI: http://www.socialresearchmethods.net/kb/ Cited 2015/01/01.

Tuominen K, Savolainen R & Talja S (2005) Information literacy as a socio-technical practice. Library Quarterly 75(3): 329–345.

Turpeinen S, Jaako J, Kankaanpää A & Hakamäki M (2012) Sport and Equality 2011. Current state and changes of gender equality in Finland. Helsinki, the Ministry of Education and Culture.

United Nations Educational, Scientific and Cultural Organization, UNESCO (2011) International Standard Classification of Education, ISCED 2011. URI: http://www.uis.unesco.org/Education/Documents/isced-2011-en.pdf. Cited 2015/01/01.

U.S. Department of Health and Human Services (2000) Healthy people 2010: understanding and improving health. Washington DC, U.S. Government.

Valkeinen H, Harald K, Borodulin K, Mäkinen TE, Heliövaara M, Leino-Arjas P, Sainio P, Kestilä L, Kunst A, Rahkonen O, Tammelin T, Härkänen T & Prättälä R (2013) Educational differences in estimated and measured physical fitness. European Journal of Public Health 23(6): 998–1002.

Van 't Riet J, Ruiter RAC, Werrij MQ & De Vries H (2008) The influence of self-efficacy on the effects of framed health messages. European Journal of Social Psychology 38: 800–9.

Vancouver JB, Thompson CM, Tischner EC & Putka DJ (2002) Two studies examining the negative effect of self-efficacy on performance. Journal of Applied Psychology 87(3): 506–516.

Veinot TC (2009) Interactive acquisition and sharing: understanding the dynamics of HIV/AIDS information networks. Journal of the American Society for Information Science and Technology 60(11): 2313–2332.

Velicer WF, Prochaska JO, Fava JL, Norman GJ & Redding CA (1998) Smoking cessation and stress management: applications of the transtheoretical model of behavior change. Homeostasis 38: 216–233.

Verdonk P, Seesing H & de Rijk A (2010) Doing masculinity, not doing health? A qualitative study among Dutch male employees about health beliefs and workplace physical activity. BMC Public Health 19(10): 712.

Vermaas K & Wijngaert L van de (2005) Seeking health information on the Internet. ECIS 2005 Proceedings. Paper 1. URI: http://aisel.aisnet.org/ecis2005/1 Cited 2015/01/01.

Viswanath K & Finnegan J (1996) The knowledge gap hypothesis: twenty-one years later. Communication Yearbook 19: 187–227.

Vuorenkoski L, Mladovsky P & Mossialos E (2008) Finland: health system review. Health Systems in Transition 10(4): 1–168

Wagner C von, Knight K, Steptoe A & Wardle J (2007) Functional health literacy and health-promoting behaviour in a national sample of British adults. Journal of Epidemiology & Community Health 61: 1086–1090.

Walwyn O & Rowley J (2011) The value of therapeutic reading groups organized by public libraries. Library and Information Science Research 33: 302–312.

Wang MP, Wang X, Lam TH, Viswanath K & Chan SS (2013) Health information seeking partially mediated the association between socioeconomic satus and self-rated health among Hong Kong Chinese. PLoS One 13(8): e82720.

Warner D & Procaccino JD (2004) Toward wellness: women seeking health information. Journal of the American Society for Information Science and Technology 55: 709–730.
Wathen CN & Harris RM (2005) Transtheoretical model of health behvavior change. In: Fisher KE, Erdelez S & McKechnie LEF (eds) Theories of information behavior. Medford NJ, Information Today, Inc.: 363–367.
Weaver JB III, Mays D, Weaver SS, Hopkins GL, Eroğlu D & Bernhardt JM (2010) Health information–seeking behaviors, health indicators, and health risks. American Journal of Public Health 100(8): 1520–1525.
Webber S & Johnston B (2000) Conceptions of information literacy: new perspectives and implicatins. Journal of Information Science 26(6): 381–398.
Wellstead P (2011) Informational behaviour of Australian men experiencing stressful life events: the role of social networks and confidants. Information Research 16(2): paper 474.
West P (1997) Health inequalities in the early years: is there equalisation in youth? Social Science & Medicine 44(6): 833–858.
Westerterp KR & Goris AH (2002) Validity of the assessment of dietary intake: problems of misreporting. Current Opinion in Clinical Nutrition and Metabolic Care 5(5): 489–93.
Wikgren M (2005) Critical realism as a philosophy and social theory in information science? Journal of Documentation. 61(1): 11–22.
Willet WC (2008) Nutritional epidemiology. In: Rothman KJ, Greenland S & Lash TL (eds) Modern epidemiology. 3rd ed. Philadelphia, Lippincott Williams & Wilkins: 580–597.
Williams M (2003) The problem of representation: realism and operationalism in survey research. Sociological Research Online 8(1).
Wilson TD (1981) On user studies and information needs. Journal of Librarianship 37(1): 3–15.
Wilson TD (1997) Information behaviour: an interdisciplinary perspective. Information Processing & Management 33(4): 551–572.
Wilson TD (1999) Models in information behaviour research. Journal of Documentation 55(3): 249–270.
Wilson TD (2000) Human information behavior. Informing Science 3(2): 49–55.
Wilson TD (2006) On user studies and information needs. 60 years of the best in information research. Journal of Documentation 62(6): 658–670.
Wilson TD (2007) Evolution in information behavior modeling: Wilson's model. In: Fisher K, Erdelez S & McKechnie L (eds) Theories of information behavior. Medford NJ, Information Today, Inc.: 31–36.
Wilson TD & Walsh C (1996) Information behaviour, an interdisciplinary perspective. British Library and Innovation Report No. 10. Sheffield, University of Sheffield. URI: http://www.informationr.net/tdw/publ/infbehav/. Cited 2015/01/01.
Wingood GM & Keltner B (2013) Sociocultural factors and prevention programs affecting the health of ethnic minorities. In: Raczynski JM & DiClemente RJ (eds) Handbook of health promotion and disease prevention: 561–578.

