



Turun yliopisto
University of Turku

WEB-BASED INTERVENTIONS SUPPORTING
THE MENTAL HEALTH OF ADOLESCENTS WITH DEPRESSION

Katriina Anttila



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To Petri, Kasper, Iitu
and All my close ones

Katriina Anttila

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University of Turku, Faculty of Medicine, Nursing Science, Doctoral Programme in Nursing Science, Finland, *Annales Universitatis Turkuensis*, Turku, 2018

ABSTRACT

The aim of this study was to enhance the knowledge of potential of web-based interventions that support the mental health of adolescents with depression. The data were collected 2008–2017. A mixed methods study in three phases was conducted. First, a systematic literature review was carried out to describe web-based interventions and examine their impact. Second, the needs of adolescents, based on their own concerns, hopes and social relationships, were explored from their perspective when they visited adolescent psychiatric outpatient clinics. Third, feedback on the web-based support system was gathered. Qualitative data were analyzed with thematic analysis and quantitative data with statistical methods.

In the review, 22 studies (27 articles) were included. The web-based interventions were diverse in their content. Further, 15 studies (16 articles) were included in the meta-analysis. Depression symptoms were found to have reduced in intervention group compared to control group, after intervention ($p=.02$) and when measured 6 months after intervention ($p=.01$). The reduce was not statistically significant at 3–5 month's follow-up. Adolescents in the intervention group left the study earlier than those in control group. The adolescents ($n=70$) described multiple concerns in their lives, but also hopes. Their ($n = 29$) social relationships varied in extent and quality. Adolescents ($n=46$) provided positive feedback on web-based support system and found it to be reliable and appropriate for them. Some adolescents had difficulties with the system and did not experience getting help. Ideas to increase interaction and add detailed information about depression on sites were given.

Web-based interventions are potentially useful for supporting mental health among adolescents with depression and complementing current services. Positive experiences by adolescents encourage the use, but those interventions are not suitable for everyone. The different needs of adolescents with depression should be taken into account when developing web-based interventions or planning treatment for them.

Keywords: adolescent, depression, digitalization, mental health, Socio-Technical Theory, web

Katriina Anttila

VERKKOPOHJAISET INTERVENTIOT MASENTUNEIDEN NUORTEN MIELENTERVEYDEN TUKENA

Turun yliopisto, Lääketieteellinen tiedekunta, hoitotiede, Terveystieteiden tohtori-koulutusohjelma, Suomi Annales Universitatis Turkuensis, Turku, 2018

TIIVISTELMÄ

Tutkimuksen tavoitteena oli saada tietoa verkkopohjaisten interventioiden mahdollisuudesta tukea masentuneiden nuorten mielenterveyttä. Aineisto kerättiin 2008–2017. Tutkimus toteutettiin kolmivaiheisena monimenetelmätutkimuksena. Ensimmäisessä vaiheessa tehtiin systemaattinen kirjallisuuskatsaus interventioiden kuvauksista ja vaikuttavuudesta. Toisessa vaiheessa selvitettiin nuorten tarpeita perustuen huoliin, toiveisiin ja ihmissuhteisiin heidän ollessa asiakkaina nuorisopsykiatrian poliklinikoilla. Kolmannessa vaiheessa kuvattiin nuorten antama palaute verkkopohjaisesta tukiohjelmasta. Laadulliset aineistot analysoitiin käyttäen teema-analyysia ja määrälliset aineistot tilastollisilla menetelmillä.

Katsaukseen valittiin 22 tutkimusta (27 artikkelia). Verkkopohjaiset interventiot erosivat keskenään sisällöiltään. Meta-analyysiin valittiin 15 tutkimusta (16 artikkelia). Masennusoireet vähenivät interventioyhmässä kontrolliryhmään verrattuna heti intervention jälkeen ($p=.02$) ja yli 6 kk seurannassa ($p=.01$). Vaikutus ei ollut tilastollisesti merkitsevä 3–5 kk seurannassa. Nuoret keskeyttivät tutkimuksen interventioyhmässä useammin verrattuna kontrolliryhmään. Nuoret ($n=70$) kuvasivat lukuisia elämäänsä liittyviä huolia, mutta myös toiveita. Heidän ($n=29$) sosiaaliset suhteensa vaihtelivat määrältään ja laadultaan. Nuoret ($n=46$) antoivat palautetta verkkopohjaisen tukiohjelman käytöstä ja kokivat sen pääosin myönteisenä ja luotettava sekä heille tarkoitetuksi. Osalla nuorista oli vaikeuksia käyttää ohjelmaa ja he eivät kokeneet saavansa siitä apua. Kehittämisehdotukset liittyivät vuorovaikutuksen lisäämiseen ja masennukseen liittyvän tiedon tarkentamiseen.

Verkkopohjaiset interventiot tarjoavat käyttökelpoisen menetelmän masentuneiden nuorten mielenterveyden tukemiseksi ja palveluiden täydentämiseksi. Nuorten myönteiset kokemukset tukevat verkkopohjaisten interventioiden käyttöä, mutta silti ne eivät sovi kaikille. Erilaiset tarpeet tulee ottaa huomioon, kun kehitetään verkkopohjaisia interventioita tai suunnitellaan hoitoa masentuneille nuorille.

Avainsanat: Digitalisaatio, nuori, masennus, mielenterveys, sosio-tekninen teoria, web

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ABBREVIATIONS

AT	Activity Theory
CBT	Cognitive Behavioral Therapy
CINAHL	Cumulative Index to Nursing and Allied Health Literature
ETENE	The National Advisory Board on Social Welfare and Health Care Ethics
ICD-10	The International Classification of Diseases-10
IPC	Interpersonal Counselling
IPT	Interpersonal therapy
ISRCTN	International Standard Randomized Controlled Trial Number
MD	Mean difference
MDD	Major Depressive Disorder
NICE	National Institute for Health and Care Excellence
OSF	Official Statistics of Finland
PPM	Precede-Proceed Model
RCT	Randomized Controlled Trial
RevMan	Review Manager
Sd	Standard deviation
SPSS	Statistical Package for the Social Sciences
STT	Socio-Technical Theory
TAM	Technology Acceptance Model
TIDieR	Template for Intervention Description and Replication
WHO	World Health Organization

LIST OF ORIGINAL PUBLICATIONS

- I Välimäki M, Anttila K, Anttila M, Lahti M. 2017. Web-based interventions supporting adolescents and young people with depressive symptoms: a systematic review and meta-analysis. *JMIR Mhealth Uhealth*, 5(12):e180.
- II Anttila K, Anttila M, Kurki M, Hätönen H, Marttunen M, Välimäki M. 2015. Concerns and hopes among adolescents attending adolescent psychiatric outpatient clinics. *Child and Adolescent Mental Health*, 20(2):81–88.
- III Anttila K, Anttila M, Kurki M, Välimäki M. 2017. Social relationships among adolescents as described in an electronic diary: a mixed methods study. *Patient Preference and Adherence*, 11:343–352.
- IV Anttila K, Anttila M, Välimäki M. A web-based adolescent depression support system: Feedback and implications for the future. Resubmitted.

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1 INTRODUCTION

Mental health among adolescents poses a world-wide challenge (Polanczyk et al. 2015, Rocha et al. 2015). Over 30% of people have some kind of mental disorder during their lifetime (Merikangas et al. 2009). Mental disorders touch around 10% of the child and adolescent population, but depending on the study, that number can range from 6.7% (Erskine et al. 2016) to 13.4% (Polanczyk et al. 2015). Among the problems associated with mental health, depression and anxiety form the most common disorders among adolescents. The prevalence of major depressive disorder (MDD) varies (Merikangas et al. 2009), but they have been suggested to affect about 4–5% of adolescents (Thapar et al. 2012).

