Development of a digital Health Report System
From exploration of need to identification of health-related problems in young people

Petra Vikman Lostelius
DEVELOPMENT OF A DIGITAL REPORT SYSTEM
FROM EXPLORATION OF NEED TO IDENTIFICATION
OF HEALTH-RELATED PROBLEMS IN YOUNG PEOPLE

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School of Health, Care and Social Welfare
DEVELOPMENT OF A DIGITAL REPORT SYSTEM
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Akademisk avhandling

som för avläggande av filosofie doktorsexamen i fysioterapi vid Akademin för hälsa, vård och välfärd kommer att offentligen försvaras fredagen den 27 oktober 2023, 09.15 i Lambda och digitalt via Zoom, Mälardalens universitet, Västerås.

Fakultetsopponent: Biträdande professor Ulrika Müssener, Linköpings universitet

Akademin för hälsa, vård och välfärd
Abstract

Introduction While foremost mental health and psychosomatic symptoms are increasing in young people, little is known about the health in young people visiting Youth Health Clinics (YHC). Also, there is no unified health survey used to collect overall health data from young people nationally at YHCs.

Aims To develop a health- and welfare technology tool to identify and increase knowledge about health-related problems in young people visiting YHCs.

Methods The structured development of a health and welfare technology tool, the Health Report System (studies I to III) had a consultative level participatory approach. Study I was qualitative and contained interviews with young people on content and design for a digital questionnaire. Studies II and III had mixed methods design and included young people, healthcare professionals, and a researcher expert panel. Qualitative data came from interviews and quantitative data from questionnaires. The studies evaluated usability and feasibility. Study IV was quantitative and used data from the evaluation questionnaire, exploring the mediated association of variables on mental well-being, using a set of regression analyses.

Results Study I: Young people (n=15) were positive to use a health and welfare technology tool if it was in accordance with their needs. It should give an overview of mental-, physical-, and sexual health and social support. The results should be discussed with healthcare professionals during a health assessment. Study II: The researchers used guidelines to develop the Health Report System and included ten validated and reliable health questionnaires. The usability of the Health Report System was evaluated by young people (n=4), YHC healthcare professionals (n=3), and an expert panel (n=7). The converged qualitative and quantitative data showed that the Health Report System was very usable for YHCs. Study III: The qualitative results from healthcare professionals’ interviews (n=11) and quantitative questionnaire results from young people (n=54) were merged. Using a matrix for assessment of feasibility, the researcher’s consensus decision, was that progression and use of the Health Report System in an intervention study was feasible. Study IV: Results from young people’s (n=223) health data showed statistical significance for the mediating effect of social functioning between the sense of mastery and mental well-being.

Conclusion This thesis presents that the Health Report System has the potential to identify health-related problems in young people, strengthen the health communication between young people and healthcare professionals, and influence the YHC organization.
This is for Clara, Jesper and Ludvig
Be courageous, honest, respectful, and humble. Be you.
You will never walk alone ♥♥♥

“...And even I can’t teach you how to fly
But I can show you how to live like your life is on the line

You throw your head back, and spit in the wind
Let the walls crack, ’cause it lets the light in
Let ’em drag you through hell
They can’t tell you to change who you are

And when the storm’s out, you run in the rain
Put your sword down, dive right into the pain
Stay unfiltered and loud, you’ll be proud of that skin full of scars
That’s all I know so far

I will be with you ’til the world blows up, yes
Up, and down, and through ‘til the world blows up”

Songwriters: Alecia Moore, Benji Pasek, Justing Paul
Text from “All I Know So Far” © Kobalt Music Publishing Ltd, Sony/ATV Music Publishing LLC.
Artist: Pink
List of Papers

This thesis is based on the following papers, which are referred to in the text by their Roman numerals.


IV. Lostelius PV, Nordgren L, Söderlund A, Thors Adolfsson E, Revenäs Å, Mattebo M. (2023) The mediating role of physical activity, social support, and self-perceived sexual health behavior on the association between the sense of mastery and mental well-being in young people at Youth Health Clinics. In manuscript

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<td>SEXIT</td>
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<td>UNICEF</td>
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<td>SD</td>
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<td>IV</td>
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<td>DV</td>
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Introduction

Health in young people

The definition of health has since 1948 inferred that health is not only the absence of disease, but also a complete state of physical, mental and social wellbeing (World Health Organization, 2020a). The definition has been criticized as non-functional in today’s society, which consist of a growing population of older people and people living with a chronic disease. More current descriptions of health suggests that it is an ability to adapt and to self-manage (Huber et al., 2011), and that good health is a resource for individuals to lead their every-day life (World Health Organization, 1986). Young people may suffer from health problems caused by poor health behavior and living habits. Use of tobacco, alcohol, illegal and prescribed drugs, insufficient eating habits, physical inactivity, lack of knowledge of sexual transmitted disease and not using condoms, contribute to poor health (World Health Organization, 2021). Puberty in itself may be critical for the health in adult years, as this time of life involves rapid pubertal development of organ systems, brain plasticity, and dynamic social and behavioral change in young people (Viner et al., 2015). Further, family relations (Berg et al., 2017) and adversity in young years, are associated with negative long-term consequences (Socialstyrelsen, 2021a), affecting a person’s whole lifespan (Rose et al., 2014; Viner et al., 2015), for example leading to adult mental health problems (Copeland et al., 2015; Schlack et al., 2021), adult obesity (Ward et al., 2017), lower life expectancy and more work disability (Laditka & Laditka, 2018). Also, poor health may affect young people’s chances to contribute to the welfare society, as poor health may keep young people home from school. Also, poor health may demand healthcare appointments, which also have reported to negatively affect school attendance (Chingono et al., 2021). Thus, this may have problematic effects on optimal learning and development (Heyne et al., 2022) leading to low income jobs, with lower living standards as a result.

Mental health is a state of mental wellbeing that enables individuals to cope with normal daily stressors, to prosper in work, and contribute to his or her community (World Health Organization, 2011). This illustrates that there is a strong connection between the ability to master challenges in life and mental wellbeing which could be described as a general sense of control over one’s life and circumstances (Pearlin & Schooler, 1978). Mental health problems include a broad range of symptoms, from less serious mental stress to severe
symptoms fulfilling the criteria for a mental illness diagnosis- (Dalman et al., 2021b).

In Sweden, most young people report good health, but mental health problems and psychosomatic symptoms, such as depression, irritability, anxiousness, sleeping problems, stomach or back ache, headache, and dizziness are increasing (Folkhälsomyndigheten, 2018a, 2018b, 2019). Although mental health in young people has been subject to surveys for about 30 years, there is no given national ‘gold standard’ measurement instrument for mental health in young people in Sweden (Dalman et al., 2021b). This makes comparisons over time complex. In 2020, 14 to 18 percent of young women and nine to ten percent of young men, 16 to 29 years old, reported to feel mental distress (Dalman et al., 2021b). Approximately 160 000 people from 15 years old, suffered in 2017 from eating disorders, of whom 30 percent had not contacted healthcare (Clinton & Birgegård, 2017). Among high school students in Sweden during 2013, slightly more than 35 percent admitted to non-suicidal self-injurious behavior the past 12 months (Zetterqvist et al., 2013). Young people themselves view mental health issues as something that is expected and common (Hermann et al., 2022).

Swedish laws (Convention on the Rights of the Child (SSFS 2018:1107), 2018; SFS 2017:30) claim the right of children and young people to influence their healthcare. Hence, it is an obligation to include young people in decisions about potential treatment options, to attain increased health. Not including people in their healthcare decisions, may for example contribute to lower patient-reported health outcomes and lead to higher healthcare utilization (Hughes et al., 2018). Therefore, there is a need to offer individualized, youth friendly healthcare to best promote mental health in young people (Goicolea et al., 2018; Tylee et al., 2007).

Youth Health Clinics

Youth friendly health services offer available, accessible, acceptable, and equitable healthcare for young people (World Health Organization, 2012). Youth Health Clinics (YHCs) in Sweden, offer first line healthcare for young people, aged 13-25 years. YHCs are integrated within the Swedish healthcare system, as a complement to other health services, and can be run by the region, the municipality, privately or a combination of those actors (The Swedish Society for Youth Centers, 2015). All YHC activities are governed by the Social Services Act (SFS 2001:453) and the Health Care Act (SFS 2017:30). The YHCs are multi-professionally staffed, led by a manager with access to a physician having the medical responsibility and a midwife. Midwives and physicians work primarily to promote and increase sexual and reproductive health and rights. At most YHCs, there are healthcare counsellors that promote and treat mental health. In addition, some YHCs may also offer contact with a
psychologist and a dietician. In exceptional cases, the YHC may have resource to a physiotherapist.

YHCs play an important role in protecting young people’s rights to good sexual, physical and mental health, and in early detection of poor health (The Swedish Society for Youth Centers, 2015). YHCs are considered youth-friendly, and able to provide safe, respectful, holistic, and empowering care for their clientele (Thomson et al., 2022). Although the young people that come to a YHC are satisfied with the care, about 65 percent of young people never visit a YHC. Reasons for this may be that there is no need for support, the knowledge about the YHC is lacking, or geographical barriers (Wiksten-Almströmer, 2006). For example, the YHC patient population is 80 to 90 percent female (Sveriges Kommuner och Regioner, 2020). It is considered important for YHCs to provide a gender-equal perspective on sexuality at YHCs. One example of gender-equality is employing male healthcare professionals for YHCs to offer boys and young men the opportunity to talk to men about sexual health. Strengthening the gender-equality may lead to more boys coming to the YHCs, as well as offering appointment times for boys exclusively (Bådagård & Torstensson, 2008; Socialstyrelsen, 2000).

To detect poor health at early stages, assessment programs are implemented in healthcare. Assessment can be seen as a sorting process to identify as many people as possible with a potential health problem, and separate them from those without, to reduce the incidence and severity of the potential health problem, to increase the choice of treatment, and to reduce mortality (World Health Organization, 2020b). There is a multitude of assessment tools used at YHCs, to capture the health status in young people, both paper-based and digital. For example, the evidence-based SEXual Identification Tool (SEXIT) (Hammarström et al., 2019) is used at many YHCs. However, there is no national consensus on which health assessment tools to use. Hence, a structured, commonly used clinical digital instrument to identify overall health in young people is missing and potentially valuable.

Health and welfare

All human beings have the fundamental right to live a life in best possible health (World Health Organization, 1948). Human health is complex and depends on interactions of biological, psychological, and social factors (Engel, 1977), and dependent on the interplay between an individual and the society (Folkhälsomyndigheten, 2022). Providing the same chance for all people to experience good health, demands equal living conditions (Folkhälsomyndigheten, 2022). The health of a nation’s population is protected (to various extent), by the nation’s public sector – the welfare state (Center for Disease Control and Prevention, 2023). There are many components within the concept of welfare, for example, housing, education, the
social protection system, the healthcare system, and the environment (Benavides et al., 2018), which all embrace both personal and social aspects, and is strengthened by participation, promotion of wellbeing and decrease of health inequities (Raphael, 2014). The concept of the welfare system was created by the United Nations, to pronounce everyone’s right to a living standard providing adequate health and wellbeing (United Nations, 1948).

Countries with a well-developed public health sector have healthier citizens (Bambra, 2013) with longer life expectancy (Beckfield & Bambra, 2016). Although Sweden is a country with a well-developed healthcare system, and young people mostly are healthy (Folkhälsomyndigheten, 2018a, 2018b, 2019), health-inequities for young people exist regarding access between individuals with different needs of healthcare and between individuals with the same need of healthcare (Wagenius et al., 2019).

Health and welfare are closely connected. The mission of the welfare state, including the healthcare system has extended from treating poor health and disease to also include the promotion and prevention of health (Benavides et al., 2018). Promoting health to individuals includes helping them towards controlling factors that affect health. For example, to identify health risks, to meet individual needs, cope with the environment (World Health Organization, 1986), and to increase their knowledge about health behaviors (Fleary et al., 2018). Examples of risky health behaviors are poor living habits, i.e. binge-drinking, smoking, eating too much or too little, and insufficient physical activity (Kann et al., 2016). Based on sound evaluations, the most efficient methods of services should be offered to those in need of support (Aili & Hjort, 2010). Hence, the guidance of people towards good health includes individualized interventions and the right to health information and access to health services (World Health Organization, 1948).

**Young people in health and welfare**

Young people merit the same rights to the best possible health, as people of other age groups, according to the convention of the right of the child (UNICEF, 1989; UNICEF Sverige, 2009). However, young people are a vulnerable group in healthcare services. They often lack of autonomy (Higginbottom & Liamputtong, 2015) in healthcare settings as it may be challenging to not be in control over their own decisions connected to their health. Feeling uncomfortable to reveal their health concerns to someone they don’t know or feel understood by, may be an aggravating circumstance (Robards et al., 2019). Examples of healthcare organizational factors that expose young people’s vulnerable position, are lack of clarity of the responsibility to detect health risks in young people, and understaffing (Socialstyrelsen, 2013a).

Poor health in young people is costly for society (Department of Health and Social Care, 2013). The most common long-term conditions that contribute to societal costs in young people, are mental health problems, metabolic,
neurological, and respiratory conditions (Punjabi et al., 2022). In Sweden, the estimated total costs of sick-leave during 2021 was 66 billion Swedish Crowns (Skandia, 2021). Therefore, detecting health-related problems in young people should lead to early interventions (Punjabi et al., 2022) and is essential to prevent negative effects in adulthood (Socialstyrelsen, 2013b). Increasing health in young people and better equipping them for adulthood and helping them to participate in and contribute to society is of importance (Punjabi et al., 2022).