Witte K (1994) Fear control and danger control: A test of the extended parallel process model (EPPM). Communication Monographs 61(2): 113–134.
Wolfe RR (2006) The underappreciated role of muscle in health and disease. The American Journal of Clinical Nutrition 84(3): 475–482.
Woods C, Mutrie N & Scott M (2002) Physical activity intervention: a transtheoretical Model-based intervention designed to help sedentary young adults become active. Health Education Research 17(4): 451–460.
World Health Organization, WHO (1948) Premamble to the contitution of the World Health Organization as adopted by the International Health Conference, New York, 19–22 June, 1946; signed on 22 July 1946 by the representatives of 61 States (Official Records of the World Health Organization, no. 2, p. 100) and entered into force on 7 April 1948. URI: http://www.who.int/about/definition/en/print.html Cited 2015/01/01.
World Health Organization, WHO (2006) BMI classification. URI: http://apps.who.int/bmi/index.jsp?introPage=intro_3.html. Cited 2015/01/01.
World Health Organization, WHO (2007) BMI-for-age boys. URI: http://www.who.int/growthref/bmifa_boys_z_5_19_labels.pdf. Cited 2015/01/01.
World Health Organization, WHO (2011) Health topics—nutrition. URI:http://www.who.int/topics/nutrition/en/. Cited 2015/01/01.
World Health Organization, WHO (2011) Health topics—physical activity. URI: http://www.who.int/topics/physical_activity/en/ Cited 2014/01/01.
World Health Organization, WHO (2012) Oral health. URI: http://www.who.int/topics/oral_health/en/ Cited 2012/01/01.
World Health Organization, WHO (2013) Physical activity. URI: http://www.who.int/topics/physical_activity/en/. Cited 2013/01/01.
World Health Organization, WHO (2014) Global status report on noncommunicable diseases 2014. Geneva, World Health Organization.
Yang ZJ & Aloe AM (2014) Risk information seeking and processing model: a meta-analysis. Journal of Communication 64(1): 20–41.
Yang ZJ & Kahlor LA (2013) What, me worry? The role of affect in information seeking and avoidance. Science Communication 35(2): 189–212.
Yates C (2013) Informed for health: exploring variation in ways of experiencing health information literacy. Brisbane Australia, Queensland University of Technology. Diss.
Yates C, Stoodley I, Partridge H, Bruce C, Cooper H, Day G & Edwards SL (2012) Exploring health infromation use by older Australians within everyday life. Library Trends 60(3): 460–478.
Yeoman A (2010) Applying McKenzie's model of information practices in everyday life information seeking in the context of the menopause transition. Information Research 15(4): paper 444.
YLE News 25.3.2014. Doctors alarmed by slump in young men's health. URI: http://yle.fi/uutiset/doctors_alarmed_by_slump_in_young_mens_health/7154516. Cited 2015/01/01.
Zachariadis M, Scott S & Barrett M (2013) Methodological implications of critical realism for mixed-methods research. MIS Quarterly 37(3): 855–879.