Adolescents themselves see mental health issues as one of the most significant health concerns in their lives (World Health Organization [WHO] 2014). Depression causes a lot of burden for people. The symptoms and effect of depression are more often experienced by girls than boys. Further, the symptoms of depression increase from the age of 13 to age of 17 years (Khan et al. 2017). The disease causes increased comorbidity, mortality and burden to social relationships (WHO 2013). Depression leads to decreased life satisfaction and decreased feelings of safety and disrupts everyday habits (Khan et al. 2017).

In addition to the notable personal burden depression causes, the disease significantly causes problems at the economic level and in working life. In the United States, the cost of depression increased 20% between 2005 and 2010 reaching 210.5 billion dollars. This total includes costs relating to medical treatment, suicide-related costs, missed working days and reduced productivity (Greenberg et al. 2015). Costs for children and adolescents included in this total not only represent money spent on medical and health care, but also the costs of school and social services (Lynch & Clarke 2006). Adolescents with depression are likely users of financial benefits, such as social insurance support (Pape et al. 2012).

In Finland, total health care costs in 2015 were 19.8 billion euros (9.4 % of GBT). Mental disorders caused costs of 100 million euros in primary health care and 750 million euros in specialized health care. (Matveinen & Knappe 2017.) Regarding working life, mental disorders caused 4 million missed working days, which the Social Insurance Institution of Finland refunded in 2009. Sixty percent of those cases involved depression. In the age group of young adults (under 30 years old), 430,500 days of missed work were refunded because of depression in 2009. (Raitasalo & Maaniemi 2011.)

There is a great need for development in health care services (Finnish Government 2018a, Rocha et al. 2015). Regarding mental health among adolescents, there is a

need to provide treatment to reduce adolescents' suffering and prevent the continuation of mental burden into adulthood (Green paper 2017). Effective treatments for adolescents with depression are available (Hetrick et al. 2016, Thapar et al. 2012). However, several challenges exist. Current services do not meet adolescents' needs. There is also gap between available services and resources. Central factors to development are user-friendliness, services of equal quality, easy access and reduction of costs. (Rocha et al. 2015.) Preventive and early interventions are one focus of reforming mental health services (McGorry et al. 2013), and utilization of digital services is another priority (Finnish Government 2018a, McGorry et al. 2013).

The web is already widely used globally (Statista 2018, Internet World Stats 2018). It is increasingly accessed by adolescents through mobile phones (Statistics Finland 2017). In the beginning of 2018, the number of web users worldwide was 4 billion (Statista 2018)—over half of world population (Internet World Stats 2018). In Finland, almost all adolescents use the web, and 95% of the age group of 16–24-year-olds use it several times a day (Statistics Finland 2017). People aged 16–24 use the web mostly for e-mails (98%), instant messages through mobile phones (97%), social media (96%) and for searching information about products and services (Statistics Finland 2017).

Several advantages of digitalization in health care are known. However, digitalization in health care services is far behind that of other branches or sectors (Imison et al. 2016). The web is actively used among people with mental disorders, although access be rarer than it is among the general population. Although mental health websites are not widely utilized, the web provides possible ways of providing mental health services. (Thomas et al. 2017.) Several web-based interventions are internationally used to support adolescents with depression (Wozney et al. 2017). Those interventions can be realized in a variety of ways and with different contents (MacDonell & Prinz 2017). Web-based interventions are found to have a promising impact on depression symptoms (Pennant et al. 2015), cost-effectiveness, quality of health care and ease of access to treatment. Also, great opportunities to manage resources and remove geographical barriers between patients are have been pointed out. (Imison et al. 2016.)

Despite the advantages of digitalization in supporting mental health among adolescents with depression, there are challenges to take into account. A large number of attempts to put digital services into use in practice have been unsuccessful (Hickey 2006). Several obstacles hinder the implementation and use of digital services in health care (Long et al. 2017, Moody et al. 2015), specifically in mental health services (Town et al. 2017). Digital systems have been found to be insufficiently integrated in surrounding structures. Unmet user needs are one of the most

important obstacles that hinder engagement with digital services in health care. Private and secure access is also a concern for users (Long et al. 2017.) Furthermore, health care professionals believe that web-based interventions may hinder the therapeutic process of adolescents (Town et al. 2017).

To meet the challenges regarding optimally using digital services, a number of factors should be considered (Hickey 2006). Equal attention should be given to both digitalization and the human being users (Mumford 2006a) to reach the best possible results through using web-based interventions (Boström et al. 2009). Regarding the development of mental health services, adolescents' opinions should be heard. Their participation (National Institute for Health and Care Excellence [NICE] 2018a) is crucial when aiming to offer high-quality (Nair et al. 2015) youth-friendly services (Ambresin et al. 2013) and enhance evidence-based practices (Davies & Gray 2017).

This doctoral thesis aims to add to the knowledge of potential of web-based interventions that support the mental health of adolescents with depression. To reach this aim, the Socio-Technical Theory (STT) (Kim et al. 2011, Mumford 2006b) was chosen as a theoretical background for the study. The STT consists of four dimensions: task, people, technology and structure (Leavitt 1965)—all essential factors for reaching the best possible use of digital services (Boström et al. 2009). In this study, three dimensions: task, people and technology are in focus. Structure is understood as the surrounding environment (Mumford 2006a) that forms from the setting in which adolescent mental health services are provided.

The doctoral thesis was conducted in the discipline of nursing science. This study supports the perception that nursing science is a research-based activity aiming to enhance health. Furthermore, the study comprehensively takes into account the holistic framework of nursing, including the needs of individual patients (Grady 2017, Barrett 2002). The concepts of health, people, environment and caring (Barrett 2002) are in focus throughout the thesis with the purpose of enhancing knowledge related to trends of digitalization in health care (Grady 2017, Reed 2018) and producing knowledge to be utilized in clinical practice, health policy and research.

The concepts of health, people, caring and environment (Barrett 2002) are understood in this study to be parallel with the four dimensions of task, people, technology and structure in the Socio-Technical Theory (Mumford 2006b, Leavitt 1965). *Health* is used to mean mental health of adolescents. *People* in this study means adolescents with health concerns of depression. More specifically, they are adolescents who have been diagnosed with depression or have symptoms of depression or anxiety. *Caring* in this study is treatment realized by using web-based interventions. This includes several interventions that aim to support mental health

with the purpose of prevention or treatment. *Environment* means the setting in which adolescents receive mental health services.

This study is linked to the Depis.Net project (ISRCTN80379583). It is a research project conducted in cooperation with the University of Turku and two Finnish hospital districts. The purpose of the project is to develop a web-based support system that is usable and appropriate for adolescents. Depis.Net aims to support self-management and enhance knowledge about the mental health and wellbeing of adolescents with depression (Välimäki et al. 2012). In this doctoral thesis, **Phase I** (Paper I) was conducted to understand web-based interventions in general. The data for this phase consists of international articles published in scientific journals (Paper I). The data used in **Phases II** and **III** (Papers II–IV) were collected from the Depis.Net web-based support system. The adolescents were participants in the intervention group, and they used the web-based support system in addition to their usual care at adolescent psychiatric outpatient clinics in Finland.