Physiotherapy

Physiotherapists are specialists in human activity and movement (World Confederation for Physical Therapy, 2019) with unique knowledge of the relationship between anatomy, neurophysiology, human movement control and the changes due to age, use, disease, and trauma (Smedal & Gjelsvik, 2020). Prevention, promotion, treatment and rehabilitation within physical, psychological, emotional and social wellbeing, are cornerstones to support patients to best possible quality of life and movement (World Confederation for Physical Therapy, 2019). Physiotherapy treatment methods aim to positively affect overall health, increased physical activity, positive body experience and improved function (Areskoug-Josefsson & Gard, 2015). Often, physiotherapy interventions are associated with behavioral change, for example to increase physical activity, in spite, of pain or fear of pain. Such interventions challenge psycho-social factors like fear-avoidance behaviors, coping strategies, social contexts, and self-efficacy beliefs, and thus demand knowledge of behavior change techniques (Asenlöf et al., 2005; Eisele et al., 2019; van Erp et al., 2019). Physiotherapists work in a multitude of clinical settings and are well familiar with interventions for all age groups. For young people, examples of treatment focus can be to improve mental wellbeing through meditative activities and physical activity interventions (Duberg et al., 2016; Mansfield et al., 2018). Another important part of physiotherapy is to contribute to increase health competency and health promotion by assessing young patient’s health and lifestyle behaviors (Dean et al., 2019).

Within the description of physiotherapy, lies also, research. Physiotherapy is a broad scientific field, which involves knowledge of human behavior and activity, as well as understanding lifestyle, health and living conditions. Cornerstones for physiotherapy research are for example, to ensure the ongoing growth and development of the profession and the identification of the unique contribution of physical therapy and its evolving scope of practice. Physiotherapy is anticipated to identify new research areas (World Confederation for Physical Therapy, 2019).

Behavioral medicine

According to the biopsychosocial model, human health is a complex interactions of biological, psychological, and social factors (Engel, 1977). Behavioral
medicine has its foundation in the biopsychosocial model and is an interdisciplinary field that integrates psychosocial and biomedical knowledge about health-related behaviors. It is used in research contexts and clinical situations, to diagnose, promote, treat, and rehabilitate patients. A behavioral medicine-based intervention may help to empower patients to self-manage and reduce their healthcare services dependency (Sandborgh, Åsenlöff, Lindberg, & Deniseon, 2010; Söderlund & Lindberg, 2001).

The behavioral medicine research field involves the development and integration of biomedical, psychosocial, and behavioral knowledge, and applies this knowledge in clinical context (Johnston & Johnston, 2017). Scientific research in behavioral medicine is interdisciplinary and patient-centered (Nash, 2018). The collaborative research approach involves to familiarization with knowledge of other professions to complement and improve one’s own discipline, for example to co-create research projects (Johnston & Johnston, 2017).

In physiotherapy, the behavioral medicine approach integrates psychosocial, behavioral and biomedical knowledge in assessment of the patient’s behaviors when choosing and applying treatment and behavior change methods and evaluating outcomes (Sandborgh et al., 2020). From a physiotherapeutic perspective, there are challenges to execute behavioral medicine interventions, based on lack of knowledge, role insecurity (Driver et al., 2017) and the lacking of time managements support from healthcare clinic managers (Driver et al., 2017; Fritz et al., 2019). Of course, the presence of a physiotherapist is crucial for physiotherapeutic behavioral medicine intervention and research. Although physiotherapeutic research within unfamiliar healthcare contexts may increase the knowledge about health, lifestyle and motivation for behavior change, and has potential to influence the healthcare organization aimed towards specific target groups (Dean et al., 2015), the physiotherapeutic perspective is not represented in all healthcare contexts.

Health and Welfare Technology

Health and Welfare Technology is a concept including a diversity of technological/digital interventions to improve the delivery of healthcare and welfare services (Hofmann, 2013). The technology-based interventions aim to maintain or promote health, wellbeing, and quality of life, as well as to increase efficiency in the delivery of welfare, and healthcare services. Also in focus, is improved working conditions (Wamala Andersson et al., 2021). Examples of health and welfare technology are communication support, disease monitoring, remote treatment, rehabilitation technology and social and emotional support and stimulation (Hofmann, 2013). Health and welfare technology is considered to have the potential to impact healthcare delivery, clinical trials and improve health outcomes (Sharma et al., 2018). It may also improve care relations and is congruent with patient-centered care (Krawczyk & Sawatzky, 2018).
The Swedish government and councils have shared goals for the development of electronic health (e-Health), for 2025, to put the individual in the center of care, further develop healthcare settings, and make healthcare and welfare equal, effective, accessible and safe (Socialstyrelsen, 2018). Health and welfare technology is intended for use in healthcare systems, and to impact patient clinical care (World Health Organization Europe, 2021). Opportunistic screening for psychosocial and mental health problems in young people has potential to disclose poor health, prevent morbidity, self-harm, and suicide (Goodyear-Smith et al., 2017). Health reporting to detect health risks before counselling has been received well by both young people and healthcare professionals (Bradford & Rickwood, 2015; Thabrew & Goodyear-Smith, 2019). However, there are challenges to develop and use health and welfare technology, for example to determine for whom it is useful, increase alienation from society, risk of improper surveillance, and threat people’s integrity and privacy (Hofmann, 2013). Also, in the procurement process of health and welfare technology implementation, only about 20 percent require evidence for its effectiveness (Richardson et al., 2022). These challenges should be considered when developing and implementing health and welfare technology into healthcare and welfare (Hofmann, 2013; Hofmann, 2015).

The production of new healthcare innovations and interventions, for example health and welfare technology tools, demands a participatory approach. The collaboration between for example, technology developers, healthcare professionals, and patients, ensure that relevant health outcomes are captured (Haywood, 2007; Staniszewska et al., 2011; Trujols et al., 2013), that the technology fits within the healthcare systems, and that it is adequate and durable for the users (Sharma et al., 2018). The inclusion of the users of healthcare services, in developing healthcare, is a way to put the patient in the center of his/her own care (Kaplan, 2016). Patient-centered care has potential to increase satisfaction and wellbeing for patients (Kuipers et al., 2019). In research, co-production projects ought to respect the participants’ knowledge and lived experiences, and honor democratic processes for positive social change and commitment to action (Brydon-Miller et al., 2003). There are different participation levels, for example non-participation (manipulation), consultation (consulted and informed) and shared decision making (equal power between researchers and participants) (Arnstein, 2019; Hart, 1992). A participatory approach strengthens a research project’s scientific rigor, relevance, and reach (Balazs & Morello-Frosch, 2013).

The view on healthcare has changed and is today looked upon as a service, being co-produced by the healthcare professional and the patient/client who wants help for a health-related problem (Batalden et al., 2016). Taking part of decisions and co-producing one’s own care leads to increased self-confidence, trust, self-esteem and empowerment for the individual, which in turn supports recovery and self-management in the society (Social Care Institute for Excellence, 2022). This highlights the equality and reciprocity in relationships,
power balance between stakeholders, assets-based and facilitating rather than delivering the service (Masterson, 2022). In Sweden, people have the lawfully regulated right (SFS 2014:821) (Socialdepartementet) to actively participate in healthcare situations. This is in line with the Helsinki Declaration, which is used to ensure ethical research performances (The Act concerning the Ethical Review of Research Involving Humans (2003:460), 2004).

This project intended to use the experiences of the end users i.e., young people in ages 16-23 years of age, and YHC healthcare professionals to develop a health and welfare technology tool for identification of health-related problems in young people.

Health Belief Model

A broad definition of health behaviors are actions of an individual, group or organization which affects health, through its determinants, correlates and consequences, such as policy change, policy development and implementation, improved coping skills and improved life quality (Parkerson et al., 1993). Another way to explain health behaviors are, for example, as beliefs, expectations, motives, values, perceptions, personality characteristics, overt behavior patterns actions and habits that relate to health maintenance, health restoration, and health improvement (Gochman, 1982, 1997).

Behavior change in health can be explained by many theories and are important to explain mechanisms to promote change (Davis et al., 2015). The core of Health Belief Model (HBM) is that people will be more engaged in healthy behavior if they believe that they may be at risk for a poor health condition, and that the consequences of the condition may be serious. If a healthy behavior can reduce the risk for attaining a disease or condition, or reduce the severity of that condition, and the possibilities for adapting to that healthy behavior are stronger than the barriers, chances for behavior change towards healthy behaviors increase (Skinner et al., 2015).

The core constructs of HBM are the individual beliefs perceived susceptibility, perceived severity, perceived threat, perceived benefits, and perceived barriers. The intervention strategies to induce behavior change in individuals are connected to the constructs. The construct perceived susceptibility concerns finding populations that may be at risk for poor health, defining the level of risk for poor health, and anchor an individual’s perception about the health risks, in the reality. The construct perceived severity involves clarifying what consequences a condition or risk behavior may involve, and to trigger emotions of distress and regret in the individual. In continuation, the perceived benefits construct has focus on helping individuals to shift perspective towards what may be gained by a changed behavior, by providing information and arguments for a healthier behavior. Identifying and reducing perceived
barriers is done by correcting misinformation, reassurance, and assistance (Skinner et al., 2015).

Other constructs included in HBM are not as thoroughly defined, for example cues to action, suggesting that internal feelings of threat may trigger behavior change (Skinner et al., 2015). These individual beliefs are modified by age, gender, ethnicity, personality, socioeconomics, and knowledge. From Social Cognitive Theory (SCT), the self-efficacy concept has been included in HBM, and highlights the role of learning and human agency in behavior (Skinner et al., 2015).

The HBM constructs have all together strong validity to influence health behaviors (Skinner et al., 2015). The perceived barriers construct is the strongest construct and has been validated for influencing all health behaviors, including treatment (Carpenter, 2010). The second strongest construct is perceived benefits, which has effect on prevention and risk reduction behaviors (Janz & Becker, 1984). Perceived susceptibility has shown more effect on random preventative health behaviors, for example participating in a screening situation, compared to behaviors that need to be maintained, such as adequate physical activity or non-smoking (Janz & Becker, 1984).

In young people, studies have found the HBM constructs perceived benefits, and perceived susceptibility as most important for the intention to participate in health assessment situations, and for help-seeking behavior (Cho & Cho, 2022; O'Connor et al., 2014). Perceived susceptibility was found leading to help-seeking behavior if young people are health conscious (O'Connor et al., 2014). Previous experiences of perceived benefits in health scanning situations were important in determining the willingness to take part in health scanning again (Cho & Cho, 2022). This indicates that HBM can be a usable model when designing health promotion programs to engage young people.

This thesis identifies health behavior, foremost in the users of the health and welfare technology tool that is being developed - the young people and healthcare professionals, specifically, to adapt to a new health assessment routine. Further, the clinical health assessment provides an opportunity for young people and healthcare professionals to talk about health and health behaviors. This has potential to create a joint understanding for health, and the consequences of risky healthy behavior. This project has been guided mostly by the HBM constructs perceptions of barriers, benefits, and susceptibility. The constructs are included in the development stages and the clinical YHC setting.
Rationale

Young people go through an overall change and development phase. The adolescent years have been found essential for gender identity, sexuality development, and lays the ground for adult overall health and wellbeing. Social support and a sense of mastery are needed for young people’s personal development and adaption to healthy lifestyle habits.

YHCs are appreciated by young people. YHC healthcare professionals promote and support young people’s health and health behaviors. Research results support healthcare professionals’ use of behavioral medicine for understanding and being supportive of behavior change. The focus at YHCs is broad and includes mental, sexual, and reproductive health and rights. However, young people also present physical health issues at the YHC. It is commonly accepted that early identification of disease and health risk behaviors is important for sustainable individual health, and for societal welfare. Opportunistically assessment of health-related problems has potential to identify poor health and has been appreciated by young people with need of healthcare, and by healthcare professionals.

YHCs use different health questionnaires to assess young people’s health and offer different support for young people. There is currently no standardized, unified health assessment tool to identify young people’s health or health related problems at YHCs in Sweden. Health and welfare technology aim to impact clinical healthcare and healthcare organizations, and digitalization of healthcare is essential.

Therefore, the focus of this thesis lies within the development of a digital health report system for young people, to increase the knowledge of the health status of the YHC young people population, and to standardize the health assessment at YHCs.
Objectives

This project’s overall objective was to develop a health and welfare technology tool to identify, and increase knowledge, about health-related problems in young people visiting YHCs.

Study I
To explore young people’s view on content and design of an Electronic Patient-Reported Outcome to provide an overview of their health and health-related problems when visiting a YHC, and their opinion on what healthcare needs to consider when using the Electronic Patient-Reported Outcome.

Study II
To develop a collection of electronic patient-reported outcome questionnaires – an Electronic Health Report Form prototype. The Electronic Health Report Form prototype should contain electronic patient-reported outcome questionnaires in four health areas, to identify health and health-related problems in young people visiting YHCs. Also, the aim was to evaluate the usability of the Electronic Health Report Form prototype.

Study III
To assess the process, resources, management, and scientific feasibility aspects of a Youth Health Report System prototype, developed within a YHC clinical context, in advance of an intervention Stepped Wedge Cluster Randomized Trial.

Study IV
To examine whether the level of physical activity, sedentary behavior, perceived social support and self-efficacy for healthy sexual behavior, mediate association between sense or mastery and mental wellbeing in young people at YHCs.
Methods

Design

To fulfill the overall objective of this project, qualitative, quantitative, and mixed methods were used. A methodological overview of studies I to IV is presented in Table 1.

Table 1. Overview of the methodology in studies I-IV.