Zhang Y (2012) College students' uses and perceptions of social networking sites for health and wellness information. Information Research 17(3): paper 523.
Zhao S (2009) Parental education and children's online health information seeking: beyond the digital divide debate. Social Science & Medicine 69(10): 1501-1505.
Zillien N & Hargittai E (2009) Digital distinction: status-specific types of Internet usage. Social Science Quarterly 90(2): 274–291.
Zimmer-Gembeck MJ & Collins WA (2006) Autonomy development during adolescence. In: Adams GR & Berzonsky MD (eds) Blackwell handbook of adolescence. UK, Blackwell Publishing Ltd, 175–204.

Appendices

Appendix 1. Questionnaire themes in Studies I–IV
Appendix 2. Health information behaviour variables; definition and questionnaire items
Appendix 3. Health information literacy variables; definition and questionnaire items
Appendix 4. Questionnaire items in Studies I–V
Appendix 5. Cronbach's alphas (α) for self-efficacy, decisional balance, processes of change, health information behaviour and health information literacy scales in Studies I–IV
Appendix 6. Physical fitness measures across stages of exercise behaviour change (additional analysis)
Appendix 7. Fitness measures across different categories of everyday health information literacy among young men (split by educational background; additional analyses)
Appendix 8. Spearman correlation coefficients (Studies I and IV)
Appendix 9. Non-response analysis

Appendix 1. Questionnaire themes in Studies I–V

Questionnaire theme	Study (year of data collection)				
	I (2010)	II (2011)	III (2012)	IV (2012, 2013)	V (2012)
Socio-demographic variables					
Age	X	X	X	X	X
Education	X	X	X	X	X
Current occupation	X	X	X	X	X
Parent's occupation			X	X	
Living arrangements	X	X		X	X
Information needs, practices and preferences in the context of physical activity					
Information needs	X				
Active seeking	X				X
Active scanning	X				
Non-directed monitoring	X				
By proxy	X				
Avoidance	X				X
Feedback preference		X			
Health information literacy					
Everyday health information literacy			X	X	X
Physical activity, exercise and readiness to change exercise behaviour					
Daily hours spent on physical activities	X	X		X	
The intensity of everyday physical activity				X	
Daily sedentary time				X	

Stage of exercise behaviour change	X	X		X
Exercise self-efficacy	X	X		
Processes of exercise behaviour change	X			
Decisional balance	X			
Other health behaviours				
Smoking			X	
Use of snuff			X	
Uso of alcoholic drinks			X	
Brushing teeth			X	
Breakfast			X	
Vegetables			X	
Fruit and berries			X	
Sweets			X	
Soft drinks			X	
Energy drinks			X	

Appendix 2. Health information behaviour variables; definition and questionnaire items

Definition of the concept	Questionnaire item
Information needs	
Individual's recognition that the knowledge he/she has is inadequate to satisfy a certain goal (Case 2007) or to make sense of their situation or the world around them (Dervin 1983).	I've been interested in information concerning physical activity (PA) or felt like you should know more about it? I've had questions concerning PA or exercise that I would like to have answers to.
Preference for feedback information	
Ipsative comparison: comparison of an individual's current and prior states.	Information about improvement in my physical fitness motivates me.
Normative comparison: comparison of an individual's behaviour or prior state to that of peers.	I get motivated when I have done better than others.
Theoretically driven feedback: feedback based on theoretical arguments.	I don't desire scientific facts about health
Active seeking	
Connecting: Actively seeking contact with an identified source in a specific information ground.	*I've looked for information for example on the Internet or ask questions about it from other people.*
Interacting: Asking a pre-planned question; active questioning strategies, e.g. list-making (McKenzie 2003).	*I've looked for information when I have had a problem or a question about exercise or PA.*
Active scanning	
Connecting: Identifying a likely source; browsing in a likely information ground.	*I've followed exercise-related shows on television or other media sources, or browsed books, magazines or the Internet for exercise information.*
Interacting: Identifying an opportunity to ask a question; actively observing or listening (McKenzie 2003).	*I've talked with other people about exercise or PA.*
Non-directed monitoring	
Connecting: Serendipitous encounters in unexpected places.	I've received exercise information by chance when reading the paper, watching the television or surfing the Internet.
Interacting: Observing or overhearing in unexpected settings, chatting with acquaintances (McKenzie 2003).	I've received exercise information by change from other people.
By proxy	

Connecting: Being identified as an information seeker; being referred to a source through a gatekeeper.	*I've asked other people to find me information about exercise.*
Interacting: Being told. (McKenzie 2003).	Other people have informed me about exercise or PA or recommended sources that contain exercise information, such as web pages, magazines, or information leaflets.
Avoidance	
Connecting: Not connecting; refraining from accessing information channels or sources.	I've avoided hearing or seeing exercise-related information.
Interacting: Not interacting; preventing or delaying the acquisition of information.	I did not want to think about exercise.