2 OVERVIEW OF LITERATURE

2.1 Adolescent depression

Adolescent depression is a significant health concern (WHO 2018a). It is the greatest source of disability in the lives of 10–19-year-olds (WHO 2016a, Vos 2015, Murray et al. 2012). Depression leads to a number of problems, such as mortality, functional impairment (Lépine & Briley 2011) and dysfunction in everyday life (Khan et al. 2017). The economic burden that depression puts on societies is significant (Greenberg et al. 2015, Lépine & Briley 2011). Currently, depression affects over 300 million people worldwide as one of the most common mental disorders (WHO 2018b). The incidence rates increase from childhood to adolescence (Kouros & Garber 2014).

A one-year prevalence of adolescent depression is represented in about 4–5% of the population of this age group (Thapar et al. 2012). However, this percentage differs depending on the type of instrument used for measurement (Karlsson et al. 2010). Mild or moderate major depressive disorder (MDD) has been found in 7.5% of adolescents (ages 13 to 18 years) in the US, while the prevalence of severe MDD was 2.9% (Avenevoli et al. 2015). Among adolescents (N = 16,955) from 12 to 17 years old in the civilian and non-institutionalized US population, depressive episodes have been found to occur in 12.5% of them (Center for Behavioral Health Statistics and Quality 2016).

Among eighth and ninth graders (14–16 years old) in Finland, 27% have been concerned about their mental state, and 12% have experienced severe or moderate anxiety (National Institute for Health and Welfare 2017). Self-reported severe depression has been found in 4.7% of girls and 2.2% of boys (N = 102,182) (Torikka et al. 2014). However, the prevalence of adolescent depression has been shown to slightly increase (Center for Behavioral Health Statistics and Quality 2016, Torikka et al. 2014). In the US, 9% of adolescents had depression episodes in 2004. By the year 2014, it had increased to 12.5% (Center for Behavioral Health Statistics and Quality 2016). Among Finnish girls, the prevalence of severe depression increased from 4.0% in 2000 and 2001 to 4.7% in 2010 and 2011. A statistically significant increase was not found among Finnish boys during the same time frame (Torikka et al. 2014).

Depression causes significant problems for individuals. It affects cognitive skills by weakening memory functioning (Holt et al. 2016, Wingenfeld & Wolf 2011), which can lead to lower achievement at school (Maurizi et al. 2013). Depression

increases a person's dysfunctional thoughts about oneself (Rawal et al. 2013). Furthermore, difficulties with sleeping are common for depressed adolescents (Hayley et al. 2015). Functional impairment is four times as usual in depressed adolescents than in non-depressed adolescents (Balázs et al. 2013). When compared to healthy peers, depressed adolescents participate less in activities at school and in the community, such as clubs and social groups (Burnett-Zeigler et al. 2012).

Personal factors can affect the amount of burden depression can bring. Some differences are related to gender and age. Girls are more sensitive than boys when it comes to suffering from sleep disturbances and feeling sad. Boys more often have problems with concentration and skills needed for making decisions. (Kouros & Garber 2014.) When comparing adolescents to adults, adolescents have more guilty attitudes towards themselves, whereas fatigue and psychomotor retardation are more common among adults (Sánchez-García et al. 2014).

Social relationships have a two-way effect on adolescent depression (Maurizi et al. 2013). Lack of supportive family relationships (Kouros & Garber 2014) and conflicts at home increase depressive symptoms (Fosco et al. 2016). In addition, adolescents whose parents have a low educational levels, unemployment or low incomes have an increased risk of depression (Wirback et al. 2014). In contrast, support from the family and school has been found to lower the presence of depression (Cupito et al. 2016). Good social relationships support depressed adolescents in managing better at school (Maurizi et al. 2013). Family structure has some effect on wellbeing, and adolescents living in nuclear families are a little more satisfied than adolescents in single-mother families (Walper et al. 2015). However, the climate at home has been found to be more effective on adolescents' wellbeing compared to family structure (Phillips 2012).

Stigma is another source of burden for adolescents with depression (Moses 2010). It can be experienced on a personal level, such as a depressed adolescent having their own negative feelings about depression, or on a general level, where other people have negative attitudes towards depression and towards people with depression (Dardas et al. 2017). At its worst, stigma experienced as coming from peers can lead to the ending of friendships. Adolescents can also experience negative attitudes and avoidance coming from their family members, and further, school staff can underestimate an adolescent's abilities and feel fear or dislike. (Moses 2010.)

Regarding mortality, depression is a significant cause of suicide among adolescents (De Crescenzo et al. 2017). Suicide is one of the leading causes of death among this age group (Viner et al. 2011). Out of all deaths of 10–24-year-old young people in 2000–2004, suicide accounted for 7–16% of deaths among males, and 6–13% of deaths among females (Viner et al. 2011). In Finland, in the age

group of 15 to 24-year-old adolescents, suicide is still the cause of death in every third case (Official Statistics of Finland 2013). The trend has been decreasing, especially from its peak among 15–19-year-old boys at the time of the economic downturn in 1990–1991, compared to the suicide rate of 2013 (Parkkari et al. 2016).

2.2 Mental health services for adolescents with depression

Mental health services for adolescents with depression are recommended to provide according to the stepped-care model (NICE 2018a, Ho et al. 2016). The model is based on idea that treatment in different steps or levels is available according to the severity of depression and adolescents' needs (NICE 2018a). The levels can be defined to be: first, watchful waiting; second, self-help; third, face-to-face treatment; and lastly, services in specialized health care. However, the number and realization of steps can vary in different settings (Ho et al. 2016).

Organizations in a variety of settings can provide mental health services for adolescents. Public or private organizations and associations (National Institute for Health and Welfare 2018a) can offer services or they can be provided through a cooperation of these. Organizations can work in community settings, such as at schools, colleges, universities (Hetrick et al. 2016) or health care centers (Pylkkänen & Haapasalo-Pesu 2016). They can operate in clinical settings in primary health care (Hetrick et al. 2016) or specialized health care (Current Care Guidelines 2016). Easy access services are used and often produced in cooperation with primary and specialized health care (Pylkkänen & Haapasalo-Pesu 2016). Both outpatient and inpatient care are used for depression treatment (Wright et al. 2016). Furthermore, services supporting primary health care and enhancing cooperation are recommended to be developed (FINLEX 1326/2010).

Primary health care services are preferred in the treatment of adolescent depression (NICE 2018a, Current Care Guidelines 2016). Organizations in primary health care are responsible for planning and providing necessary treatment (Borg 2016). Health care centers provide services by doctors, nurses, psychologists and public health nurses. Professionals at health care centers are knowledgeable about the service system and are able to guide adolescents in getting the appropriate services (Pylkkänen & Haapasalo-Pesu 2016). In school settings, preventive health services for pupils and their families are provided (National Institute for Health and Welfare 2018b) with the purpose of promoting wellbeing, supporting development and recognizing needs for special support (FINLEX 1326/2010). School health services are responsible for following and recognizing problems in adolescents' mental condition (Borg 2016) and providing supportive meetings with the school health

nurse, psychologist or curator, if needed (The Finnish Association for Mental Health 2018, FINLEX 1287/2013). Family guidance centers can provide support regarding the development of any depression-related problems and potential concerns in the adolescents' family situations (National Institute for Health and Welfare 2018c, Fosco et al. 2016, Kouros & Garber 2014).

Easy access or "walk-in" services are recommended to adolescents (FINLEX 1116/1990). The idea is to reach adolescents that are not yet in the field of services (Erikson & Arnkil 2012) and prevent marginalization (Leemann & Hämäläinen 2015). Referral is not needed, and adolescents can get help anonymously. Adolescents at this stage do better when more alternations of treatment, and resources in their normal life, such as family support, are available. (Erikson & Arnkil 2012.)