<table>
<thead>
<tr>
<th>Study</th>
<th>Design</th>
<th>Sample</th>
<th>Data collection</th>
<th>Data analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Qualitative, explorative</td>
<td>15 young people</td>
<td>Semi-structured individual interviews</td>
<td>Inductive latent content analysis</td>
</tr>
<tr>
<td>II</td>
<td>Mixed methods, development, and usability testing study</td>
<td>Development: 8 researchers in expert panel, one IT-company employee; Usability evaluation: 4 young people, 3 healthcare professionals, 7 researchers</td>
<td>Development: Literature search/collective knowledge from 8 researchers; Usability evaluation: Semi-structured interviews, usability questionnaire</td>
<td>Development: Iterative process to assess quality and select questionnaires; Usability evaluation: Inductive manifest content analysis, descriptive statistics</td>
</tr>
<tr>
<td>III</td>
<td>Mixed methods, feasibility study</td>
<td>54 young people and 11 healthcare professionals</td>
<td>Questionnaires and semi-structured group interviews</td>
<td>Descriptive statistics, Thematic analysis</td>
</tr>
<tr>
<td>IV</td>
<td>Cross-sectional</td>
<td>223 young people</td>
<td>Questionnaires</td>
<td>Descriptive data in frequencies, simple linear regression, multiple regression, Sobel’s test.</td>
</tr>
</tbody>
</table>
Project development phases and finish point

This research project intended to develop a health and welfare technology tool, to be used in clinical studies and evaluated for potential clinical healthcare use. In the project, the tool for clinical use was viewed as an intervention that had potential to affect the health assessment at YHCs and thus the healthcare service, and in the end, health in young people. During the development, different terms have been used for the project features. This thesis uses the final terms. All developed features are digital. The development of the health and welfare technology tool took place in six stages, in studies I, II and III. In the project’s finish point, stage seven, collected health data were explored (study IV).

During the development, several participant groups were included to reflect various perspectives. Young people and healthcare professionals participated on a consultative level (Arnstein, 2019; Hart, 1992). Also, study II included an Information Technology (IT) company and a researcher expert panel. The participants’ opinions for development and improvements of the Health Report System guided and influenced the researchers’ decisions. Figure 1 provides an illustrative overview of the different studies and the development stages, as well as the studies’ focus.

![Figure 1. An illustrative overview of the four studies in the doctoral project.](image-url)
To develop the health and welfare technology tool, the researchers were guided by the COnsensus-based Standards for the selection of health Measurements Instruments (COSMIN) (Prinsen et al., 2016), (study I and II). The COSMIN guidelines are presented in Figure 2.

![Figure 2. The COnsensus-based Standards for the selection of health Measurement Instruments (COSMIN) guidelines (Prinsen et al., 2016) construction process is illustrated.](image)

**Stage 1: Explore (study I)**
To find out what kind of health domains and questions to include when developing a health and welfare technology questionnaire, and how to design the questionnaire, a semi-structured interview guide (appendix; study guide I) was constructed by the researchers to use in individual interviews. A sample of young people with health appointments at a YHC, were asked about their opinions, which identified health domains of interest to measure; physical-, mental-, sexual health and social support. The questions needed to be kept as general health questions within the identified health domains, but also include some specific questions about mental health.

**Stage 2: Develop (study II)**
The researchers and an IT-company participated in the construction of the Health Report System, presented in Figure 3. This stage included developing study information, a Health Report Form, a Case Report Form, an Evaluation Questionnaire, and an Action Report Form. The digital features intended for
clinical use at YHCs are the Health Report Form and the Case Report Form. All other features are study-specific and needed only for the research project.

Figure 3. Illustration of the Health Report System features.
**Study information**

To inform potential participants about the studies, information in writing and film were constructed and digitalized, together with the obligatory consent to participate in the research project and included in the Health Report System.

**Intervention outcome measures**

*Health Report Form*

To develop an intervention questionnaire (Health Report Form), the results of study I guided a structured literature search within mental health, physical health, sexual health, and social support. An iterative process to select the best suited patient-reported outcome questionnaires took place amongst the researchers and ended in a consensus decision about what questionnaires to include (study II). The selected questionnaires had at least acceptable reliability and validity in its original language. However, some questionnaires were not validated for the YHC age group 12 to 23. Others were not validated for the age group, but were used in large Swedish studies with participants from 16 years of age (Dalman et al., 2021a). The questionnaires are presented in Figure 4. A study-specific constructed self-efficacy question for behavior change (Bandura, 2005) was added, with the recommended 100-poining Numerical Rating Scale (NRS) for responses.

The selected patient-reported outcome questionnaires were first compiled in a paper version. The questionnaire items and response options were coded in Microsoft Excel and the questionnaires were then digitalized by the IT-company. The Health Report Form was divided into sections based on content: background, physical health (including lifestyle habits), mental health, sexual health, and social support, and finally the self-efficacy question. Based on the study I results, each questionnaire started with the visual aid of an emoji, to explain its’ content. The emojis were all free to use from https://pixabay.com/sv/images/search/emojies/. Table 2 provides details of the included patient-reported outcome questionnaires, within each health domain.

Table 2. The health areas and health questionnaires of the Health Report Form for the intervention.

<table>
<thead>
<tr>
<th>Health area</th>
<th>Questionnaire</th>
</tr>
</thead>
<tbody>
<tr>
<td>Background questions</td>
<td>SEXual Identification Toolkit (Hammarström et al., 2019) (SEEXIT) (age, housing, living with, birthplace, parents’ birthplace, gender, sexual orientation, level of education)</td>
</tr>
<tr>
<td>Physical health</td>
<td>Questions for the National Guidelines: Living Habits (Socialstyrelsen)*</td>
</tr>
</tbody>
</table>

26
Alcohol Use Disorders Identification Test – Consumption* (Audit-C) (Bradley et al., 2003; Bush et al., 1998)

Questions for the National Guidelines: Living Habits, indicator questions for physical activity (Kallings; Socialstyrelsen)

Health Behavior in School-aged Children (HBSC) (King et al., 1996)

Mental health

Generalized Anxiety Disorder 7-item scale (GAD-7)** (Spitzer et al., 2006)

Patient Health Questionnaire-9 (PHQ-9)** (Kroenke et al., 2001)

The SCOFF Questionnaire (acronym from the questions) (Morgan et al., 1999)

Sexual health

SEXual Identification Toolkit (Hammarström et al., 2019) (SEEXIT); sexual health and experiences of violence

Social support

Berlin Social Support Scales (BSSS)*; sub-scales “need for support” and “support-seeking” (Schulz & Schwarzer, 2003) (study II)

6-item Revised UCLA loneliness scale (RULS-6) (Wongpakaran et al., 2020) (study III & IV)

*Not validated questionnaire for the YHC age group
** Not validated for the YHC age group but used in large national studies

Case Report Form

The researchers constructed a health summary consisting of with bar graphs and optional text, to inform healthcare professionals of the health status of the young people, the Case Report Form. The bar graphs’ colors were green (good health/low risk), yellow (increased risk for poor health or risky health behavior) and red (apparent risk for poor health or risky health behavior) and were intended to provide the healthcare professionals at the YHC with quick overview information on the young person’s health status. An extract of the Case Report Form bar graphs is displayed in Figure 4. When possible, the levels were set based on the included questionnaires’ instructions. When demanded, the research group decided the cut-off scores. The Case Report Form also offered the responses in text presented after the Case Report Form bar graphs.
Assessment of evaluation measures

Evaluation Questionnaire

An Evaluation Questionnaire was developed to match and evaluate the Health Report Form outcomes, with background questions. The selected questionnaires were compiled in a paper version and digitalized by the IT-company. The Evaluation Questionnaire contained background questions (age, biological sex, living situation, marital status, country of birth, employment, and education level) and questions about mental health, physical health, sexual health, and social support. The questionnaires included in the Evaluation Questionnaire and the health areas are portrayed in Table 3.

Table 3. Characteristics of the instruments included in the Evaluation Questionnaire.

<table>
<thead>
<tr>
<th>Health area</th>
<th>Questionnaires</th>
</tr>
</thead>
<tbody>
<tr>
<td>Background questions</td>
<td>Age, sex, birthplace, parents’ birthplace, housing, living with, level of education</td>
</tr>
<tr>
<td>Physical health</td>
<td>International Physical Activity Questionnaire (IPAQ) (Craig et al., 2003)</td>
</tr>
<tr>
<td>Mental health</td>
<td>Sense of Mastery Scale (SOMS-7) (Pearlin &amp; Schooler, 1978)</td>
</tr>
<tr>
<td></td>
<td>Short Warwick-Edinburgh Mental Well-Being Scale (SWEMWBS) (Koushede et al., 2019) (study II and III)</td>
</tr>
</tbody>
</table>
12-items General Health Questionnaire (GHQ-12) (Goldberg, 1972) (study IV)

Sexual health

Self-efficacy for protection against Sexual Transmitted Infection, unwanted pregnancy and having sex as sober

Social support

The Oslo 3-item Social Support Scale (OSSS-3) (Dalgard SO, 1996) (studies II & III)

Minnesota-Manchester Quality of Life, adolescent version. subscales social functioning (Bhatia et al., 2002) (studies II, II & IV)

Action Report Form

An Action Report Form was developed to enable evaluation of the healthcare professionals’ actions after the health assessment with the young person. Figure 5 shows the questions and response options for the healthcare professionals to register.

Stage 3: Evaluate usability (study II)

The usability evaluation focused on the study information and the Health Report Form. To find improvement possibilities, young people were introduced to the study information, consent, and the Health Report Form when interviewed digitally. The healthcare professionals were also introduced to the Case Report Form. The interviews were individual. All participants also responded to a System Usability Scale with response options on a Likert scale from 1 through 10. The researcher expert panel were introduced to the study information, consent, and the Health Report Form when interviewed digitally as a group. They did not respond to the usability questionnaire.
<table>
<thead>
<tr>
<th>ELECTRONIC ACTION REGISTRATION FORM</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Choose your profession</strong></td>
</tr>
<tr>
<td>☐ Midwife</td>
</tr>
<tr>
<td>☐ Registered healthcare counsellor/psychologist</td>
</tr>
<tr>
<td>☐ Doctor</td>
</tr>
<tr>
<td>☐ Other</td>
</tr>
<tr>
<td><strong>The visit took place</strong></td>
</tr>
<tr>
<td>☐ Physically</td>
</tr>
<tr>
<td>☐ Digitally</td>
</tr>
<tr>
<td><strong>The patient has an ongoing healthcare contact outside the YHC, regarding the following health area</strong></td>
</tr>
<tr>
<td>☐ Physical health</td>
</tr>
<tr>
<td>☐ Mental health</td>
</tr>
<tr>
<td>☐ Sexual health</td>
</tr>
<tr>
<td>☐ Social support (i.e., emotional support and care)</td>
</tr>
<tr>
<td>☐ No ongoing healthcare contact outside of YHC</td>
</tr>
<tr>
<td>☐ I do not know</td>
</tr>
<tr>
<td><strong>What health areas were discussed during the present visit?</strong></td>
</tr>
<tr>
<td>☐ Physical health</td>
</tr>
<tr>
<td>☐ Mental health</td>
</tr>
<tr>
<td>☐ Sexual health</td>
</tr>
<tr>
<td>☐ Social support (i.e., emotional support and care)</td>
</tr>
<tr>
<td>☐ No ongoing healthcare contact outside of YHC</td>
</tr>
<tr>
<td>☐ I do not know</td>
</tr>
<tr>
<td><strong>Planned post-appointment</strong></td>
</tr>
<tr>
<td>☐ New appointment on young person’s own initiative</td>
</tr>
<tr>
<td>☐ Booked re-appointment to YHC</td>
</tr>
<tr>
<td>☐ Young person rejects suggested re-appointment at the YHC</td>
</tr>
<tr>
<td>☐ Referral for healthcare or social care, other than the YHC</td>
</tr>
<tr>
<td>☐ Midwife</td>
</tr>
<tr>
<td>☐ Registered healthcare counsellor/psychologist</td>
</tr>
<tr>
<td>☐ Doctor</td>
</tr>
<tr>
<td>☐ Other</td>
</tr>
</tbody>
</table>

*Re-appointment at the YHC to:

Figure 5. The Action Report Form, in which the healthcare professionals registered their planned actions after the young people’s health assessments at the Youth Health Clinic.
Stage 4: Improve the Health Report System
Based on the usability evaluation results, the researchers made suggested improvements to the Health Report Form, for example removing unnecessary questions, defining unclear terminology, and reducing the amount of questionnaire information. Also, the social support questionnaire was exchanged for a more valid and reliable questionnaire. Further, the emoji pictures were updated. The final choice of emoji picture to start every questionnaire, is presented in Figure 6.

![Figure 6](image)

Figure 6. The final choice of emoji picture, marking the start of each questionnaire in the Health Report Form (free for use at www.pixabay.com).

Stage 5: Assess feasibility of study planning and evaluation questionnaire (study III)
In advance of a study to test the intervention effects of using the Health Report Form and the Case Report Form for assessing young people’s health at YHCs, a feasibility study was performed (study III). Young people contributed by responding to the health questions in the Evaluation Questionnaire and the Health Report Form. Healthcare professionals contributed with their experiences and opinions on using the Health Report System during the study period. Two informal workshops with healthcare professionals were held to deepen the understanding of the clinical flow at a YHC, and to facilitate recruitment of young people to the research studies. A control group and an intervention group were included, for example, to mirror the design and study procedure of a Stepped Wedge Cluster Randomized Trial.

Stage 6: Improve the Health Report System
Based on the feasibility assessment results, the researchers made further improvements to the Health Report System to better suit a fourth-coming Stepped Wedge Cluster Randomized Trial. Examples of changes were to discuss with each YHC that had accepted to participate in the study, how to
enable time to allow recruitment of young people, how to create time for the health assessment conversation, to adjust clinical routines, and to offer continuous contact with YHCs for support. In the Evaluation Questionnaire, the primary outcome measure was exchanged to enable cost-economic calculations.