Appendix 3. Health information literacy variables; definition and questionnaire items

Dimension (Niemelä *et al*. 2012)	Definition (MLA 2003)	Questionnaire item
'Motivation'	Ability to 'recognize a health information need'	EHIL 1. It is important to be informed about health issues.
	Ability to 'identify likely information sources – to retrieve relevant information'	EHIL 2. I know where to seek health information.
	Ability to 'identify likely information sources – to retrieve relevant information' / Ability to 'use [likely information sources] – to retrieve relevant information' / Ability to 'assess the quality of the information'	EHIL 3. I like to get health information from a variety of sources.
	Ability to 'use – information to make good health decisions' / Ability to '[assess the] – applicability [of information] to a specific situation'	EHIL 9. I apply health related information to my own life and/or that of people close to me
'Confidence'	Ability to 'use [likely information sources] – to retrieve relevant information'	EHIL 4. It is difficult to find health information from printed sources (magazines and books).
	Ability to 'use [likely information sources] – to retrieve relevant information'	EHIL 5. It is difficult to find health information from the Internet.
	Ability to 'assess the quality of the information'	EHIL 10. It is difficult to know who to believe in health issues.
'Evaluation'	Ability to 'assess the quality of the information'	EHIL 6. It is easy to assess the reliability of health information in printed sources (magazines and books).
	Ability to 'assess the quality of the information'	EHIL 7. It is easy to assess the reliability of health information on the Internet.
'Understanding'	Ability to 'understand – information'	EHIL 8. Health related terminology and statements are often difficult to understand.

Appendix 4. Questionnaire items in Studies I–V

Only the questions used in Studies I–V are presented. Numbering does not reflect the original questionnaire's numbering. All questionnaire items were in Finnish.

[A] Study I (2010)
[B] Study II (2011)
[C] Study III (2012)
[D] Study IV (2012, 2013)
[E] Study V (2013)

MOPO questionnaire Date_____

Initials____

Young people's lifestyles, health and physical activity is studied in the MOPO study. By participating in the study and responding to the questionnaire you have the opportunity to influence new ways to promote the well-being of young people.

The questionnaire is confidential and the information provided will not be shared with outsiders. Respond to each question by circling or checking the appropriate alternative.

Please respond to each question.

How old are you? ABCDE

_____ years old

What is your current occupation? ABCDE

1 Student
2 Eployed
3 Unemployed
4 Other, what? _____

Who do you live with? ABDE

1 With parents
2 With a parent
3 Alone
4 With a roommate / sibling
5 With a spouse
6 Grandparents or other relatives
7 I am homeless
8 With someone else, who? _____

What are the occupations of your mother and father? CD

Mother _____
Father _____

How much do you engage in physical activity and exercise in your free time? If there is strong seasonal variation in your physical activity, please select the option that describes the situation on average. [D]

1 I read, watch television and do tasks that are not physically demanding

2 I walk, bicycle, or attend to some physical activity in other ways at least 4 hours a week

3 I exercise (e.g. running, jogging, swimming, skiing, gymnastics, ball games, laborious gardening) on average at least 2 hours a week,

4 I do hard physical training for competitions (e.g. running, orienteering, skiing, swimming, ball games) several times a week

How much are you 'on the go' (at work, walking or bicycling to and from school, at recess, doing household chores, exercising) on an average day? [ABD]

1 less than one hour

2 one to two hours

3 More than two hours

How much do you sit on an average day (e.g. while studying, working, driving, reading, watching television, or on a computer)? [ABD]

During leisure time _____ hours a day

At school / work _____ hours a day

Do the following things make it harder for you to engage in exercise at your leisure time? [A]

1 = yes, 2 = no

1 Lack of interest

2 Lack of time

3 Laziness

4 Feeling tired because of work, studies etc.

5 Melancholic mood or fatigue

6 Lack of exercise skills

7 I don't know how I should exercise

8 An illness or an injury

9 Lack of money

10 Lack of exercise facilities

11 Lack of exercise equipment

12 Poor transport possibilities to exercise facilities

13 Lack of appropriate type of exercise

14 Lack of instruction in exercise

15 Lack of appropriate group

16 Uncomfortable feeling caused by exercise

17 Shame

18 Other, what?_____

Are the following things important reasons for you to exercise? [A]