Specialized health care services are recommended if support in primary health care is not sufficient (The Finnish Association for Mental Health 2018). This includes cases of moderate or severe depression (NICE 2018a, Current Care Guidelines 2016), psychotic symptoms, suicidal ideation (NICE 2018a, Kaukonen et al. 2010) and requirements of the Child Welfare Act (FINLEX 417/2007). Adolescent psychiatry can operate as an independent medical speciality (Pylkkänen & Haapasalo-Pesu 2016) or in combination with child psychiatry (Salamone-Violi et al. 2015). Both outpatient and inpatient treatments are used (NICE 2018a, Järvelin 2016, Wright et al. 2016), but outpatient care is strongly recommended (FINLEX 1326/2010, FINLEX 1116/1990). Psychiatric specialized health care services are provided at hospitals by hospital districts and also in health care centers (Järvelin 2016).

Outpatient clinics provide services both in acute and non-emergent cases (Kaukonen et al. 2010). A rehabilitation plan for every adolescent should be drawn up with the purpose of enhancing ability to function and attending school (Pylkkänen 2013). Psychotherapy is strongly recommended as treatment (NICE 2018a, Current Care Guidelines 2016) in its different forms such as psychodynamic therapy, family therapy and cognitive behavioral therapy. Psychotherapy can be realized as its own service at outpatient clinics in primary or specialized health care or produced as an outsourced service by private therapists (Pylkkänen 2013). Additional treatment options include occupational therapy, music therapy or group treatments offered in daytime units (Pylkkänen & Haapasalo-Pesu 2016). The more severe the depression is, the more essential medication is (Current Care Guidelines 2016), but always in combination with psychosocial treatment (Kumpulainen & Laukkanen 2016).

Inpatient specialized health care is needed when the patient's mental condition is severe and outpatient care is not sufficient. The treatment can be voluntary or involuntary (NICE 2018a, Kaltiala-Heino & Lindberg 2016, FINLEX 1116/1990).

The goal of inpatient care is to support adolescents in getting back to their normal life in cooperation with their family and other resources that are part of the adolescent's normal life (Kaltiala-Heino & Lindberg 2016).

The Finnish stepped-care model is organized by public sector actors (Pylkkänen & Haapasalo-Pesu 2016) and is produced by municipalities or associations of municipalities (FINLEX 1116/1990). Currently, almost 300 municipalities are responsible for organizing sufficient services for its citizens (FINLEX 1116/1990). Municipalities belong to one of the 20 hospital districts (Kuntaliitto 2017) that are responsible for providing specialized health care services in Finland (FINLEX 1989/1062). Mental health services for children and adolescents in Finland are currently under reform based on a key project organized by the national government's child and family services (LAPE) (Ministry of Social Affairs and Health 2018b). Providing early support and prevention based on the needs of children and their families, and drawing from evidence-based knowledge, are central elements of the project (National Institute for Health and Welfare. 2018d). Likewise, the collaboration of various service providers throughout primary health care, child protection services and specialized health care is crucial (National Institute for Health and Welfare 2018e).

In Finland, some recommendations and laws guide the principles of adolescent psychiatric care. Adolescent mental health services are recommended for those who are aged 13–22 (Pylkkänen & Haapasalo-Pesu 2016). There are also time limits based on Finnish legislation for responding to adolescent mental needs. For people under 23-years-old, the Finnish care guarantee mandates that the estimation for the need for treatment must begin within three weeks of the arrival of the referral. The examinations needed for this estimation must be carried out within six weeks, and the possible treatment must begin within three months of when the need for treatment was determined. (Ministry of Social Affairs and Health 2018a, FINLEX 1326/2010.)

In specialized health care in 2008, 2,269 adolescents aged 13 to 17 years were treated in Finnish inpatient clinics. In outpatient clinics, 17,623 patients were treated with an average of 9.8 visits per patient. In 2015, the number of inpatients decreased to 2,064 (9%). The number of outpatients increased to 20,321 (15%) with an average of 13 visits. MDD and anxiety disorders are the main reasons for psychiatric special health care of adolescents (Järvelin et al. 2017).

2.3 Treatment for adolescents with depression

Treatment for adolescents with depression is available (Thapar et al. 2012). Positive outcomes have been found to relate to treatment (Cox et al. 2014, Thapar et al. 2012) and prevention interventions (Hetrick et al. 2016), and also with cost-effectiveness (Lynch & Clarke 2006). However, there are some challenges in the treatment of adolescent depression. Less than 50% of adolescents needing treatment actually get appropriate treatment (Center for Behavioral Health Statistics and Quality 2016, Burnett-Zeigler et al. 2012). Although treatment is recommended to be carried out in outpatient clinics, the available resources cannot meet the needs of all adolescents needing treatment (Pylkkänen & Haapasalo-Pesu 2016). Thus, there is a need (Kärkkäinen 2016), but also ongoing actions and opportunities, to develop the current treatment system (Green paper 2017).

Depression treatment is recommended to provide following evidence-based guidelines for improving health outcomes (NICE 2018b). Information about depression and its treatment should be provided in an age-appropriate way by health care professionals. Further, information about self-help groups and support groups should be offered (NICE 2018a). Exploration of the adolescent's life situation is essential (Current Care Guidelines 2016), and treatment should be carried out in a supportive and collaborative atmosphere with the patient and their family members. Social workers and educational workers should be part of treatment (NICE 2018a). Psychotherapy alone or in combination of medication is recommended (Current Care Guidelines 2016). Noticing the severity of the depression and urgency of the episode is important in treatment planning (Current Care Guidelines 2016). The available resources also effect what kind of treatment is provided (Thapar et al. 2012).

Treatment for adolescents with depression can be provided through various interventions. Psychoeducation can be used in the prevention and managing of adolescent depression. It can be provided to groups, families or individuals and delivered through information papers, online or through lectures. It may be effective to ensure adolescents' understanding of their depression, and in that, empower them in enhancing their wellbeing (Jones et al. 2017).

Psychological therapies are used with or without antidepressant medication (Cox et al. 2014). Psychotherapies are based on different frameworks and delivered in a variety of manners. Family therapy has been found to be effective in treating adolescent depression and, among five levels of effectiveness of psychological interventions, it is ranked to be best at the support level (level 1) (Chorpita et al. 2011). A randomized controlled trial (RCT) (n = 72, age: 9–15 years) showed a significant reduction in depression symptoms after family therapy intervention and in the follow-up (Trowell et al. 2006). In a systematic literature review, the effectiveness of

psychological interventions for children and adolescents with mental disorders was studied. Out of the 435 studies that were included, the cognitive behavioral therapy (CBT) framework was found to be effective for adolescent depression. CBT with or without medication and CBT involving parents it reached level 1 in supporting depression (Chorpita et al. 2011).

CBT-based therapies were compared to interpersonal therapy (IPT) and to third-wave CBT in the systematic review. Their impact in preventing the onset of depression was especially looked at. Based on 32 studies (total number of participants = 5, 965) included in the review, the risk of depression onset was reduced when using any intervention ($P = .01$) compared to no intervention. Based on 70 studies (total number of participants = 13, 829), depression symptoms decreased in post-intervention ($P < .0001$) with the effects lasting up to three months ($P < .0001$) and 4–12 months ($P < .0002$), but not after that (Hetrick et al. 2016). Interpersonal therapy was found to be effective in the prevention of depression when compared to no intervention (Hetrick et al. 2016). It reached level 2 support, meaning good support, for adolescent depression (Chorpita et al. 2011).