Stage 7: The finish point

Based on the study III feasibility assessment, a Stepped Wedge Cluster Randomized Trial intervention study was executed. Before the start and throughout the time of the study, continuous contact was kept with the YHCs, through planned digital and physical meetings, two hours of open meetings per week and email-contact. Before study start, the healthcare professionals received the educational material (written and videos) and live digital education. Data were collected from September 15\textsuperscript{th}, 2022, through February 9\textsuperscript{th}, 2023, at fourteen YHCs in three Swedish regions. The control group and intervention group of young people were informed of the study. Those who consented were either part of the control group or the intervention group. The control responded to the Evaluation Questionnaire. The intervention group responded to the Evaluation Questionnaire, and in addition, also to the Health Report Form questions. For the intervention group, healthcare professionals used the Case Report Form for the health assessments. For all participating young people, the healthcare professionals registered their planned actions in the Action Report Form.

In study IV, data from the Evaluation Questionnaire from both groups were used to explore association between health variables and to describe health in young people visiting the included YHCs. This way, study IV was tied to study I through providing insight to young people’s health based on the health areas that young people found important.

Settings

In the four studies participated altogether 17 YHCs from the four Regions; Västmanland (some participated in more than one study), Örebro County, Uppsala, and Dalarna in the project. The YHCs came from both rural and urban locations and were staffed with between two to approximately 20 healthcare professionals. To explore young people’s opinions towards a digital health assessment tool (study I), five YHCs in two regions (Västmanland and Örebro County) participated. To evaluate the usability (study II) of the Health Report Form and Case Report Form, one YHC from Region Västmanland participated. The feasibility (study III) was tested at one YHC in Region Dalarna. To add to the results for the Case Report Form, not published data from the study II was included and hence part of study III. For study IV, data from fourteen YHCs were included; five YHCs were in Region Västmanland,
five YHCs were from Region Uppsala and four YHCs were from Region Dalarna. Figure 7 gives an overview of the number of YHCs participated in each study and Regions.

Figure 7. Illustration of the participating Youth Health Clinics’ regional location. Data on the Case Report Form were included in results for study III.

Participants

In total, 331 people participated in the research project. Of those were 296 young people with YHC health assessment appointments, 26 were YHC healthcare professionals, eight were researchers (expert panel), and was the IT-company employee. The demographics of the young people that participated are presented in Table 4. In the interviews and workshops to evaluate the usability (study II) and feasibility (study III) of the Health Report System, the participating healthcare professionals were a manager, a doctor, an
assistant nurse, midwives, healthcare counsellors and psychologists. The participating researchers of the expert panel had different healthcare professions: three physiotherapists, one midwife, one dietician, one psychologist, one healthcare counselor and one nurse. The academic degrees of the group were diverse; four were associate professors, one was a researcher, one was professor, and two doctoral students. One of the researchers was male.

Table 4. Characteristics of the young people included in the project’s four studies.

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Study I</th>
<th>Study II</th>
<th>Study III</th>
<th>Study IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total number (n) of participants</td>
<td>15</td>
<td>4</td>
<td>54</td>
<td>223</td>
</tr>
<tr>
<td>Age in years, mean Standard Deviation (SD)</td>
<td>19,13 (1,96)</td>
<td>17,5 (1,91)</td>
<td>18,43 (2,33)</td>
<td>18,22 (1,91)</td>
</tr>
<tr>
<td>Female, n (%)</td>
<td>11 (73,33)</td>
<td>4 (100)</td>
<td>42 (89,36)</td>
<td>209 (93,7)</td>
</tr>
<tr>
<td>Born in Sweden, n (%)</td>
<td>14 (93,33)</td>
<td>4 (100)</td>
<td>46 (97,87)</td>
<td>207 (92,8)</td>
</tr>
<tr>
<td>Living with parent/guardian, n (%)</td>
<td>10 (66,66)</td>
<td>3 (75)</td>
<td>34 (72,34)</td>
<td>215 (96,4)</td>
</tr>
<tr>
<td>Student, n (%)</td>
<td>15 (100)</td>
<td>4 (100)</td>
<td>39 (74,47)</td>
<td>148 (66,4)</td>
</tr>
<tr>
<td>High school, n (%)</td>
<td>10 (66,66)</td>
<td>4 (100)</td>
<td>23 (48,94)</td>
<td>133 (59,6)</td>
</tr>
<tr>
<td>Working, n (%)</td>
<td>8 (17,02)</td>
<td>13 (27,66)</td>
<td>59 (26,5)</td>
<td></td>
</tr>
</tbody>
</table>

**Procedure**

Healthcare professionals were active in recruiting young people for participation in the project’s studies. They informed of the study and asked for interest to participate (studies I and II). In study III, the healthcare professionals also registered the young people in the Health Report System and thus sent electronic information and consent to participate. For study IV, young people were informed of the study at arrival at the YHC. Some were informed of the ongoing study verbally and by reading study advertising in the waiting room, while others were only provided with the ads. They scanned a Quick Response (QR) code, that lead to the Health Report System content, including the specific study information and consent to participate.

The healthcare professionals were informed of how to use the Health Report System before the start of studies III and IV and before the start of the intervention phase for each study. The healthcare professionals were offered support throughout the studies. In study III, close e-mail or phone contact was encouraged, and a few digital video meetings were planned. In study IV, close e-mail or phone contact was encouraged, and had two planned open digital meetings per week.
Data collection

For the project, various data collection methods were used. For all studies, informed consent was collected before the start of the study. Study I collected qualitative data exclusively. Study II collected qualitative, quantitative data and data from a literature search. Also, the expert panel’s clinical work and research experience contributed with suggestions for questionnaires to select, and ideas for searching for new questionnaires for the Health Report Form. Study III collected qualitative and quantitative data, while study IV focused only on quantitative data.

Interviews (studies I, II and III)

Study I explored the opinions of young people concerning the content and design of a potential health and welfare technology tool for use at YHCs, by individually interviewing young people at YHCs.

Study II investigated the usability of the Health Report Form and Case Report Form by interviewing young people and YHC healthcare professionals. The interviews with healthcare professionals were face-to-face and individual. The interviews with young people were individual, except for one interview with two young people. All interviews with young people were digital due to a water damage at the YHC. The expert panel members were interviewed digitally and in group, for convenience due to distance.

Study III assessed the feasibility of the Health Report System by interviewing YHC healthcare professionals. The interviews were held digitally and in three groups of two to three healthcare professionals, based on their profession: mid-wife and assistant nurse, healthcare counsellors and psychologists. The feasibility aspects in focus were explored the process (recruitment potential), resources (study administration and IT-platform satisfaction) and the management aspect (data accessibility, and interpretation of the Case Report Form).

The author of this thesis performed all interviews, sometimes assisted by a co-author (studies II and III). A semi-structured guide (appendix, study guides I, II and III), and a digital audio-recorder were used for all interviews. The time for the interviews ranged between 30 to 90 minutes. Demographic data was collected before each interview. All interviews were transcribed verbatim.

Literature search (study II)

A literature search was performed at the end of 2019 to find suiting questionnaires. The search was based on a broad PubMed scope and internet search, using keywords and phrases. The references in all identified studies were also explored. Further, a Swedish website targeted to healthcare professionals, to
help find reliable and valid health questionnaires, primarily concerning mental health and social support, was consulted for appropriate questionnaires.

Questionnaire data (studies II, III and IV)
Study II collected data on usability from young people and healthcare professionals, from the System Usability Scale (Brooke, 1996). The 10 statements are responded to on a Likert-scale with response options ranging from Totally disagree (1) to Totally agree (5). The Swedish version of the System Usability Scale 1,4_sv (Göransson, 2001-2011) was used.

Study III evaluated scientific aspects of feasibility by assessing the data collected from the Evaluation Questionnaire, in the Health Report System, ranging over physical-, mental-, and sexual health, and social support. Young people responded to the Evaluation Questionnaire health questions before their YHC appointment.

Finally, study IV used collected data from the Evaluation Questionnaire to search for associative relations between the dependent variable (mental well-being), the independent variable (sense of mastery) and potential mediating variables (levels of physical activity, sedentary behavior, self-efficacy for healthy sexual behavior and social functioning.
Data analyses

Interviews (studies I, II and III)

The interviews from study I and II were analyzed by inductive content analysis (Graneheim et al., 2017; Graneheim & Lundman, 2004; Lindgren et al., 2020). The interviews from study III were analyzed with Thematic Analysis (Braun & Clarke, 2006).

For each study, the transcripts were read several times to create familiarity with the data. In the start, the thesis’ author and a co-author read and coded the same transcripts separately, to strengthen the consensus of which were the items with meaning. Before proceeding, comparisons between the coding work were made to enhance the credibility. In the final stages of the content analysis, all co-authors participated to ensure that the content of each category created a unit and was separated from other categories. The themes of the thematic analysis created during repeated contact with the co-authors. Table 5 gives an example of the analysis process of study II.

Table 5. Example of the schematic analysis process of study III.

<table>
<thead>
<tr>
<th>Transcription</th>
<th>Condensation</th>
<th>Code</th>
<th>Sub-category</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>I think all ... important parts were there ... everything from ... well sexual issues are usually... why young people kind of go there ... but there are other things as well. Like violence and relationships and stuff like that. I think it was a great mix of everything.</td>
<td>I think all parts were there, sexual issues but other things as well. It was a great mix of everything.</td>
<td>Good mix of questions from different health areas.</td>
<td>Can identify the right health areas, appropriate for young people.</td>
<td>Captures overall health of young people but needs clarification.</td>
</tr>
</tbody>
</table>
Literature search (study II)

The expert panel of eight researchers participated in an iterative analysis process, discussing the results from the literature search, reference search and suggestions from the expert panel. The questionnaires were evaluated for reliability and validity, questionnaire length, target group and if they had been translated into Swedish. The iterative process helped to limit the selection of included questionnaires and ended when consensus had been reached among the expert panel.

Questionnaires (studies II, III and IV)

In study II, the System Usability Scale scores for each item and participant were calculated and converted into a total value for each participant according to instructions (Lewis, 2018). In study III, Microsoft Excel was used for the quantitative data descriptive summary statistics, to assess the feasibility aspects.

Joint data analysis of feasibility (study III)

The feasibility of the study procedure and the Evaluation Questionnaire, the process (recruitment potential), the resources (study administration and IT-platform accessibility), management (data accessibility, interpretation of Case Report Form) and the Evaluation Questionnaire scientific rigor (variation of data and missing items) were examined in a joint assessment. The researchers assessed data first separately, followed by a group discussion to end in a final assessment of all feasibility aspects. The feasibility assessment matrix is presented in Table 6.

Table 6. Illustrating the matrix used to assess the feasibility aspects.

<table>
<thead>
<tr>
<th>Feasibility aspects</th>
<th>Feasibility criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Process</td>
<td>Estimation of 30% of eligible young people to participate</td>
</tr>
<tr>
<td>Recruitment potential</td>
<td></td>
</tr>
<tr>
<td>Study administration</td>
<td>Is the education material understandable and the study procedure manageable, from a healthcare professional’s time and effort perspective, when using the Information Technology (IT) platform?</td>
</tr>
<tr>
<td>IT-platform accessibility</td>
<td>Is the work with the IT-platform acceptable?</td>
</tr>
<tr>
<td></td>
<td>Were there any technical problems obstructing the feasibility of using the IT-platform and if so, which?</td>
</tr>
</tbody>
</table>
Management

Data accessibility
Was the access to Case Report Form and action registration form in the IT-platform acceptable?

Interpretation of the Case Report Form
Was the healthcare professionals’ interpretation of the Case Report Form satisfactory?

Scientific

Variations of data
Was there any ceiling- to floor effects – thus, the variations in the data were acceptable?

Missing items
Was the number of items lacking responses acceptable?

Statistical analyses of mediating associations of lifestyle behaviors (study IV)

In study IV, data management and statistical analyses were performed with SPSS Statistics for Windows, version 28.0.1.0, the SPSS tool PROCESS (Hayes), and an online Sobel’s test calculator (Preacher & Leonardelli, 2010-2023). (Baron & Kenny, 1986). Four conditions were needed for mediation:

The independent variable must significantly predict the dependent variable.

1. The independent variable must significantly predict the mediator. The pathways for conditions 1 and 2 are illustrated in Figure 8.

2. The mediator must significantly predict the dependent variable when controlled for the independent variable.

3. The effect of the independent variable on the dependent variable must be less when controlled for, compared to the effect in step 1.

An SPSS handbook (Field, 2018) was used to guide the exploration of the conditions.

To examine the mediation effects on the variables high, moderate, and low physical activity, sedentary behavior, sexual health self-efficacy and social functioning, between sense of mastery and mental wellbeing, regression analyses were performed, following examples from Baron and Kenny (1986) and Field (2018). The standardized coefficients (β) and significance levels are reported for each path.
Condition 1 was tested with simple linear regression to explore the potential associations, between the independent variable and the dependent variable. Condition 2 was tested with simple linear regression to explore the potential associations between the independent variable and the mediator variables. Condition 3 was tested with multiple regression to explore if the potential mediators significantly affected the dependent variable when the independent variable was controlled for, also revealing the mediator variables’ direct effect on the dependent variable. Finally, condition 4 was tested through the search for complete or partial mediation towards the dependent variable. If there no longer is a correlation between the independent and the dependent variable, there is a complete mediation. If the direct relationship of the independent variable to the dependent variable is less in the fourth regression than in the first, partial mediation is present. This is more realistic than perfect mediation (Baron & Kenny, 1986).