1 = yes, 2 = no

1 Competing and succeeding in sports

2 Developing or maintaining strength or other component of physical fitness

3 Increasing muscle mass

4 Losing weight
5 Promoting health
6 Improving physical appearance
7 Increasing sexual appeal
8 Enjoying the positive sensations caused by exercise
9 Enjoying rigorous efforts or self 'discipline'
10 Building and/or maintaining social relationships
11 Increasing own status among friends
12 Relieving stress or pressure from school or work
13 Increasing energy
14 Uplifting your mood
15 Accepting your own body
16 I exercise because my friends or family tell me to
17 To enjoy nature
18 Other, what?_____

The following experiences can affect the exercise habits of some people. Choose the alternative that best describes your thoughts or behaviour during the preceding month. [A]

1 = no/never, 2 = very rarely, 3 = sometimes, 4 = often,5 = very often or always

How often during the preceding month have you… [A]

been interested in information concerning physical activity (PA) or felt like you should know more about it?

had questions concerning PA or exercise that I would like to have answers to?

How often during the preceding month have you… [AE]

not wanted to think about exercise?

avoided hearing or seeing exercise-related information?

How often during the preceding month have you… [AE]

looked for information about exercise or physical activity for example on the Internet or asked questions about it from other people?

looked for information about exercise or physical activity when having a problem or a question about these subjects?

How often during the preceding month have you… [A]

followed exercise-related shows on television or other media sources, or browse books, magazines or the Internet for exercise information?

talked with other people about exercise or physical activity?

How often during the preceding month have you… [A]

received exercise information by chance when reading the paper, watching the television or surfing the Internet?

received exercise information by change from other people?

How often during the preceding month have you… [A]

asked other people to find you information about exercise?

been informed about exercise or PA by other people or other people have recommended sources that contain exercise information, such as web pages, magazines, or information leaflets?

How often do you brush your teeth? [C]

1 Never or nearly never

2 A couple of times a week

3 Once a day

4 Twice a day

5 More than twice a day

How often do you drink alcoholic drinks at least six units at a time (a unit refers to one bottle of beer, a class of wine or a standard restaurant drink of spirits)? [C]

1 Never

2 Less than once a month

3 Once or twice a month

4 Once a week

5 Two or three times a week

6 Daily or nearly daily

Do you take snuff? [C]

1 = no, 2 = yes, regularly. I take snuff _____ portions a day

Do you usually eat breakfast? [C]

1 = yes, 2 = no

How often during the preceding week have you consumed the following foods or drinks? [C]

1 = not once, 2 = on 1 to 2 days, 3 = on 3 to 5 days, 4 = on 6 to 7 days

1 Fresh vegetables / salad

2 Fruit / berries

3 Chocolate or other sweets

4 Sugary soft drinks

5 Energy drinks

Choose the alternative that best describes your thoughts. [B]

1 = strongly disagree, 2 = moderately disagree, 3 = neutral, 4 = moderately agree, 5 = strongly disagree, 0 = not sure

1 Information about the improvement of my physical fitness motivates me

2 I get motivated when I have done better than others

3 I don't desire scientific facts about health

Do you have an expert's report about a diagnosis of dyslexia? [CDE]

1 = yes 2 = no

Please assess the following statements.[CDE]

1 = strongly disagree, 2=agree, 3=neutral, 4=disagree, 5 = strongly agree

1 It is important to be informed about health issues.

2 I know where to seek health information.

3 I like to get health information from a variety of sources.

4 It is difficult to find health information from printed sources (magazines and books).

5 It is difficult to find health information from the Internet.

6 It is easy to assess the reliability of health information in printed sources (magazines and books).

7 It is easy to assess the reliability of health information on the Internet.

8 Health related terminology and statements are often difficult to understand.

9	I apply health related information to my own life and/or that of people close to me.
10	It is difficult to know who to believe in health issues.

Appendix 5. Cronbach's alphas (α) for self-efficacy, decisional balance, processes of change, health information behaviour and health information literacy scales in Studies I–IV

Scale	Cronbach's α	Study
Self-Efficacy Scale	0.95, 0.95	I, II
Decisional balance pros	0.88	I
Decisional balance cons	0.88	I
Decisional balance	0.81	I
Experiental Processes	0.88	I
Behavioural Processes	0.86	I
Processes of Change Scale	0.93	I
Information needs	0.81	I
Active seeking	0.89	I
Active scanning	0.81	I
Non-directed monitoring	0.82	I
Obtaining information by proxy	0.67	I
Avoiding information	0.71	I
Information behaviour scale	0.87	I
Everyday health information literacy	0.70, 0.70	III, IV

Appendix 6. Physical fitness measures across stages of exercise behaviour change (additional analysis)

Table 28. Mean scores, Kruskal-Wallis test results, and pairwise multiple comparisons results for physical fitness measures across stages of change among young men (*n* = 446).