IPT has been modified to a six-meeting-long intervention of Interpersonal Counselling (IPC). The intervention aims to work with complicated and stressful relationships of adolescents with mild or moderate depression. IPC was implemented and studied in Finnish schools, where public health nurses, psychologists and school social workers had been trained in this type of therapy. Adolescents ($n = 46$) with mild or moderate depression participated in a controlled study. The study found that symptoms of depression were reduced clinically significantly, and only 8% of participants needed a referral to specialized health care. IPT intervention was not found to be more effective than usual treatment, but the results were promising for implementing structured interventions for the treatment of adolescent depression in primary health care and school circumstances. (Ranta et al. 2018.)

In the systematic review, expressive writing and relaxation reached level 2, meaning a good level of support. Further, self-control training and self-modeling reached level 4 with minimal support (Chorpita et al. 2011). Mindfulness-based interventions are often used in treating adolescents with depression (Shomaker et al. 2017, Ames et al. 2014). Adolescents ($n = 7$, age: 12–18 years) participating in a mindfulness-based cognitive therapy group for eight weeks were found to have enjoyable experiences and a reduction in symptoms (Ames et al. 2014).

Music therapy is also used to treat depression. In a review of nine studies ($n=421$, age: 14–86 years), short-term benefits were found as pertaining to depressive symptoms (Aalbers et al. 2017). Two studies where participants were adolescents were included in review: a published research article (Hendricks et al. 1999) and a dissertation (Hendricks 2001). Depressive symptoms were reduced significantly

after music therapy among adolescents (n=40, age: 14–15 years) when compared to non-music therapies (Hendricks et al. 1999).

Physical exercise is known to have positive effects on health in general. Furthermore, there are no negative side-effects and the cost of exercise is low. Based on a review of 16 studies involving exercises (total number of participants = 1,191, age: 11–19 years), small positive effects were found related to children's and adolescents' depressive and anxiety symptoms. (Larun et al. 2006.) Dance movement therapy is one particular form of physical activity that is used as depression treatment, although, based on a review of three studies involving participants of a wide range of ages (n = 147, 40 adolescents, 107 adults), no significant improvement in depressive symptoms were found ($P < 0.07$) (Meekums et al. 2015). In one of the studies, however, dance movement therapy among adolescent girls was studied (n = 40, age: 16 years). Here, it was found to balance the sympathetic nervous system with relaxing effects and reduce psychological symptoms. It was a low-cost intervention and easy to implement (Jeong et al. 2005).

2.4 Web-based interventions for adolescents with depression

Web-based interventions are used for the prevention (Lattie et al. 2017, Clarke et al. 2015) and treatment of depression (Leone de Voogd et al. 2016, Rice et al. 2014). The interventions can be delivered online, by DVD or CD-ROM, or with phones or mobile applications (MacDonell & Prinz 2017). In the interventions, adolescents can complete quizzes or questionnaires or play interactive games. They can communicate through phone text messages or online instant messaging, or train skills by doing exercises (MacDonell & Prinz 2017). The interventions can linearly progress through modules or be used without a strict order (MacDonell & Prinz 2017). The interventions are constructed in variety of ways (Wozney et al. 2017, Rice et al. 2014), and adolescents' engagement with the interventions can vary (Rice et al. 2014). In a systematic literature review of web-based CBT-based interventions, the length of interventions varied from three to 26 weeks, and the number of modules varied from four to 30 (Vigerland et al. 2016).

The possibility to receive feedback from professionals and to communicate is included in some web-based interventions. Audio/video conversations are sometimes a feature. (MacDonell & Prinz 2017.) Support from a therapist can be provided through messages, phone calls or face-to-face meetings (Vigerland et al. 2016). During the work process, contact with a therapist can include a short introduction of the intervention or continuous feedback and conversations (Wozney et al. 2017). On the contrary, some interventions are mainly self-directed without communication with professionals (MacDonell & Prinz 2017).

Web-based interventions are used for a variety of purposes for adolescents with depression (Rice et al. 2014, Barak & Grohol 2011). They can be psychoeducation sites, self-help activities, professionally led psychotherapies (Barak & Grohol 2011) or social networking sites (Rice et al. 2014). The interventions can be used for the purpose of supporting adolescents' parents or to offer self-help tools to adolescents (Stenberg 2016), which can be used by adolescents, their parents or both (Vigerland et al. 2016).

The purpose of an Australian web-based intervention called MoodGYM is to identify and overcome depression-related problems and develop coping skills. It is a module-based self-directed intervention, structured by the CBT framework. (O'Kearny 2009.) It is used in several countries and has been translated into Finnish (Päihdelinkki.fi 2013).

The moderated online therapy, Rebound, aims to prevent depression relapses, and is also Australian. The intervention, lasting at least 12 weeks, uses elements from positive psychology, mindfulness and strength-based interventions. It consists of social networking, therapeutic elements and moderation by peers and professionals. The social network components were the most used in this intervention. Depression symptoms have been found to have been reduced by 45% in young people ($n = 42$, age: 15–25 years) between baseline and after the intervention ($P = .0001$). This therapy was also reported to be safe to use. (Rice et al. 2016.)

Web-based emotional memory training intervention targets reducing anxiety and depressive symptoms. Working memory training is a chessboard memory exercise with emotional elements. In one related study, high school students ($n = 168$, age: 11–18 years) participated in an active or placebo group, but differences were not found between the groups in anxiety or depressive symptoms. However, adolescents' self-esteem increased in the active group. (Leone de Voogd et al. 2016.)

The web-based skill-building intervention, ProjectTECH, aims to prevent depression among adolescents. It is a CBT-based web-based intervention lasting 8 weeks. It includes 40 small lessons, skills training and the possibility of peer communication. High school students ($n = 39$, age: 14–19 years) tested its feasibility, acceptability and effectiveness. The intervention was found to be usable, and it was used frequently by adolescents. Significant improvements were found in depression symptoms, perceived stress and positive affects ($P < 0.05$). (Lattie et al. 2017.)

A fantasy game, SPARX, from New Zealand also is meant to support adolescents with depression, and it is used on CD-ROM (Cheek et al. 2014, Merry et al. 2012). The CBT-based intervention offers treatment in a fantasy world where adolescents can practice skills by using an avatar. When the acceptability of this intervention was studied among adolescents living in rural areas ($n = 16$, age: 13–18 years),

privacy was described as being important. However, the intervention was found to have potential to enhance access to therapy. (Cheek et al. 2014.)

The effectiveness of web-based interventions was studied in systematic reviews. Promising results have been found in reducing depression symptoms among adolescents (Pennant et al. 2015, Rice et al. 2014). In a review of 15 studies, all studies except one showed positive results (Rice et al. 2014). In a meta-analysis a total of 27 studies involving 5 to 25-year-olds were conducted. The effectiveness of computerized psychological therapies was found to decrease depression and anxiety symptoms significantly, when compared to the control group, for people aged 12–25 years (Pennant et al. 2015). In a meta-analysis of 25 included studies of people aged 3 to 21, CBT-based web-based interventions were found to be effective regarding psychiatric conditions (Vigerland et al. 2016).

Even with these promising results, the impact of web-based interventions on depression is still ambiguous. In a two-study meta-analysis, face-to-face therapy was found to be more effective when compared to computerized CBT (Pennant et al. 2015). In a meta-analysis including seven studies on web-based interventions, the results did not show statistically significant decreases in depression symptoms. However, anxiety symptoms were found to statistically significantly decrease, when compared to a waitlist (Ye et al. 2014). Further, mixed effects or no effects on wellbeing were found in a narrative systematic review of 43 studies using different ways of web-based communication and social media. Although adolescents reported increased self-esteem, feelings of belongingness and experiences of getting social support, there were also reported risks of exposure to bullying and increase of depression symptoms (Best et al. 2014).