Multiple regression was used to analyze the non-standardized (B) and standardized (β) coefficients with respective p-values and to reveal indirect effect of the mediator on the DV, when the IV was controlled for. The significance of the indirect effect was analyzed, using Sobel’s test in the SPSS tool PROCESS (Hayes).
Ethical considerations

The four studies in this thesis were ethically approved (Study I, Dnr 2017/484 and study II-IV, Dnr 2020-01921) and performed according to the principles of the Declaration of Helsinki (The World Medical Association, 1964). Young people with an YHC appointment were invited to participate with the freedom to decline without any consequences. However, many young people come to the YHC with friends, and some with a parent, which may have an impact on their choice. Further, the studies include young people under 18 years of age. According to Swedish law, young people from 15 years and whom are able to realize what participation in research surveys means, are eligible, without parental consent, to decide to participate in research, after being informed of the study conditions, responsibilities and rights (The Act concerning the Ethical Review of Research Involving Humans (2003:460), 2004). In this project, the young participants were in direct contact with the healthcare professionals at the YHCs. Hence, they were able to determine each participant’s ability to understand the conditions of participating. The sensitive questions may have caused the participants to feel uncomfortable. Therefore, the informed consent was essential. Also, the health areas and nature of the questions were based on the opinions of young people (study 1). Further, if the sensitive questions were to cause any reactions in the young people, the YHCs were qualified to offer support to the young people if needed. Overall, being able to identify health risks or poor health in young people in early stages is important both on individual and societal level (Socialstyrelsen, 2021a). Hence, the benefits were found larger than the potential personal costs.

The healthcare professionals participated mainly in groups and not anonymously. To choose to not participate may have been hard and caused them to feel guilty, disloyal, or fear consequences. Also, participating in group interviews may cause the participants to feel vulnerable and hesitant to speak openly (Ngozwana, 2018). However, being part of the group may also provide a safe, allowing space for creativity and co-creation of shared knowledge (Batalden et al., 2016; Co production and Participatory Research, 2020; Gibson, 1991; Laverack, 2004). The degree of freedom that healthcare professionals have, to choose to participate in clinical research may be discussed. However, participation is essential for increased quality and efficiency of healthcare, and specified in the regional plan for Region Västmanland (Norström et al., 2022). Also, this project did not include any personal or
sensitive information from the healthcare professionals. With this under consideration, the benefits were predominant.

To healthcare professionals, identifying health risks in their clients is important. However, it may also worry healthcare professionals to detect poor health, due to increased workload. Even though the Health Report Form was not intended as a diagnostic tool, the health problems that were revealed in young people may still have created a demand to provide treatment for people without actual need. Thus, ethical principles, for example, human value, autonomy, no harm, do good, and justice (Gillon, 1994) may have been challenged. Also, the YHC healthcare professionals may have experienced increased stress, dissatisfaction with work, self-doubt, and concerns about failure (Ethical aspects of health- and welfare technology, 2022). To facilitate for the healthcare professionals, extensive support was offered project specific education films, written material, and continuous digital meetings. Contact with the project leader (i.e., the author of this thesis) was encouraged.
Results

Explore young people’s opinions (study I)

The foundation of the Health Report System came from the opinions of young people with health appointments at YHCs, in study I. The health areas were identified along with their opinions on the content and design, and of using a digital health questionnaire (in study I called an electronic patient-reported outcome). The main theme “an Electronic Patient Reported Outcome created based on my needs is worth using” contained two sub-themes: “appealing content and design” and “trusting healthcare”. The sub-themes each contained two categories, each with two sub-categories. The results are presented in Figure 9.

*ePRO = electronic patient-reported outcome, i.e, the health and welfare technology tool under development.

Figure 9. Illustration of an overview of the study I results; the theme, and the two subthemes, each with two categories.
The health domains physical-, mental-, sexual health and social support, the wish for non-diagnostic, general questions and, at the same time, the demand for specific questions on self-harm and suicide thoughts are found in the sub-theme “appealing content and design”. Also, the way to state written questions were addressed. It was important that the questions were nonjudgmental, inclusive, allowed voluntary responding and posed the questions in the right way, to facilitate young people’s interest in completing the questions.

The sub-theme “trusting healthcare” contained signs of the young people’s uncertainty and lack of autonomy in the healthcare setting. It was important to feel safe to use the health and welfare tool and to share vulnerable feelings with healthcare professionals. The sense of comfort and safety was essential for being open with their feelings. The health and welfare tool was viewed to have potential to mediate the information about young people’s health without them having to say anything, and instead place the responsibility to ask about the responses on the healthcare professionals. Also, the young people believed that responding to the health questions prior to the health assessment could help them put more focus on their own health. It was considered important to keep health the assessments face-to-face.

Develop and evaluate usability (study II)

In total 43 identified questionnaires were evaluated for the Health Report Form. An iterative analysis process within the research group ended in the inclusion of ten questionnaires: SEXIT (Hammarström et al., 2019), Audit-C (Bradley et al., 2003; Bush et al., 1998), lifestyle questions from the National Guidelines for living habits (Socialstyrelsen), physical activity and sedentary behavior (Kallings; Socialstyrelsen), HBSC (King et al., 1996), GAD-7 (Spitzer et al., 2006), PHQ-9 (Kroenke et al., 2001), SCOFF (Morgan et al., 1999), the BSSS’ subscales “Need for support” and “Support seeking” (Schulz & Schwarzer, 2003) and a self-constructed study-specific self-efficacy question for behavior change, according to Bandura (Bandura, 2005). Before inclusion the BSSS was translated into Swedish. An IT-company digitized the included questionnaires.

The manifest analysis of the Health Report Form usability evaluation from the qualitative interview data, resulted in three categories and seven subcategories (Figure 10).
The first category “Captures overall health of young people but needs clarification” contained three subcategories, “Can identify health areas appropriate for young people”, “May make young people aware of the need for behavior change” and “Some questions and wording irrelevant and difficult to understand”. The category supported that the included health questionnaires were relevant and managed to capture health aspects that were important to young people. Further, answering to the questions could make young people more susceptible to the need for behavior change to improve or sustain their health. Also, there were suggestions for improvements, for example, to remove or change questions that were not important to young people, such as questions on height, weight, and gender descriptions, and to add questions on family relations. Further explanations of the terms “social support”, “behavioral change”, and “anxious” were desired from the young people. The healthcare professionals could connect the self-efficacy behavior change question to challenges from conversations about behavior change with young people and appreciated the question.

The category “Fun, easy and optional will keep young people’s interest” and the two subcategories “Needs an easy-going and neutral design” and “Must be able to choose to answer”, include opinions that an electronic tool with good lay-out, structure and simple design, could be helpful for young people to complete the health questions. The young people liked the emoji designs but said that they could be exchanged for other pictures or even colors.
or fonts. The healthcare professionals and expert panel found it important to change the emojis because of risk to influence young people by planting an emotion about the health area and the questions it represented. It was pleasing that answering the questions before the meeting was optional, and that they could choose to skip questions they did not want to answer.

The last category, “Potential contribution to improve the health consultation” contained two subcategories: “May help to mediate sensitive health information” and “Helpful for planning and performing the meeting”, points out that using the Health Report Form could possibly be beneficial for both young people and healthcare professionals. From young people’s perspective, the Health Report Form had potential to support honest answers to sensitive questions, while the healthcare professionals were hesitant to asking such questions. They suspected that young people would not complete these questions due to the sensitive nature. They were also suspicious that since the responses were electronical, young people may not answer then because they may not know who would receive their answers at the YHC. However, the young people believed that the health questions could make them more focused on themselves and facilitate to prioritize among their health concerns. Also, the healthcare professionals were hopeful that the Health Report Form could create solid ground for talking with young people about health and thus contributing to their professional evaluation.

The quantitative data from the participants’ System Usability Scale questionnaire show that the participants agreed with all statements (Tables 7 and 8). They agreed most with the positive statements “I think I would like to use the prototype” and I would imagine that most people would learn to use this prototype very quickly” and disagreed most with the negative statement “I think that I would need the support of a technical person to be able to use this prototype”. There were no missing items.

Table 7. Individual and sum scores for the positive statement of the System Usability Scale.

<table>
<thead>
<tr>
<th>Odd items</th>
<th>1 Like to use</th>
<th>3 Easy to use</th>
<th>5 Clear &amp; organized</th>
<th>7 Quick to learn</th>
<th>9 Confident using it</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participants</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>4</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>2</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>3</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>4</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>5</td>
</tr>
</tbody>
</table>
Table 8. Individual and sum scores for the negative statement of the System Usability Scale.

<table>
<thead>
<tr>
<th>Even items</th>
<th>2 Too Complex</th>
<th>4 Need support</th>
<th>6 Too many contradictions</th>
<th>8 Awkward to use it</th>
<th>10 Needed to learn before</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participants</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>6</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>2,5</td>
</tr>
<tr>
<td>7</td>
<td>3</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Total score</td>
<td>9/7</td>
<td>8/7</td>
<td>10/7</td>
<td>12/7</td>
<td>9.5/7</td>
</tr>
</tbody>
</table>

Notes: The total score per item ranged from 7 to 35, with lower scores reflecting more optimal usability. Participants 1 to 3 were healthcare professionals and participants 4 to 7 were young people.

When the System Usability Scale scores were converted to grades of usability (Lewis, 2018), they showed that five participants’ scores concurred with the grade “best imaginable” (participants 3, 4, 5, 6, 7) and two participants’ scores were concurrent with the grade “good” (participants 1 and 2), as shown in Figure 11.
Assess feasibility (study III)

In total 54 young participants completed the Evaluation Questionnaire. There was a majority of female participants (89,4%), with the mean age of 17.9 years, born in Sweden (97,9%) and living with parents/guardian (72,3%). Some participants had current contact with other health services (25,5%), mostly for help with mental health problems (53,8%). There were no significant difference between intervention and control groups. Also, eleven healthcare professionals from the two YHCs were included. Healthcare professionals from the mid-size YHC consisted of counsellors (n=3), psychologists (n=3), midwife (n=1) and assistant nurse (n=1). Healthcare professionals from the small-size YHC were a counsellor (n=1), a midwife (n=1) and a manager (n=1). One healthcare professional participant was male.

Evaluation of process, resources, and management

Qualitative data

Three themes from the qualitative thematic analysis describe the healthcare professionals’ views on the feasibility aspects process, resources, and management (Figure 12).
The theme “We knew recruitment could be hard” is sub-ordinate to the process feasibility aspect. Slow recruitment was a concern that the YHC healthcare professionals had from previous experience, and was confirmed in this study, as well as possible solutions to the problem. The theme “Information and routines helped, but time was an issue” is connected to the resource feasibility aspect. The video, written education material and the digital educational meetings were helpful when YHC healthcare professionals wanted to understand how to use the Health Report System. However, they also said that they needed routines to make the tasks smoother. To find the time for young people to respond to the Health Report Form, they discussed opportunities and challenges. One suggested solution was to include the response time during the health assessment. Finally, the theme “The Case Report Form was valuable in the health assessment” states that the healthcare professionals were helped by the information presented about the young person’s health. The colors of the bar graphs were easy to understand, and the healthcare professionals appreciated that the text responses could add details to enhance the understanding of the bar graphs. However, some of the healthcare professionals did not find the bar graphs, and thus based the health assessment only on the text responses. The psychologists and healthcare counsellors already used a clinical assessment guide and thought that the Case Report Form could be more useful for midwives than for psychologists and counsellors. Finally, the healthcare professionals were concerned that their workload would increase.

Evaluation of process and scientific aspects

**Quantitative data**

To evaluate the feasibility of the process aspect of the recruitment potential, data were collected from the Evaluation Questionnaire. In total 54 young people chose to participate and responded to the questions, which was 26 percent...
of those who were asked to participate. The scientific aspects of feasibility; data variance and missing items, were evaluated from these responses. There were a few missing items in four out of six included questionnaires: from 0 to <5%, as presented in Table 9. For all included questionnaires, the results showed a variance in the data.

Table 9. The number of items, the accumulated total number of possible responses and the number of missing data items per Patient-Reported Outcome questionnaire.

<table>
<thead>
<tr>
<th>Questionnaires</th>
<th>Number of items</th>
<th>Number of items missing data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Short Warwick-Edinburgh Mental Well-Being Scale (SWEMWBS)</td>
<td>7</td>
<td>1/378</td>
</tr>
<tr>
<td>International Physical Activity Questionnaire (IPAQ)</td>
<td>3</td>
<td>8/162</td>
</tr>
<tr>
<td>Sexual health self-efficacy</td>
<td>3</td>
<td>1/162</td>
</tr>
<tr>
<td>Sense of Mastery Scale</td>
<td>7</td>
<td>14/378</td>
</tr>
<tr>
<td>Life and Health young</td>
<td>8</td>
<td>0/432</td>
</tr>
<tr>
<td>Oslo 3-item Social Support Scale (OSSS-3)</td>
<td>3</td>
<td>0/162</td>
</tr>
</tbody>
</table>

Merging qualitative and quantitative data

In the discussion section, qualitative and quantitative datasets were converged. The research group found that the criteria for the feasibility aspects process (recruitment potential), resources (study administration and IT-platform satisfaction) the management aspect (data accessibility, and interpretation of the Case Report Form) and scientific (variation of data and missing items) were fulfilled. However, improvements possibilities were identified. For example, it was apparent that there was a need to increase the support to the healthcare professionals to make routines to administer the IT-platform and help them with any problems to use the Health Report System, for example how to access the Case Report Form. Overall, it was found feasible to progress with a randomized trial with some modifications. The joint feasibility aspects results, and modification comments, are presented in Table 10.

Table 10. The results of the converged feasibility assessment with comments to consider for change.