Variable	Stage of change					*p*[1]	Pairwise multiple comparisons (*p* < .05)
	PC 7.4% (*n* = 33)	C 12.1% (*n* = 54)	P 14.1% (*n* = 63)	A 13.2% (*n* = 59)	M 53.1% (*n* = 237)		
Aerobic fitness	43.5	49.0	49.3	51.1	57.1	< .001	PC, C, P, A < M
Muscle mass %	48.3	46.3	47.0	44.9	48.3	< .001	PC > A < M
Body fat %	15.7	17.5	16.1	20.1	14.8	< .001	PC, P < A > M
Waist circumference	79.7	82.0	80.5	85.9	81.5	.009	PC, P < A > M
BMI	21.9	22.8	21.8	24.4	23.1	.004	PC, P < A
Grip strength	44.6	49.5	47.6	48.6	50.6	.002	PC < M

[1] Additional analysis; data collected in 2010; PC = precontemplation, C = contemplation, P = preparation, A = action, M = maintenance

Appendix 7. Fitness measures across different categories of everyday health information literacy among young men (split by educational background; additional analyses)

Table 29. Mean (*M*) and standard deviation (*SD*) values of anthropometric, aerobic fitness and muscle strength measurements of respondents (*n* = 605) studying in *general upper secondary school* across the different categories of everyday health information literacy (EHIL).

Variable	EHIL			Total	*p*[1]
	Low	Basic	High		
	M (*SD*)	*M* (*SD*)	*M* (*SD*)	*M* (*SD*)	
	n = 94	*n* = 323	*n* = 188	*N* = 605	
BMI	23.7 (4.8)	22.7 (4.0)	22.6 (3.4)	22.8 (4.0)	Ns
Aerobic fitness (VO2max, ml/kg/min)	52.55 (7.9)	53.5 (7.0)	54.9 (7.2)	53.8 (7.3)	.017
Muscle mass (%)	45.8 (5.4)	47.4 (4.5)	48.1 (4.3)	47.4 (4.6)	< .001
Body fat (%)	18.6 (9.5)	15.9 (7.9)	14.9 (7.3)	16.0 (8.1)	.004
Waist (cm)	83.5 (12.5)	81.1 (10.0)	80.5 (8.3)	81.8 (10.0)	.032
Grip strength (kg)	43.4 (7.4)	44.5 (7.9)	45.4 (8.1)	44.6 (7.9)	Ns

[1]Kruskal-Wallis test

Table 30. Mean (*M*) and standard deviation (*SD*) values of anthropometric, aerobic fitness and muscle strength measurements of respondents (*n* = 432) studying in *vocational upper secondary school* across the different categories of everyday health information literacy (EHIL).

Variable	EHIL			Total	p^1
	Low	Basic	High		
	M (*SD*)	*M* (*SD*)	*M* (*SD*)	*M* (*SD*)	
	n = 116	*n* = 253	*n* = 63	*N* = 432	
BMI	223.6 (5.2)	23.1 (4.4)	22.7 (3.9)	23.2 (4.6)	Ns
Aerobic fitness (VO2max, ml/kg/min)	50.6 (6.8)	51.9 (6.7)	53.3 (6.6)	51.7 (6.8)	.026
Muscle mass (%)	46.4 (5.7)	46.8 (5.0)	48.2 (3.9)	46.9 (5.1)	Ns
Body fat (%)	17.5 (10.0)	16.8 (8.6)	14.3 (7.1)	16.6 (8.9)	Ns
Waist (cm)	83.5 (12.5)	82.6 (10.0)	79.6 (9.0)	82.4 (10.7)	Ns
Grip strength (kg)	45.5 (7.2)	46.1 (7.5)	47.7 (7.0)	46.2 (7.3)	Ns

[1]Kruskal-Wallis test

Table 31. Mean (*M*) and standard deviation (*SD*) values of anthropometric, aerobic fitness and muscle strength measurements of respondents (*n* = 33) with *compulsory school education* across the different categories of everyday health information literacy (EHIL).

Variable	EHIL			Total	p^1
	Low	Basic	High		
	M (*SD*)	*M* (*SD*)	*M* (*SD*)	*M* (*SD*)	
	n = 12	*n* = 19	*n* = 2	*N* = 33	
BMI	20.9 (1.8)	23.6 (5.9)	21.0 (0.9)	22.5 (4.7)	Ns
Aerobic fitness (VO2max, ml/kg/min)	55.0 (6.4)	49.1 (8.8)	53.5 (6.4)	51.5 (6.4)	Ns
Muscle mass (%)	48.3 (3.5)	45.5 (5.8)	48.8 (1.6)	46.7 (5.1)	Ns

Body fat (%)	13.8 (5.7)	18.8 (9.7)	13.4 (3.1)	16.6 (8.4)	Ns
Waist (cm)	76.4 (5.1)	83.6 (14.0)	77.3 (6.0)	80.6 (11.5)	Ns
Grip strength (kg)	44.0 (6.2)	46.7 (9.2)	48.5 (4.9)	45.8 (8.0)	Ns

[1]Kruskal-Wallis test

Appendix 8. Spearman correlation coefficients (Studies I and IV)

Table 32. Spearman's correlations between the TTM and information behaviour variables (*n* = 616) (Study I).