Adolescents' opinions regarding web-based interventions have been explored in a few studies. Kenny et al. (2016) studied opinions on using mental health mobile applications among adolescents in a school setting ($n = 34$, age: 15–16 years). Regarding layout, adolescents reported liking attractive, colorful sites (Kenny et al. 2016). Another study focused on views about web-based support for mental health problems among adolescents in a school setting ($n=106$, age: 12–19 years) and found that more colorful sites were preferred by adolescents with less education, while adolescents with more education preferred black and white sites with more information (Havas et al. 2011). Safety of use, privacy and confidentiality were appreciated features of interventions (Kenny et al. 2016). The adolescents expressed the need for a website offering information and self-tests about mental health, as well as possibilities to chat about the subject with others (Havas et al. 2011). Experiences of adolescents with subthreshold depression ($n = 83$, age: 14–21 years) were studied when the adolescents used a web-based intervention as a depression treatment. After the intervention, they described that they got some help

and more understanding about their situation. They also described having more positive attitudes towards depression treatment than they had at baseline (Iloabachie et al. 2011). The possibility to contact a professional (Kenny et al. 2016), social interaction, and peer support were seen as important for them (Kenny et al. 2016, Iloabachie et al. 2011).

In Finland, some web-based interventions are available but not fully utilized (Stenberg 2016). The website of Nuorten Mielenterveystalo (Nuortenmielenterveystalo 2018) includes information, links, self-help programs and guidance regarding services. It is used in parts of every hospital district (Stenberg et al. 2016). However, no published research articles about Nuorten Mielenterveystalo were found. The digital clinic, Meru Health, was found to offer treatment for depression in Finnish via mobile phones. The intervention is based on mindfulness, cognitive behavioral therapy, and behavioral activation. The 8-week intervention includes theme videos, exercises, and the possibility to get support from a therapist (Meru Health 2018). Published research articles regarding Meru Health were not found.

2.5 Theories regarding use of web-based interventions

A number of theories can be used as a framework when developing digital services (Kok 2014, Crosby & Noar 2011) or redesigning human behavior or work (Hasan & Kazlauskas 2014; Ajzen 2011). Dwivedi et al. (2017), Goodhue and Thompson (1995) and Davis (1985) report on relevant theories, especially those regarding the use or assessment of digital services.

For the purpose of this doctoral thesis, Activity Theory (Hasan & Kazlauskas 2014), The Precede-Proceed model (Crosby & Noar 2011), The Technology Acceptance Model (Davis 1985) and The Socio-Technical Theory (Mumford 2006a, Leavitt 1965) were explored more closely to find a study framework. In the following, the purpose and use of the theories are described. Finally, The Socio-Technical Theory was chosen for the framework of this study because of its emphasis on both the users' human perspective and its aspects of digitalization.

Activity Theory (AT) was developed in 1920s by Russian psychologists Vygotsky and Leontiev for the purpose of understanding human activity and its rationales in practice in social environments. AT offers a holistic framework of human activity by taking into account the aspects of subject, object, community, outcomes, tools, rules and workers (Hasan & Kazlauskas 2014). The AT has been used as a framework, for example, when redesigning work at a children's hospital by analyzing uncoordinated medical care paths, including the use of digital services (Engström 2000). This framework has been used to analyze the use of digital services

regarding self-directed learning to add understanding about digital systems as dynamic and complex tools (Su et al. 2013). Alongside the technology acceptance model, the AT was used to understand factors related to intention of physicians to use guidelines digitally (Hsiao & Chen 2016).

The **Precede-Proceed model (PPM)** is a planning model based on an ecological approach created by Green and Kreuter in 1980 (Crosby & Noar 2011). The PPM is divided into two stages. The planning stage (Precede) includes an appraisal of social, epidemiological, behavioral, educational, ecological and administrative factors relating to people's health behavior. The evaluation stage (Proceed) includes the implementation and evaluation of the process, impact and outcomes (Green and Kreuter 1999 in Crosby & Noar 2011). The purpose of the PPM is to guide logic proceeding in development of interventions and health promotion programs (Crosby & Noar 2011) in dynamic and complex health care environments (Phillips et al. 2012). The PPM has been used to evaluate stress management applications delivered by mobile tools with the purpose of changing human behavior (Payne et al. 2016). It has been used for appraising health care interventions that use home visits for enhancing child-parent engagement. Further, Lam et al. (2017) point out that the purpose of using the PPM in this case was to construct consistent planning phases and systematically involve children and parents in the planning. Only the Precede stage was used to conduct need assessment when developing nutrition programs to promote healthy eating among college students (McMullen et al. 2017).

The **Technology Acceptance Model (TAM)** was introduced in 1985 by Davis in his doctoral thesis (Chuttur 2009, Davis 1985) for explaining human behavior related to computer usage in organizations (Davis et al. 1989). The purpose of the TAM is to explore the determinants affecting the acceptance of use of digital services. The TAM consists of the idea that external factors affect perceived usefulness and therefore make using digital services easier. Furthermore, perceived usefulness and ease of use are the main determinants that affect the acceptance of digital services in organizations (Chuttur 2009, Davis et al. 1989). The TAM and its modifications have been used to promote nurses' use of digital services in health care since the early 2000s (Strudwick 2015). The model has been used to identify nurses' attitudes and influencing factors related to automated medication storage and distribution systems (Escobar-Rodriguez & Romero-Alonso 2013). Furthermore, it has been used for assessing beliefs about and acceptance of digitalization among health professionals (Ketikidis et al. 2012). It has been used to increase understanding about the usefulness of web-based interventions (Kurki et al. 2011) and to describe behavioral intention of the use of a web-based support system from the staffs' perspective in adolescent psychiatry (Kurki et al. 2017).

The **Socio-Technical Theory (STT)**, also called the Socio-Technical Systems (Kim et al. 2011, Appelbaum 1997) or the Socio-Technical System Design (Leitch & Warren 2014), aims to optimize the social and technical systems equally to maximize the efficacy and people's satisfaction in their work (Adam & Warren 2000). The STT intends to improve the implementation of digital services in organizations (Appelbaum 1997). The best possible output of a system change is understood to be reached when all aspects of the technical and social subsystems (Boström et al. 2009), consisting of the four dimensions of task, people, technology and structure, are taken into account (Leavitt 1965).

Development of the Socio-Technical Theory began after World War II at the Tavistock Institute of Human Relations (founded 1946), in London (Mumford 2006a). The group working at the institute consisted of therapists, consultants, researchers and psychiatrists who provided support to soldiers after the war. They found that the approaches they used with soldiers could be developed and applied in organizational circumstances with the purpose of enhancing employees' work satisfaction and personal skills (Mumford 2006b). In the early phases of STT, it was applied to redesign work in coal mines (Appelbaum 1997). The idea was to reform human work and life by combining human skills with new technology. The open-system concept is based in theory. The environment was understood as one component of technology use that influences the usability, acceptability and functionality of the digital services (Baxter & Sommerville 2011).

The STT has been used as a framework in several studies in different areas and branches of science. Regarding environmental and energy policy, the STT was applied to analyze investments in the electricity sector. The purpose was to activate a downturn of carbon and to enhance energy policy that tackles the challenges of low-carbon investments (Bolton & Foxon 2015). The STT has been incorporated into innovation science research to add the user's perspective to the existing perspective of production (Geels 2004). It has been used as a design to provide a broad context for understanding the use of products and the value of information systems in organizations (Miah et al. 2012).