<table>
<thead>
<tr>
<th>Feasibility aspects</th>
<th>Feasibility criteria</th>
<th>Results</th>
<th>Are feasibility criteria met?</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Process</td>
<td>Recruitment potential</td>
<td>30% of eligible young people expected to participate</td>
<td>26% of eligible young people participated</td>
<td>YES</td>
</tr>
</tbody>
</table>

Resources
<table>
<thead>
<tr>
<th><strong>Study administration</strong></th>
<th>Is the education material understandable and the study procedure manageable, from a healthcare professional’s time and effort perspective, when using the Information Technology (IT) platform?</th>
<th>Going through what to do made it easier and reminding videos and written instructions good</th>
<th>YES</th>
<th>The education material is helpful</th>
<th>Discuss Youth Health Clinic work planning, to ensure time for the health assessment conversation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>IT-platform accessibility/acceptability?</strong></td>
<td>Is the work with the IT-platform acceptable? Were there any technical problems obstructing the feasibility of using the IT-platform and if so, which?</td>
<td>Using the IT-platform was quick and simple No technical problems were reported</td>
<td>YES</td>
<td>Working out routines were recommended</td>
<td></td>
</tr>
<tr>
<td><strong>Management Data accessibility</strong></td>
<td>Was the access to Case Report Form and action registration form in the IT-platform acceptable?</td>
<td>The Case Report Form histograms were not found and used by all</td>
<td>YES</td>
<td>The text answers also provided the information needed</td>
<td>Contact is needed with healthcare professionals to remind them and provide support</td>
</tr>
<tr>
<td><strong>Interpretation of Case Report Form</strong></td>
<td>Was the healthcare professionals’ interpretation of the Case Report Form satisfactory?</td>
<td>The Case Report Form revealed new information and was found easily understood</td>
<td>YES</td>
<td>Text answers added detailed information to the histograms</td>
<td></td>
</tr>
<tr>
<td><strong>Scientific Variations of data</strong></td>
<td>Were there any ceiling- to floor effects – thus, the variations in the data were acceptable?</td>
<td>No ceiling- to floor effects were detected</td>
<td>YES</td>
<td>Descriptive statistics showed acceptable data variance</td>
<td></td>
</tr>
</tbody>
</table>
Mediating effects (study IV)

In total, 223 young people visiting a YHC participated in study IV. The group participants were mainly female (93,7%), born in Sweden (92,8%) and living with a parent or guardian (71.3%). They were either in a relationship (47,5%) or single (44,8%). More information on the participants is presented in Table 4. The means or medians for the studied variables, and the Spearman rho correlation coefficients (r) are displayed in Table 11.

Table 11. Means or medians, standard deviations, missing values, non-parametric correlation coefficients and significance level for the studied variables.

<table>
<thead>
<tr>
<th>Studied variables n=223</th>
<th>Means, medians and standard deviations (SD)</th>
<th>n</th>
<th>Correlation coefficient</th>
<th>Significance (2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mental wellbeing, mean (SD)</td>
<td>13.3 (6,92)</td>
<td>223</td>
<td>-.63**</td>
<td>&lt;.001**</td>
</tr>
<tr>
<td>Sense of mastery, mean (SD)</td>
<td>13.2 (3,8)</td>
<td>220</td>
<td>-.07</td>
<td>.35/NS</td>
</tr>
<tr>
<td>IPAQ Minutes of vigorous physical activity/week, median (SD)</td>
<td>120</td>
<td>200</td>
<td>-.14</td>
<td>.08/NS</td>
</tr>
<tr>
<td>IPAQ Minutes of moderate physical activity/week, median (SD)</td>
<td>90</td>
<td>186</td>
<td>-.15*</td>
<td>.05*</td>
</tr>
<tr>
<td>IPAQ Minutes of walking/week, median (SD)</td>
<td>200</td>
<td>207</td>
<td>.15</td>
<td>.06/NS</td>
</tr>
<tr>
<td>IPAQ Minutes of sedentary behavior/day, median (SD)</td>
<td>240</td>
<td>204</td>
<td>-.01</td>
<td>.84/NS</td>
</tr>
<tr>
<td>Sexual health self-efficacy, mean (SD)</td>
<td>210 (84,09)</td>
<td>223</td>
<td>-.01</td>
<td>.84/NS</td>
</tr>
<tr>
<td>Social functioning, mean (SD)</td>
<td>4.0 (0,70)</td>
<td>221</td>
<td>-.405**</td>
<td>&lt;.001**</td>
</tr>
</tbody>
</table>

Simple regression analysis

From non-parametric correlation calculations, variables with significant correlations were chosen for further analysis; mental wellbeing, sense of mastery, moderate physical activity, and social functioning.
The independent variable (IV) sense of mastery was regressed on the dependent variable (DV) mental wellbeing, in a simple regression, revealing 42 percent of shared variance (condition 1). Next, the mediator variable social functioning was found to be associated significantly with the IV (condition 2). Moderate physical activity was not significantly associated with the IV and was not eligible for further analysis.

Multiple regression analysis

The DV was regressed on the mediating variable social functioning and the IV, using multiple regression. The sense of mastery and social functioning explained 48 percent of the variance in the DV (Adj R²=.48, F=100.83, p=<.001, df=1) (condition 3). The path coefficients (β) were significant. To calculate the strength of the relationship between sense of mastery, social functioning, and mental wellbeing, due to direct, indirect, and total structural effects, the statistical t-values from the multiple regression were used in a Sobel’s test (Sobel, 1982). There was a significant indirect effect of sense of mastery on mental wellbeing via social functioning was significant (t=3.18*, p=0.001). The association between sense of mastery and mental wellbeing was weaker (from β=.65 to β=.58), revealing partial mediation (condition 4). The direct, indirect, and total structural effects between the sense of mastery, social functioning, and mental wellbeing, the statistical t-values from the multiple regression were used in a Sobel’s test (Sobel, 1982), following the instructions for an internet Sobel’s test calculator (Preacher & Leonardelli, 2010-2023). The relative magnitude of common variance in percent due to direct effect of sense of mastery on mental wellbeing was 89 percent. The relative magnitude of the indirect effect of the mediator was 11 percent, as calculated in the SPSS PROCESS tool (Hayes).

Figure 13 is the final model of the mediation. It reveals the partial mediation between sense of mastery and mental wellbeing and the mediating effects of social functioning between sense of mastery and mental wellbeing.
Figure 13. The final path model for mediating effects of social functioning between sense of mastery and mental well-being. The standardized coefficients (β) and the t-values are presented for each path in the model (**p<.001, *p<.05).
Discussion

Summary of result

The young people who were consulted in the interviews on their opinions about the content and design of the Health Report Form, contributed to large extent to the development of the Health Report System. Their opinions guided the decisions of the health content, and design of the Health Report Form. The first version of the Health Report Form was based on a structured process, guiding the research group when selecting health measurement instruments. This version was found usable for YHCs when tested by young people and healthcare professionals, as well as the expert panel group. The feedback was used to update the Health Report Form. Also, to enable a future Stepped Wedge Cluster Randomized Trial, an Evaluation Questionnaire was developed, together with a Case Report Form, and an Action Report Form. The involvement of young people and healthcare professionals was essential also when testing the study procedure and the Evaluation Questionnaire for feasibility aspects. A structured consensus decision was made by the researchers, based on the converged qualitative and quantitative data, supporting the feasibility to proceed with a Stepped Wedge Cluster Randomized Trial. Again, the participants’ feedback influenced a further update of the Health Report System. The Evaluation Questionnaire provided health data, used to explore the association between the different health variables, which demonstrated that young people with high sense of mastery experience higher mental well-being, that is further strengthened by a high level of social functioning. This YHC multi-center project collected health data which has provided implications of the health status of the YHC population.

Application of theory in development of the Health Report System

The main theory - HBM

In this thesis, answering to health questions before a health assessment was considered a health behavior because it is an active part of participation in one owns healthcare. Also, the participants in the research project accepted and
adapted to use a new and digital tool for the health assessment. The HBM was developed in response to, and to understand, the failure of disease detection and prevention programs (Hochbaum, 1958; Rosenstock, 1960). It is important to understand what will motivate young people to engage in healthy behaviors. Thus, HBM was a suitable choice for this thesis. When developing new measurement tools, HBM should be specific to behavior and population (Skinner et al., 2015). The project’s population was young people and healthcare professionals, and the intervention was to use the Health Report Form and the Case Report Form as a health assessment tool and a common ground for talking about the young person’s health. In understanding young people in help-seeking behavior (O’Connor et al., 2014) and health scanning (Cho & Cho, 2022), it has been concluded that two of the HBM constructs had strongest effects on the behavior; perceived benefits and perceived susceptibility.

This project used foremost the constructs perceived barriers, susceptibility, and benefits, to guide the exploration of what young people found important to consider in development and when using the Health Report System. The HBM constructs are visible in the data collection situations, the clinical situations and in the study results. For example, the constructs perceived barriers and benefits are reoccurring in the interview guides (appendix, studies I, II and III), in questions such as: “Tell me how it has worked to retrieve the Case Report Form? What functioned well? What did not function as well?” From the study I results and throughout, the young participants were positive to respond to the health questions, because it gave them time to reflect about their health. This is closely connected to the HBM construct perceived susceptibility, as it potentially serves as a reality check and increases the awareness of health risks. The same construct occurs in the health assessment situation, where young people and healthcare professionals are allowed to discuss health and become aware of health risks or poor health. This, of course, should also be an opportunity to talk about health gains and the benefits of changing health behavior.

In the results of studies II and III, it became evident that the participants saw the potential in the Health Report System to redistribute the responsibility of initializing to talk about sensitive health problems. Thus, the pressure on young people could potentially decrease and the health assessment could at the same time be more meaningful to them (perceived benefits). This could contribute to create a common ground for the health assessment conversation. The value of being allowed to talk about what is most important has been reported previously (Bradford & Rickwood, 2015). The participants highlighted several benefits from using the Health Report System. For example, the opportunity to self-reflection could lead to increased knowledge about themselves (perceived susceptibility) and thus act validating and empowering for young people. Hence, the HBM was considered as a valid theory to the project which also strengthened the continued development of the Health
Report System. However, this thesis cannot provide any statistical calculations on the relevance on these constructs, as this was never the purpose.

Notable, this research project is correlated to the biopsychosocial theory (Engel, 1977) through the overlapping biological, psychological, and social health areas, to include many health issues that young people may experience. Also, the cooperation between the researchers, their interdisciplinary competence and experience from health behavior, together with the focus to promote good health and prevent and treat poor health, link the project to behavioral medicine research field (Johnston & Johnston, 2017).

Alternative theories

There were of course other theories to choose when conducting this project. Considerations were made for, for example, the Social Cognitive Theory (SCT) (Bandura, 1986) by Bandura (originally Social Learning Theory (Bandura, 1979 ). The SCT is one of the most utilized in understanding and improving health behaviors (Kelder et al., 2015). Interventions for supporting healthy lifestyle behaviors in young people, based on SCT, have been found plausible (Beauchamp et al., 2019; Ledoux et al., 2016; Liu et al., 2021) and useful for healthcare professionals in understanding patients’/clients’ motivation level for lifestyle behavior change in or other complex factors, for example those predicting non-suicidal self-injury (Hasking & Rose, 2016). Hence, using the SCT as foundation to form evidence-based interventions, targeted towards specific population groups can be useful and feasible. Therefore, this theses views SCT as a good choice of theory in continuance of the healthcare professionals to use the health information from the health report form, in motivating young people to behavior change for increased health.

Knowing the challenges of performing this research project, one may question if it would have been more reasonable to downsize the objectives of studies II and III. This would have allowed study IV to constitute of an implementation science research study. Implementation science is used to promote the systematic uptake of new research findings, and to influence healthcare professionals and YHC organization and to improve the healthcare quality and effectiveness (Eccles & Mittman, 2006). Using, for example, the Behavior Change Wheel method (Michie et al., 2011) to explore and understand potential participants capability, motivation, and opportunity for changing their behavior to participate in the research, may have facilitated the recruitment process and thus, participation. The method could also be useful to explore barriers and facilitators in intervention implementation from organizational and policy levels. A pilot implementation study is thus implicated before further implementation of the Health Report System.
The YHC population

Diversities
Young people who visit YHCs are in ages 12-25. This period in life spans over the human developmental phase, which affects physical, cognitive, and psychosocial functioning (World Health Organization). The population includes adolescents (10-19 years) and (young) adults (19-26 years) (World Health Organization). One can easily argue that the YHC population is not comparable to any other group of young people in the healthcare setting. Adding to the complexity, due to ethical reasons (SFS 2017:30), this project only accepted participation from young people from 15 years of age. This is an example of the challenges for this thesis, and the reason for the pragmatic approach in solutions to realize the development and evaluation of the Health Report System.

The over-representation of young women in this thesis’ participant population reflects the skewedness of the YHC population with a majority of female visitors (Sveriges Kommuner och Regioner, 2020). The YHCs already work to minimize the existing health inequities in the healthcare they provide, foremost by offering available, youth-friendly, accessible, acceptable, healthcare for young people (World Health Organization, 2012). YHCs are aware of the challenges to provide the same healthcare to all in need (Wagenius et al., 2019) and are adjusting to be able to include also the most vulnerable in their care, for example focusing on how to enable boys to come to the YHC (Bådagård & Torstensson, 2008; Socialstyrelsen, 2000). However, focus must also be on the known YHC population. This thesis contributes with increased knowledge to heath-and welfare with implications of the health status of the YHC population, viewed as a healthy population.

Mental wellbeing, sense of mastery, and social functioning
The health data revealed that the YHC population produced lower mean scores in mental wellbeing, than the reports from a 1995 reference group (Sconfienza, 1998). Although the two groups are not fully comparable, the decrease in mental health status reflects the continuous decrease in mental wellbeing in young people, since approximately 30 years (The Public Health Agency of Sweden, 2022). Also, the YHC population had low ability to adjust their lives to reach goals in life, leaving them to powerlessness (Lachman & Weaver, 1998; Pearlin & Schooler, 1978). Young people themselves, have high awareness of a stigmatization of mental health problems, which includes stereotypes, prejudice and discrimination, and suggest better education about mental health problems, and inclusive gender norms to reduce any pressure on young people and to increase their mental health (Hermann et al., 2022).
Hence, evidence is strengthened to identify mental health risks in early stages and to empower young people. The YHC healthcare professionals are trained and used to work nonjudgmentally, respectfully (Thomson et al., 2022), and gender equally with a health equity perspective. However, the lack of national governance and coordination of YHC healthcare does not produce an overview of the Swedish YHC population. Hence, if YHCs were to use the same health outcome tool, it could potentially lead to improved health assessments and interventions across the nations, and thus improving health status and health equity in the YHC healthcare.