Variable	Self-eff.	Cogn. proc.	Beha. proc.	Dec. pros	Dec. cons	Info. need	Active seeking	Active scanning	Non-directed	By proxy	Avoid.	Inf. behaviour sum
Stage of change	.610[2]	.498[2]	.518[2]	.383[2]	-.547[2]	.3802	.367[2]	.501[2]	.327[2]	.291[2]	.062	.450[2]
Self-efficacy		.567[2]	.578[2]	.405[2]	-.533[2]	.424[2]	.450[2]	.523[2]	.333[2]	.326[2]	.097[1]	.506[2]
Cognitive processes			.771[2]	.588[2]	-.357[2]	.674[2]	.631[2]	.652[2]	.516[2]	.509[2]	.042	.741[2]
Behavioural processes				.533[2]	-.388[2]	.592[2]	.576[2]	.619[2]	.541[2]	.517[2]	.063	.681[2]
Dec. balance pros					-.217[2]	.415[2]	.349[2]	.408[2]	.278[2]	.369[2]	.036	.457[2]
Dec. balance cons						-.192	-.193[2]	-.319[2]	-.163[2]	-.159[2]	-.112[2]	-.240[2]
Information need							.674[2]	.628[2]	.501[2]	.646[2]	.115[2]	.824[2]
Active seeking								.611[2]	.558[2]	.514[2]	.037	.823[2]
Active scanning									.630[2]	.575[2]	.110[2]	.825[2]
Non-directed mon.										.527[2]	.081	.750[2]
By proxy											.115[2]	.745[2]
Avoidance												-.087[1]

[1]Correlation is significant at the .05 level (2-tailed) [2]Correlation is significant at the .01 level (2-tailed)

Table 33. Spearman's crorrelation coefficients between health information behaviour and everyday health information literacy (EHIL) variables (*n* = 886) (Study IV).

Variable	Avoidance	Active seeking	Active scanning	Non-directed	By proxy	EHIL sum
Information need	.126[2]	.602[2]	.498[2]	.465[2]	.475[2]	-.003
Avoidance		.018	-.086	.047	.246[2]	-.309[2]
Active seeking			.662[2]	.609[2]	.571[2]	.089[2]
Active scanning				.670[2]	.483[2]	.106[2]
Non-directed					.580[2]	.058
By proxy			.	.		-.151[2]

[1]Correlation is significant at the .05 level (2-tailed) [2]Correlation is significant at the .01 level (2-tailed)

Appendix 9. Non-response analysis

Table 34. Socio-demographic characteristics of the total population (men attending the call-ups), study participants, and respondents in 2012.

Variable	Total *N* (%)	Participants *n* (%)	Respondents *n* (%)	p^1 (total vs. participants)	p^1 (total vs. respondents)
Age				< .001	< .001
17	293 (23.5)	220 (26.7)	178 (26.9)		
18	819 (65.8)	559 (67.8)	448 (67.8)		
> 18	133 (10.7)	45 (5.5)	35 (5.3)		
Total	1245 (100)	824 (100)	661 (100)		
Education				.031	.002
Compulsory	71 (5.7)	38 (4.6)	26 (3.9)		
Vocational upper secondary	610 (49.0)	365 (44.3)	282 (42.7)		
General upper secondary	564 (45.3)	421 (51.1)	353 (53.4)		
Total	1245 (100)	824 (100)	661 (100)		

[1]Pearson's *chi square test; total* = all participants and non-participants; *participants* = all men who participated in the MOPO study; *respondents* = men who responded to at least one questionnaire item included in Studies I–V.

Table 35. BMI values among respondents and non-respondents in 2011, 2012, and 2013.