In health care, the STT has been used in action research projects to improve health information system development towards usable systems in operation theatre departments. The STT has been used to redesign an inadequately working patient administration system by taking into account users' (nurses') needs regarding system use and data-entry. It has promoted the redevelopment of flexible user interface with the possibility to consider needs not only related to digitalization. Challenges involving a lack of communication and coordination in the subcultures of three units were noticed. After all dimensions of the STT were taken into account, the patient administrative system improved, and user satisfaction increased (Adaba

& Kebebew 2017). In Finland, the STT has been used as a framework in the implementation of electronic patient records. The purpose was to figure out the meaning of socio-technical implementation. Further, the aim was to study how the STT has been adopted and what it means to successful working processes. All four dimensions (task, people, technology and structure) of the Socio-Technical Theory were found to be significant to successful implementation of patient records (Valta 2013).

3 AIMS OF THE STUDY

The overall aim of this study is to enhance the knowledge about the potential of web-based interventions to support the mental health of adolescents with depression. The study consists of three phases, which are presented in Figure 1. The goals are as follows:

Phase I: Description of web-based interventions and impact of the interventions aims to describe web-based interventions and examine the impact of the interventions with the purpose of supporting the mental health of adolescents with depression (Paper I).

Phase II: Description of adolescents' needs based on concerns, hopes and social relationships aims to describe adolescents' needs based on concerns, hopes and social relationships described in the web-based support system developed for adolescents with depression (Papers II and III).

Phase III: Description of adolescents' feedback on the web-based support system aims to describe the strengths, weaknesses and ideas for future modification of the web-based support system developed for adolescents with depression from the adolescents' perspective (Paper IV).

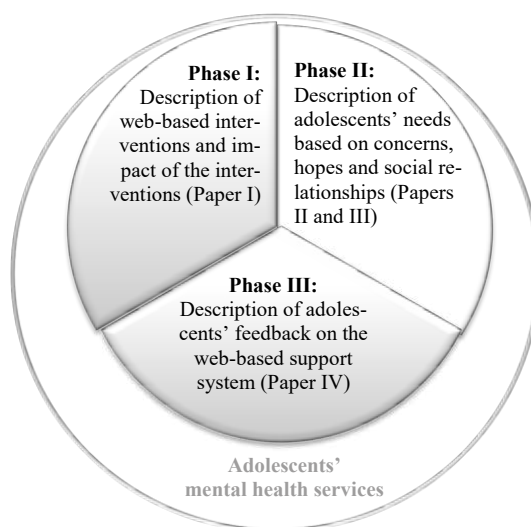


Figure 1. Phases of the study.

4 MATERIALS AND METHODS

4.1 Theoretical approach

The theoretical approach of this doctoral thesis employed the Socio-Technical Theory (STT) (Mumford 2006b). It was chosen to guide this study because it equally emphasizes social and technical aspects regarding the use or implementation of web-based interventions. It offers a framework that takes the perspective of adolescents as well as the technology features of web-based interventions into account in the environment of mental health services. These aspects are significant when seeking to gain understanding about the use of digital services in practice (Baxter & Sommerville 2011).

The Socio-Technical Theory has been widely tested and developed since its starting point. Its main idea, to optimize technical and social systems, has been adapted to different situations (Whetton 2005, Mumford 2006b). In Europe in the 1960s and 1970s, there was an increased focus on humanization, democracy and group work, including common decision-making, in working life. In 1980, when job satisfaction of employees was understood to be important for productivity in industry, the position of the socio-technical approach was enhanced in the US. At the same time, the business climate and the industry changed. The ideas of Lean Production with standardizing processes took hold. Reducing costs was central, while a lack of economic consideration was a weakness of the Socio-Technical Theory. Later, projects with new computer systems were implemented, also in hospitals, successfully using the principles of the Socio-Technical Theory. (Mumford 2006b.)

The four dimensions of the Socio-Technical Theory are: task, people, technology and structure (Leavitt, 1965). Structure is also named as an organizational environment (Mumford 2006a). The four dimensions are dependent on each other, and a change in one dimension causes a change in the others (Leavitt 1965, Cipriano 2012). For example, if there is an intention to increase the use of technology, in addition to the technology, the aspects of task, people and structure should be taken into account (Leavitt 1975). As follows, the dimensions of the STT are first described based on theory, and after that, defined in the context of this doctoral thesis.

Task is defined as a purpose of a project. It is the set of qualifications or preconditions of an organization, its “raison d’être” (Leavitt 1965). It includes the production of service, taking into account the complexity of the levels of people, organization and technology. In health care, the task is to provide evidence-based and consumer-centered services in appropriate ways. A task should be modified to

reflect any changes in its environment. The task of health care should, thus, follow the shift in resources from hospital-centered treatment to preventive and communal services. (Whetton 2005.)

In this study, the task is understood to enhance people's health and wellbeing (Ministry of Social Affairs and Health 2018c) by offering comprehensive and evidence-based mental health services (WHO 2015). It consists of the promotion of mental health and the prevention of its associated problems and, further, the treatment of mental disorders (WHO and Calouste Gulbenkian Foundation 2017). It includes supporting people's ability to function and work (Ministry of Social Affairs and Health 2018c). Requirements and needs for people of different ages and developmental stages should be taken into account when providing mental health services for them (WHO and Calouste Gulbenkian Foundation 2017). Moreover, adolescents are recommended to actively participate in the development of the task through what kind of services are provided to them (NICE 2018a). In **Phase I**, the description and impact of web-based interventions are studied for understanding the possible health advantages of the interventions, and for understanding what factors construct the interventions. In **Phases II** and **III**, the adolescents are users of mental health services and web-based interventions. Their needs and feedback are examined to understand the use of web-based interventions in supporting their mental health.

People is defined as actors who use digital services in practice (Leavitt 1965). The term is associated with social aspects of human beings, including needs, values, attitudes (Cipriano 2012, Boström et al. 2009) and feelings (Leavitt 1965). Further, it refers to people's knowledge, skills (Cipriano 2012, Boström et al. 2009), opportunities to learn and need of social support (Mumford 2006b). Organizational processes nowadays are understood to be people-oriented, and changes happen by influencing behavior of people through different approaches. The approaches can range from early manipulative approaches to current more equal approaches where the changes are caused by group pressure or need satisfaction (Leavitt 1965). In health care, people (patients, clients) are actively participatory and are an essential part of evidence-based decision making (Cipriano 2012). They are involved in the planning, monitoring and evaluation of health services (Nair et al. 2015, WHO 2015).

In this study, people are users of web-based interventions in mental health services. They were experts on their own situation and mental condition, based on their experiences (Davis & Grey 2017). They were adolescents or young people with diagnosed depression or symptoms of depression or anxiety, worded in this study as 'adolescents with depression. In **Phase I**, the people were in the age range between

10 and 24 years (Sawyer et al. 2012). They were participants of randomized controlled trials (RCT) included in the systematic literature review in this study. The people in **Phases II and III**, are the adolescents who were between 15 and 17 years old. They participated in the Depis.Net project (Välimäki et al. 2012), where the data of **Phases II and III** were formed. The adolescents were referred to adolescent psychiatric outpatient clinics because of symptoms of depression or anxiety. Besides their treatment as usual, they worked self-reliantly for six weeks by using the web-based support system developed for adolescents with depression.

Technology is defined as an intervention or tool that employs mechanical and technological solutions for a specific problem (Leavitt 1965). It consists of the material devices and their applications, but also the knowledge related to the devices (Cipriano 2012), including evaluation and testing the use of the digital services (Leavitt 1965). To utilize digitalization in health services evidence-based knowledge is needed to understand how the services are produced and delivered (Cipriano 2012). Currently in the health care sector, development and strengthening of digitalization is in focus (Finnish Government 2018b). Regarding the possibilities of saving costs with digitalization, technology offers effective services without the constraints of location and with optimized waiting times (Whetton 2005). Digitalization can also replace employees (Parviainen et al. 2017) and provide easier access to health services for users (Andrews et al. 2013).