The level of social functioning in the YHC were similar to previous studies (Söderquist & Udén). The self-perceived good social functioning indicates that the YHC population also perceives high health-related quality of life (Bhatia et al., 2002; Svedberg et al., 2012). In line with this, study IV showed that high sense of mastery and high social functioning separately affected mental wellbeing positively. Further, the positive effect on mental wellbeing was higher when the effects were correlated. Hence, in the triad relationship between mental health, sense of mastery, and social functioning, utilizing the individually most approachable variable for every individual, could be of relevance to supporting young people at YHCs to strengthen their mental health.

Physical activity and sedentary behavior

Physical activity is often reported in time but calculated in Metabolic Energy Turnover minutes (Ainsworth et al., 2000) and divided in the categories vigorous, moderate and low (light, or walking) (IPAQ Research Committee, 2005). For better understanding, vigorous physical activity requires hard breathing which makes talking hard. Moderate physical activity affects the breathing, but it is still possible to carry a conversation. Walking (slowly) creates no effect on the breathing (Prosch, 2022).

The YHC population reported vigorous physical activity well above the recommendations. The young people were moderately physical active less than the recommendations. This draws a picture of a population of athletes, active in challenging sports activities or gym classes, several times a week, but not participate in further exercise, apart from walking slowly. Further the YHC population only reported three sitting hours per day, much less than the results of previous reports of 10 sitting hours per day (Nyberg & Fröberg, 2020). This is a surprising result which need to be further explored, along with details on the population.

The study IV results did not reveal any significant association between the level of physical activity and sense of mastery or mental wellbeing. This is surprising since evidence are strong that physical activity and decreased sedentary behavior are effective in decreasing poor mental health, also in psychiatric in-patient adolescents with depression (Philippot et al., 2022). Hence, in the YHC population, this needs to be further investigated.
Sexual health

In study IV, three self-efficacy questions were composed (Bandura, 1997, 2005) to find out how young people rated their ability to positive health behavior, to maintain good sexual health. The questions are of interest, since young people are prone to more risky behavior than adults, due to the maturity-level of the brain (Blakemore & Choudhury, 2006). The young people in the thesis reported overall good self-rated ability for positive sexual health behavior. The young people’s view of their self-efficacy to positive sexual health behavior may or may not be shared with the YHC healthcare professionals. However, this was not explored in this project. Unfortunately, the results don’t clarify the circumstances under which sexual behavior may be positive or negative (Vasilenko et al., 2014). However, as sexual health is fundamental at YHCs, one must assume that the subject is discussed during the health assessments.

Pushing the physiotherapy frontier forward

Physiotherapy is a research field and clinical practice. Physiotherapists interact closely with other disciplines to increase health competency, health promotion and to do research (Fysioterapeuterna, 2018) to develop the scope of physiotherapy. In physiotherapy, digitalization is considered essential for the vision of a society that allows all people to be physically active (Fysioterapeuterna, 2018) in an adequate way. This project is rooted in physiotherapy by highlighting a possible extension of the scope of practice and pushing the research area further forward. The biopsychosocial and behavioral medicine approach in the project is present in the overlapping health areas included in the Health Report Form. Also, using the Health Report Form implies behavior change in the YHC healthcare professionals, to start and keep using the health and welfare technology tool, as a new way to assess health in young people. For young people, the time to self-reflect and create a joint understanding of what health is, may lead to the realization that behavior change is needed and empowerment to healthier behaviors.

At YHCs, physiotherapists are rarely members of the healthcare team. Hence, the expertise knowledge to analyze and understand movement and the pre-requisites for being physically active, for each person, is missing. Therefore, there is a need to extend the physiotherapeutic perspective in YHC intervention and research.

For Swedish physiotherapists, the area of mental health constitutes a specialist area, demanding extended education. Mental health problems are represented among patients or clients in all healthcare and welfare settings and age groups. There are several research studies and recommendations covering physiotherapeutic methods to treat mental problems. Basic Body Awareness
emanates from the body, aims at strengthening physical, physiological, psychological and existential resources and is used to treat for example depression (Danielsson & Rosberg, 2015; Gyllensten et al., 2003), and can be used as complementary treatment for example, for long-term pain (Socialstyrelsen, 2021b). Physical activity is prescribed as an intervention for depression (Andersson et al., 2021) and anxiety (Hovland et al., 2021), and used to decrease sedentary behavior in patients with psychosis (Gyllensten et al., 2020). Also for young people, physical activity is effective in improving wellbeing (Hale et al., 2021; Lubans et al., 2016), but reduction in frequency and severity of mental health problems in not as clear (Hale et al., 2021).

The study IV findings provided some insight in the way the YHC population is physically active. However, from a physiotherapy perspective, the results did not provide enough answers within this area. It would be interesting to explore physical activity and sedentary behavior in the YHC population, in a follow-up qualitative study.

It has been found to be a necessity for physiotherapists to take larger responsibility in working with sexual health promotion, and enable a more holistic perspective on for example chronic illness and physical impairments (Areskoug-Josefsson & Gard, 2015). Physiotherapists have extensive knowledge of pain and physiotherapeutic interventions can have effect on acceptance of the body, and bodily symptoms, such as persistent pain (Aymerich et al., 2022). The sexual health questions in this thesis did not relate to pain or bodily discomfort. However, pain in young people, related to sexual activity occurs, for example, due to sexually acquired reactive arthritis, as a result from the sexual transmitted infections Chlamydia or Gonorrhea (Denison et al., 2016). However, there are other examples of experienced pain related to sexual activity, for example painful sexual intercourse, pelvic pain, vaginal muscle spasms, and persistent pain in the vulva. Overall, pain experiences relating to sexual functioning is under-reported by patients and overlooked by healthcare professionals (Nimbi et al., 2020). As physiotherapy interventions act empowering, increases physical functioning and mental wellbeing, the presence of the physiotherapy competence in all healthcare settings is logic, also at YHCs.

The thesis contribution to the research area of health and welfare

This thesis has added knowledge within the research area of health and welfare. The welfare aspects of health were addressed through the interdisciplinary research collaboration, with shared, and increased health competency as a result. Also, the potential benefits of adding physiotherapists as coworkers at YHCs were highlighted in this thesis. As Sweden aspires to be world
leading in using digitalization and eHealth to increase health, reach health equity, increase independence and participation in society (Swedish Government. Swedish Association of Local Authorities and Regions, 2020), the thesis contributes to knowledge in this field.

This project aimed to develop and evaluate a digital system for young people with health appointments at YHCs to report of their overall health status. Although independent digital questionnaires are already used at YHCs, the questionnaires differ across the nation, which makes any comparisons and meta-analyses difficult. The thesis contributes with new implications of the overall health in a multicenter YHC population (study IV). However, any health effects from using the Health Report System at YHCs are not accounted for in this thesis.

Methodological discussion

The complexity of the methodological challenges faced in the doctoral project and their solutions have been handled, to serve the realistic clinical context, i.e., in a pragmatic way (Cambridge Advanced Learner's Dictionary & Thesaurus). For example, when needed, small local modifications to the study procedure were made to support the specific YHC context. Also, the names for the digital questionnaires and the digital system were customized for best fit in connection to the knowledge building during the development process. This may to some extent challenge the reader’s understanding of this thesis.

The development of health and welfare technology, such as an electronic patient-reported outcome, demands an extensive process characterized by the participation of technology developers, clinicians, and patients to ensure that relevant health outcomes are captured (Goodyear-Smith et al., 2016; Staniszewska et al., 2011), the technology fits within the healthcare systems, and is adequate and durable for the users (Sharma et al., 2018). Although the involvement of service users in co-production and shared decision-making in health- and social care are defining aspects of participation in health and welfare (Eide et al., 2017), patient involvement in healthcare development is not self-evident (Wiering et al., 2017). The Health Report System created in this project was developed with the participation of young people, healthcare professionals, and researchers. Although with non-equal power in the project, the level of participation used in studies I, II and III, was consultative and did contribute to development decisions. This is equivalent to step five (out of eight) of ‘Hart’s ladder of youth participation’ (Arnstein, 2019; Hart, 1992), well above the level of non-participation (step zero). The inclusion of the potential users of the Health Report Form, was central and viewed as strengthening the scientific rigor, relevance, and reach (Balazs & Morello-Frosch, 2013). The project values were those of equality and mutuality (Masterson et al., 2022) between young people, healthcare providers, and researchers.
(Nielsen, 2017). Nevertheless, co-production of new healthcare services innovations for children and young people needs a high level of participation for best possible intervention sustainability (Larsson et al., 2018).

The pragmatic and participatory approach of this clinical research project came with several challenges. In clinical research, the participatory approach can be defined in several ways and include a variety of things. This challenges the understanding, reproduction, and evaluation of such projects (Masterson et al., 2022). Also, cost estimations are difficult, and have raised questions of, the suitability for co-production in research and healthcare services (Oliver et al., 2019). Another challenge was the study recruitment process. Reasons for young people’s non-engagement may be their lack of availability during school hours and holidays, or that they are unable to make their own decisions (Gaillard et al., 2018). A study regarding implementation of digital healthcare interventions for young people has concluded that among other factors, motivation, capability, and opportunity affected young people’s willingness to use the interventions. Other factors were the sustainability and usability of the digital intervention (Liverpool et al., 2020). For the current project, the COVID-19 pandemic hindered recruitment of participants. Also, recruitment of young people may have been obstructed due to problems to adapt YHC clinical work to the research tasks.

For healthcare professionals, clinical research is viewed as important. However, participating in research projects may cause changes in their daily work routines and add to potential stress and workload. There is a risk that lack of time, experience, or organization systems endangers their commitment (Bench et al., 2019). It has been suggested that clear instructions, possibilities for flexible time management, simple patient inclusion, task delegation and no additional contact with other professions have been found facilitation research participation among pharmacists (Kuipers et al., 2019). In retrospect, the project could potentially have had better recruiting success if any facilitators and barriers would have been identified and worked with, in a more structured and thorough way.

The young people who participated made a homogenous project population. Approximately 90 percent were female, born in Sweden, and living with parents. Around 70 percent were a student between 17.5 to 19 years old. Some lived in both rural and urban locations, providing some variability to the population. In research, heterogenous population groups are in general considered more representative for the an entire population of people, to be able to draw general conclusions (Field, 2018). However, some qualitative data collection, for example for focus group discussions, have highlighted that homogeneity of a group of five to eight participants is considered a ground for trust and encourages deeper discussions (Kreuger & Casey, 2015).

The sample population recruitment of young people in studies I and II was convenient, affected by the healthcare professionals’ memory to invite young people to participate, whether contact could be made with those interested to
participate and if managing to find a suitable time for the interview. The young people in studies III and IV surveys were provided with digital information and consent when making an appointment or showing up at the YHC. In study III, no calculation of power was made. Data for study IV was collected from a Stepped Wedge Cluster Randomized Trial, failing to achieve the calculated need for power. However, the objectives for study III and IV were not to test a hypothesis. Therefore, there were no risk for finding a non-existing effect (type 1-error), or missing an existing effect (type II-error) in the study populations (Field, 2018). In none of the studies, were there any records were kept of the young people who declined to participate, due to clinical everyday conditions at the YHCs. Hence, there are no drop-out analysis to present, since there is no information about the participants who chose to not participate. Preferrable, the project population should have been more diverse to give more insight of young people’s opinions and health, and perhaps possible if the recruitment time was extended. Unfortunately, this was not possible. However, the participants in this project were representative of the sample frame (Fowler, 2009), reflecting the YHC population (Sveriges Kommuner och Regioner, 2020), which indicates transferability to other YHCs.

This thesis includes a variety of research methods, one qualitative explorative study, two convergent mixed methods studies and one quantitative non-experimental cross-sectional study. Studies relying on qualitative data can be perceived as less valuable or less reliable, or less scientific to a larger public. The strength of qualitative analysis is that it can be both descriptive and interpretative (Lindgren et al., 2020). The quotations give strength to the propriety of the data and provide the reader with the opportunity to judge the trustworthiness of the study (Rendle et al., 2019). Non-experimental quantitative studies provide summaries of trends or opinions of a population with the intent of generalizing to a larger population (Fowler, 2009). However, instead of valuing one scientific method over the other, one should consider how useful the method is in relation to the aim of the study (Sandelowski, 2000). Mixed methods studies combine qualitative and quantitative data in the same research study, for example to provide a comprehensive analysis of the of the research problem (Creswell & Creswell, 2018). The combination of the qualitative and quantitative data in this study was assumed to provide additional perspectives and a more complete understanding.

In study I, the results from exploring young people’s opinions on content and design of a questionnaire highlighted the importance of including overall questions about mental-, physical-, and sexual health and social support, and could reveal any self-harm or suicide risks. Also, security and confidentiality were important factors affecting the attitudes of young people to use a questionnaire. The evaluation studies II and III, confirmed the study I results. The positive attitudes towards a health questionnaire were supported by previous research, recognizing the questionnaire as making time for what’s important (Bradford & Rickwood, 2015) and as able to identify health-related issues in
young people (Goodyear-Smith et al., 2017; Hammarström et al., 2019; Thabrew & Goodyear-Smith, 2019).

In study II, the development started based on the results from study I in a structured approach to select appropriate questionnaires. Also, the combined expertise of the young people, healthcare professionals and the expert panel provided solid ground for the content in the Health Report System. The Health Report Form consisted of 10 questionnaires. The number of questions were discussed, and the researchers were aiming to balance the demands on the young people to answer questions with the information the healthcare professionals would gain. Finally, the number of questions was in total 74 items, with various response options. The questionnaires developed in this study were not validated in their new context or format. When digitalizing paper-based questionnaires, validation may be important, depending on the degree of modifications made (Coons et al., 2009). However, no changes were made to the questionnaires when converted digitally, indicating less implication for validation (Coons et al., 2009). Further, electronic questionnaires have been found to provide better data quality, decrease costs and facilitate clinical symptom management and decision-making compared to paper-based questionnaires (Meirte et al., 2020). The inclusion of the diverse participants (Rubio et al., 2003), and the step-wise development process (Prinsen et al., 2016), can be viewed to assess content validity (Almanasreh et al., 2019). Still, more research is needed to validate the Health Report Form for use at the YHC context, in other healthcare settings, and for young people, 12 to 15 years old, before implementation is justifiable.