	Total	Participants	Respondents	p^2 (total vs. participants)	p^2 (total vs. respondents)
Year 2011	*N* = 1,280	n = 880	n = 523	.001	Ns
BMI[1] (M, SD)	23.2, 4.4	23.0, 3.9	22.9, 3.9		
Year 2012	*N* = 1,198	n = 805	n = 487	Ns	.045
BMI (M, SD)	23.4, 5.0	23.3, 4.7	22.9, 4.3		
Year 2013	*N* = 1,275	n = 1,016	n = 823	.029	Ns
BMI (M, SD)	23.1, 4.4	23.3, 4.8	23.1, 5.9		

[1]BMI information from preliminary health examinations [2]Student's *t-test ;total* = all participants and non-participants; *participants* = all men who participated in the MOPO study; *respondents* = men who responded to at least one questionnaire item included in Studies I–V.

List of original publications

I Hirvonen N, Huotari M-L, Niemelä R & Korpelainen R (2012) Information behavior in stages of exercise behavior change. Journal of the American Society for Information Science and Technology 63(9): 1804–1819.

II Hirvonen N, Enwald H, Bath P, Pyky R, Korpelainen R & Huotari M-L (2015) Individual factors affecting preferences for feedback message tactics in the contexts of physical activity. Journal of Health Communication 20(2): 220–229.

III Hirvonen N, Niemelä R, Ek S, Korpelainen R & Huotari M-L (2015) Socio-demographic characteristics associated with health information literacy of young Finnish men. Information Research 20(1): paper: isic25.

IV Hirvonen N, Ek S, Niemelä R, Pyky R, Ahola R, Korpelainen R & Huotari M-L. Everyday health information literacy in relation to health behavior and physical fitness. A population-based study among young men. Library & Information Science Research (manuscript).

V Hirvonen N, Korpelainen R, Pyky R & Huotari M-L (2015) Health information literacy and stage of change in relation to physical activity information seeking and avoidance: a population-based study among young men. Proceedings of the 78th Association for Information Science and Technology (ASIS&T) Annual Meeting, St. Louis, MO USA, November 6–10, 2015.

117. Alaniska, Kari (2013) Kalojen kuninkaan tie sukupuuttoon : Kemijoen voimalaitosrakentaminen ja vaelluskalakysymys 1943–1964

118. Enwald, Heidi (2013) Tailoring health communication : the perspective of information users' health information behaviour in relation to their physical health status

119. Känsäkoski, Helena (2014) Value creation in childhood obesity care and prevention

120. Myllykangas, Mikko (2014) Rappeutuminen, tiedostamaton vai yhteiskunta? : lääketieteellinen itsemurhatutkimus Suomessa vuoteen 1985

121. Kangasvuo, Jenny (2014) Suomalainen biseksuaalisuus : käsitteen ja kokemuksen kulttuuriset ehdot

122. Harjuniemi, Jenna (2014) Kön, språk och kognition : semantiska och begreppsliga strukturer hos svenska femininavledningar och deras finska och tyska ekvivalenter

123. Jylhä, Eva-Jo (2014) The creation of the Small New England Town in Alice Hoffman's Massachusetts novels : a cultural imagological study

124. Mäkinen, Leena (2014) Narrative language in typically developing children, children with specific language impairment and children with autism spectrum disorder

125. Anttila, Tero (2014) The power of antiquity : the Hyperborean research tradition in early modern Swedish research on national antiquity

126. Ylipulli, Johanna (2015) Smart futures meet northern realities: anthropological perspectives on the design and adoption of urban computing

127. Saviniemi, Maija (2015) On noloa, jos ammattilaiset tekevät tökeröitä kielioppivirheitä : toimitushenkilökunnan kielenhuoltotiedot, -käytännöt ja -diskurssit

128. Uusitalo, Ari (2015) Hyvästit, potkut vaiko lobbauksen hedelmä? : Yhdysvaltain suhtautuminen Filippiinien itsenäisyyskysymykseen ja sen ratkaisuun 1929–1934

129. Korpua, Jyrki (2015) Constructive Mythopoetics in J. R. R. Tolkien's *Legendarium*

130. Virtaluoto, Jenni (2015) Technical communication as an activity system: a practitioner's perspective

131. Hyöty, Helena (2015) "Toiset rakastavat, toiset vihaavat." : Ilmari Kiannon tuotannon julkinen reseptio Suomessa

132. Oikarinen, Teija (2015) Arkeologia digitaalisen aikakauden kynnyksellä

Book orders:
Granum: Virtual book store
http://granum.uta.fi/granum/

UNIVERSITY OF OULU P.O. Box 8000 FI-90014 UNIVERSITY OF OULU FINLAND

ACTA UNIVERSITATIS OULUENSIS

UNIVERSITY of OULU
OULUN YLIOPISTO

ISBN 978-952-62-1039-1 (Paperback)
ISBN 978-952-62-1040-7 (PDF)
ISSN 0355-3205 (Print)
ISSN 1796-2218 (Online)