The study II usability evaluation was carried out with few participants. All together fourteen people were interviewed (four young people, three healthcare professionals and seven researchers in an expert panel). The interview group had diversity in age and occupation, but not in gender. Seven people answered a usability questionnaire (the young people and healthcare professionals). It has previously been established that for early usability evaluations, five participants are sufficient to identify usability issues (Nielsen & Landauer, 1993). However, for a significant outcome, at least eight participants had been required (Lewis, 2018). In the evaluation of feasibility (study III), the qualitative data were collected from in total eleven healthcare professionals. Two interviews were individual and three were in groups of two to three people, based on their profession. Ethical considerations may be raised on the possibility of the healthcare professionals to decline participation, and the smallness of the interview groups. However, there was a small number of participants available, and the group interview context was preferred over individual interviews. A pragmatic decision was made and the interviews were performed in resemblance to the Mini focus group discussion of two to five participants (Kamberelis & Dimitriadis, 2005). A difference to the focus group methodology, however, was that during the interviews, the researcher took the role as an investigator, asking the questions to the participants, instead of
acting like a moderator to facilitate discussion among the participants (Bloor et al., 2001). The qualitative results of the usability and feasibility evaluation were converged with the quantitative results. The planning and procedure of study III followed a feasibility aspects matrix (Thabane et al., 2010). Before the decision meeting, all researchers first analyzed the data individually. After that, in a group discussion, all opinions on the decisions were listened to and discussed to reach a decision, without any personal gain from the final decision. This type of consensus decision differs from the democratic procedure because no one owns the “right answer” to a question. Instead of deciding between different options, the group participants work together to make the best decision for the group, which creates a cooperative dynamic (Butler & Rithstein, 1987).

The study IV results showed statistical significance for the association between the dependent variable of mental wellbeing, the independent variable sense of mastery, and social support. Limitations are that the cross-sectional design did not allow any causal conclusions. It is also arguable whether the sense of mastery affects mental wellbeing or vice versa. However, previous research has assumed that mental health is affected by the sense of managing life (Caputo, 2003; Cusack et al., 2022; Pearlin et al., 1981; Pudrovska et al., 2005; Surtees et al., 2006; Wilkins & Beaudet, 1998). Again, the population was lacking in young men, which make the results hard to transfer to a general population, but relevant to other YHC patient populations (Sveriges Kommuner och Regioner, 2020).

Clinical research should serve the society and its context (Alvesson & Sköldberg, 2017). Hence, this project was pragmatically designed to allow clinical and research solutions and to involve the potential future users, i.e., young people and healthcare professionals.
Conclusion

The involvement of young people and healthcare professionals in studies I, II and III contributed to the development of the Health Report System. The Health Report System was able to identify health-related problems in young people and served as a common ground for the health assessment conversation. The participants in this project found this positive and with potential to strengthen the understanding of health between young people and healthcare professionals. The Health Report System was found usable for YHCs and feasible for further research. Study IV contributed with novel scientific knowledge about health in young people at YHCs. Results showed association between sense of mastery and mental wellbeing and for the mediating effects of social functioning on mental wellbeing.

The thesis’ pragmatic approach in adjusting the project to everyday clinical routines was at the same time necessary and challenging, and revealed the complexity of performing robust scientific research in clinical YHC settings. Despite evaluating the usability and feasibility, co-operating with YHC healthcare professionals before the starting point of all studies, and extensive support to the YHCs, recruitment was difficult. This knowledge can serve as a “heads-up” in designing future research projects, and implicate the need for pilot implementation studies, mapping implementation barriers and facilitators.

Finally, the physiotherapy research field has grown through the interdisciplinary collaboration in this project, by exploring a clinical setting where physiotherapists are scarce. Also, the co-operation with other professions has increased the collective understanding of health in young people at YHCs and has exposed unutilized possibilities for physiotherapy interventions. Finally, the project contributes to physiotherapy, through its participation in digitalization, which today is essential to achieve the version of society that allows people to be physically active.

In summary, this thesis contributes to multi-level knowledge. For example, the constructed Health Report System has potential to identify health risks and poor health in young people, strengthening the health communication between young people and healthcare professionals. This, in turn, has potential to influence the interventions at the YHC organization, and expand the work opportunities for physiotherapists.
Clinical implications and future studies

According to the findings in this thesis, collecting overall health status data from young people when visiting a Youth Health Clinic can reveal health-related problems that may not have been identified if expected to come verbally from the young people. Also, the Health Report System and the digital approach were considered usable and feasible, which strengthens the use of a digital health questionnaire.

Studies I to III have contributed with experience of a research process where young people and YHC healthcare professionals participated on a consultative level to the development of a digital health and welfare tool. Considering the positive spirit for the project, and disregarding the COVID-19 pandemic, the recruitment process was the single most challenging obstacle for this project. Hence, structured implementation research is needed in advance of forthcoming clinical implementation of new research projects or healthcare innovations. Other plausible settings for evaluated implementation are potentially the school nurse and the primary care health central.

The lack of scientific knowledge about the Youth Health Clinic patient population points to the need for larger survey studies. Study IV implies that young people visiting Youth Heath Clinics suffer from mental health problems. From a physiotherapy perspective, exploring the physical activity and sedentary behavior in the YHC population, would be interesting.

More studies related to YHCs could have importance for the support for young people and for YHC management when describing their need for financial support from the government.
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Svensk sammanfattning


I studie IV samlades data i utvärderingsformuläret från 223 ungdomar. Syftet var att statistiskt undersöka om någon av de olika hälsovariablerna var associerade med psykiskt välbefinnande, och att beskriva hälsofamiljens hos
ungdomsmottagningens patientpopulation. Resultaten visade att unga människor med hög känsla av att hantera livet upplevde högre psykiskt välbefinnande, som ytterligare förstärktes av hög social funktionsnivå. Vidare visade resultatet att det psykiska välbefinnandet i gruppen var lägre än jämförelsegrupper från andra studier, och att ungdomarna upplevde låg känsla av att hantera livet, men hög social funktion. Gällande fysisk aktivitet och sexuell hälsa fanns inga statistiskt säkerställde associationer.

Appendix

Interview guide study I

Syfte: Syftet med studien är att utforska hur ungdomar ser på att utforma en applikation som fångar ungdomars behov av stöd för att ge UM bättre underlag i sin bedömning av hur ungdomar mår och vilket stöd ni behöver.

Vad upplever du är viktigt för vården att veta om hur man bäst kan ta reda på hur ungdomar mår?

  Vad är viktigt för vården att tänka på för att ge ungdomar det stöd som de vill ha?
  Vilka förbättringar tycker du att UM kan göra för att ungdomar ska bli omhändertagna på bästa sätt på UM?

Vad tycker du att en applikation ska innehålla för att fånga upp ditt mående?

Vad skulle du tycka om att bli ombedd att fylla i en applikation som handlar om din hälsa innan första besöket på UM?

  På vilket sätt skulle det vara positivt att fylla i en app för att förmedla hur du mår?
  På vilket sätt kan det vara negativt att fylla i en app för att förmedla hur du mår?
  Har du någon åsikt om man ska fylla i appen på en telefon eller surfplatta?
  Vilka fördelar finns det att fylla i appen på plats på UM?
  Finns det också nackdelar?

Hur många frågor skulle känna OK att svara på? Hur lång tid får det ta att fylla i applikationen?

  Vilken typ av frågor ska absolut INTE ingå i applikationen?
  Vilken typ av frågor SKA absolut ingå i applikationen?
Interview guide study II

Syfte: Att tillsammans med ungdomar och personal utveckla en prototyp till ett digitalt stöd för tidig identifiering av hälsorelaterade problem hos ungdomar som besöker UM.

Hur uppfattar du filmen gällande att informera om studiens
- bakgrund och syfte
- tillvägagångssätt
- hantering av data och sekretess
- kännedom om resultat
- försäkring och ersättning
- studiens ansvariga
- frivillighet och digitalt samtycke

Hur uppfattar du möjligheten att gå vidare till skriftlig information till forskningspersoner?

Om du tänker på hur prototypen var utformad:
Hur upplever du utformningen i prototypen avseende
- layout?
- resultatpresentation?

Hur upplever du utformningen i prototypen avseende
- frågeordning
- frågestruktur
- svarsalternativ

Hur uppfattar du förmågan hos prototypen att identifiera för er relevanta hälsoområden vid ungdomars besök på UM?
Vad har du för funderingar kring hur det digitala stödet ska användas på UM, gällande:
- hur och var den fylls i
- hur den används i samtalet
- fördelar/potential,
risker/svårigheter
Kan du ge några förslag på vad som kan förbättras?
Kan du säga någon om hur du ser på prototypens utvecklingspotential?
Finns det något övrigt som du vill tillägga som inte framkommit i intervjun?
Har du någon tanke om ett namn till det digitala stödet?

Tycker du att jag har missat att fråga om något när vi har pratat? Kan vi komplettera med det nu?
1. Är det något annat du vill lägga till?
2. Hur tycker du det har varit att prata med mig om de här frågorna?
3. Får jag träffa dig igen för att återkoppla och stämma av om vi har lyckats ringa in sånt som du tycker är viktigt för att fånga sånt som ungdomar söker stöd för?

Tack för hjälp!

Interview guide study III

Syfte: Pilotstudien syftar till att lägga grund för en fullskalig randomiserad kontrollerad studie. Den avser att studera genomförbarhet gällande tillvägagångssätt inom process, resurs, hantering och vetenskapliga aspekter vid implementering av ett digitalt stöd för tidig identifiering av hälsorelaterade problem hos ungdomar som besöker UM.
Frågeställningar:

1. **Process:** bortfall och rekryteringspotential?

2. **Resurser:** administration för utskick av digital länk, antal läsplattor, tekniska problem, tid att besvara utvärderingsinstrument och instrumentet i det digitala stödet, tids- och resursåtgång för att hjälpa ungdomar besvara instrumenten i det digitala stödet på plats, möjlighet och utmaningar för personal och ungdomar att delta?

3. **Hantering:** dataöverföring från läsplatta till personalens dator, personalens tolkning av resultaten, stödjer resultaten ungdomars förståelse, oförutsedda händelser?

4. **Vetenskapligt:** problem vid dataregistrering i läsplattan, kan frågorna besvaras, har data glömts, variationer av data, tak- eller golveffekt på utvärderingsinstrumentet, kvalitet på data från Regionen och koppling till övriga data.

Frågeställningar 2 och 3:
EnterMedic, Rekrytering, DigiYouth, Individrapporten, Åtgärdsregistrering.

**EnterMedic:**
Hur tycker ni det har varit att hantera IT-systemet Entermedic?
Berätta hur ni har upplevt stödet i form av filmer och skrivna instruktioner samt utbildningstillfällen.
Hur har det fungerat att navigera i Entermedic?
Berätta hur det har varit att registrera ungdomarna.
Hur har det funkat att göra utskick av digital länk?
Hur lång tid har krävts?
Hur har ni löst hanteringen av registrering utifrån bemanning och arbetsbelastning?
Vilka andra funktioner i Entermedic har ni använt?
Gällande EnterMedic: vilka hinder/styrkor finns, sett ur klinisk vardag?

**Rekrytering**
Berätta hur det har varit att rekrytera ungdomar.
När det gäller att rekrytera ungdomar, vilka hinder/styrkor finns, sett ur ert perspektiv?
Hur tror du att vi bäst kan nå ungdomar?
Hur har du agerat när ungdomarna inte har besvarat DigiYouth?

**DigiYouth**
Hur har det fungerat att använda DigiYouth hos er?
Har någon ungdom besvarat antingen utvärderingsformuläret eller DigiYouth på plats hos er?

- Använd de egen telefon eller mottagningens läsplatta?
- Berätta hur det har fungerat när ungdomar har besvarat utvärderingsformuläret respektive DigiYouth på plats hos er, med egen telefon och mottagningens läsplatta?

*Hur har tekniken fungerat gällande att öppna DigiYouth på läsplattan?*
*Hur upplever ni att tidsåtgången för att besvara utvärderingsinstrumentet, när ungdomarna gjort det på plats?*
*Hur upplever ni tidsåtgången för att besvara DigiYouth, när ungdomarna gjort det på plats?*
*Hur har besöket påverkats av att ungdomar har besvarat stödet på plats på UM?*
*Hur många läsplattor behöver ett UM kunna erbjuda?*

**Individrapporten**
Berätta hur det har funkat att hämta individrapporten?

Vad fungerar bra? Vad fungerar mindre bra?

Hur tycker ni det fungerar att tolka resultaten som redovisas i individrapporten?

Hur har ni använt individrapporten i mötet med ungdomarna?

Vad fungerar bra?
Vad fungerar mindre bra?

**Åtgärdsregistrering**
Hur ser ni på åtgärdsregistreringen efter besöket? Tidsåtgång?
Vad upplevde ni som enkelt respektive svårt när det gäller åtgärdsregistreringen?
Vilka förändringar skulle kunna underlätta registreringen?
OM ni skulle vara med i studiens nästa fas – interventionsstudien:
   Vad ser ni som hinder och eventuella risker?
   Vad ser ni som möjligheter?

Övrigt
Om det här skulle vara ett system ni använde kliniskt – vad behövs göras för
att det skulle varar lättillgängligt och värdefullt att använda?

Hur ska man få ungdomarna att svara?

Berätta vilka problem eller händelser har ni stött på, som inte kunnat förutses
gällande studien som helhet?

Finns det något annat som ni vill tillägga som inte framkommit i intervjun?
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