In this study, technology is defined as the digital services in the environment of health care. More specifically, it means web-based interventions that aim to support the mental health of adolescents with depression. Technology in this study refers to different web-based interventions, such as therapies, treatment or self-help interventions or psychoeducation delivered online. Furthermore, chat or video conversations, mobile applications, text messages and web games are included in the dimension of technology (Barak & Grohol 2011). In **Phase I**, technology refers to web-based interventions delivered in a variety of ways, such as on the web, through mobile phones or tablet applications, or with program installation packages to use on a computer. In **Phases II and III**, the web-based support system called Depis.Net was an intervention that adolescents used in addition to their treatment as usual. The intervention included information pages, exercises and questionnaires and quizzes (Välimäki et al. 2012).

Structure (or organizational environment by Mumford (2006a)) means the systems of communications, rules and hierarchy of authority regarding to working process (Leavitt 1965). It consists of relationships and responsibilities between the factors inside the system (DeSanctis & Jackson 1994). Reward methods are also included in structure (Boström et al. 2009). Structural approaches to organizational

change concentrate on the coordination of workflow. These approaches focus on managing and controlling the jobs or decentralizing decision making and operations and moving them to the local unit level. (Leavitt 1965.) Health care organizations are typically complex and hierarchic, having professional sub-cultures and teamwork with formal and informal norms. Change in appointed structures is usually slow, and implementation of technology solutions can shape status regarding power and privileges. (Whetton & Hartnett 2005.)

In this study, structure is defined as mental health services for adolescents. It is the physical environment where the web-based interventions were offered to adolescents (Polit & Beck 2012). It consists of organizations and the mental health services that were providing support to adolescents, such as school circumstances and health care services (Hetrick et al. 2016). In **Phase I**, structure refers to a variety of settings where web-based interventions for adolescents were provided. The structure consists of organizations that were working in community or clinical settings, such as school or health care organizations. In **Phases II** and **III**, the structure is six adolescent psychiatric outpatient clinics in specialized health care in Finland.

4.2 Methodological approach

The methodology of this study is based on a mixed-methods approach. A triangulation of both quantitative and qualitative research traditions is followed to access the different dimensions of reality (Patton 1999). A combination of positivism (Shih 1998), post-positivism (Kettes et al. 2011) and pragmatism (Morgan 2007) forms the orientation of this study with the purpose of understanding the nature of knowledge and decisions made through the research process (Braun & Clarke 2006). Positivism (Shih 1998) underpins a research tradition where the interest is in measurement of evidence and generalization of results (Risjord 2002). In the post-positivistic tradition (Kettles et al. 2011), the interest is in phenomena (Shih 1998), including values and beliefs that cannot be confirmed by measurement (Risjord 2002). Furthermore, pragmatism brings to this study the idea of the practical nature of knowledge, which is emphasized through the twofold philosophical orientations (Morgan 2007).

The approach was chosen because it allows the research topic to be reached from the perspectives of both human experiences and extent of how largely the interest of the study is (Fettes et al. 2013). Mixed methods were used because, by comparing results from both quantitative and qualitative approaches, the validity of the

study can possibly increase (Fettes et al. 2013). Designs, sampling methods and data analyses according to study phases and papers are described in Table 1.

Mixed methods were used at the following three levels: design, methods, and interpretation and reporting levels. First, at the research design level the convergent approach was used (Fettes et al. 2013, Kettles et al. 2011). The research questions represent both quantitative and qualitative approaches for getting complementary pictures from various perspectives through adolescents' experiences (NIH Office of Behavioral and Social Sciences 2018). Data collection was conducted in parallel by using structured questionnaires with qualitative questions (Fettes et al. 2013).

Second, at the method level, the merging approach was used for adding understanding, as mentioned in the study aim (Fettes et al. 2013). Data were collected by simultaneously using quantitative and qualitative methods, as well as the analyses of different data that were conducted separately (NIH Office of Behavioral and Social Sciences 2018, Fettes et al. 2013, Plano Clark et al. 2008) and emphasized equally (Kettles et al. 2011, Plano Clarke et al. 2008). Third, at the interpretation and reporting level, quantitative and qualitative results were integrated. According to weaving approach, the results were described together by themes narratively (Fettes et al. 2013).

Table 1. Designs, sampling methods and data analysis according to study phases and papers.

Phase	Paper	Design	Sampling methods	Data analysis methods
I	I	Systematic literature review	Selective sampling	Deductive thematic analysis, Meta-analysis
II	II	Explorative qualitative study	Purposive sampling	Inductive thematic analysis
	III	Descriptive mixed methods study	Purposive sampling	Descriptive statistics, Inductive thematic analysis
III	IV	Descriptive mixed methods study	Purposive sampling	Descriptive statistics, Deductive thematic analysis

4.3 Design

In **Phase I**, a systematic review and meta-analysis was conducted for collecting knowledge on web-based interventions and evidence of their impact on supporting

the mental health of adolescents with depression (Higgins & Green 2011). A systematic literature review was performed because of the need for comprehensive knowledge about the subject and to appraise the quality of the studies (Aromataris & Pearson 2014) to enhance the appropriate use of web-based interventions in adolescents' mental health services. Web-based interventions in the original studies were described based on a Template for Intervention Description and Replication (TIDieR), including a checklist and guide (Hoffman et al. 2014). The meta-analysis was conducted according to Cochrane Handbook using the RevMan computer program (Higgins & Green 2011). The quality of included studies was appraised to find and describe believable and valid results of the reviews (Higgins & Green 2011). (Paper I.)

In **Phase II**, the explorative qualitative design (Paper II) and descriptive mixed methods (Paper III) designs were used. Adolescents were involved (Braun & Clarke 2006) to give a more authentic representation of the reality of their own health; this was done according to The Global Standards for Quality Health Care Services to participate adolescents more in the development of mental health services (Nair et al. 2015). An explorative qualitative study was conducted to gain a deep understanding of adolescents' concerns and hopes in their daily lives (Thomas & Magilvy 2011), and to explore the topic from the adolescents' point of view (Sandelowski 2004) (Paper II). A descriptive design with mixed methods was used to understand adolescents' experiences from multiple viewpoints (NIH Office of Behavioral and Social Sciences 2018). Both the extent of adolescents' social relationships and their experiences relating to this topic were examined (Kettles et al. 2011). Data (qualitative and quantitative) were collected concurrently and weighted equally when the results were merged (Plano Clark et al. 2008). Quantitative data were described using frequencies (Paper III). An inductive thematic analysis was used to describe the adolescents' experiences using the themes and conducting a flexible analysis without pre-existing assumptions (Braun & Clarke 2006). (Papers II and III.)

In **Phase III**, a descriptive design with mixed methods was used to understand adolescents' feedback on the web-based support system from multiple viewpoints (NIH Office of Behavioral and Social Sciences 2018). Both magnitude and individually described experiences were examined for this purpose (Kettles et al. 2011). Quantitative and qualitative data were collected concurrently (Plano Clark et al. 2008). Quantitative data were described with counting frequencies. Qualitative data were analyzed with a thematic analysis to identify adolescents' relationships from their own perspective (Braun & Clarke 2006). Results based on quantitative data were demonstrated through examples from qualitative writings (Plano Clark et al. 2008) and combined by themes (Fettes et al. 2013). (Paper IV.)

4.4 Setting

In **Phase I**, electronic databases formed a study setting for the systematic literature review (Andrews et al. 2004). The following databases were used: PsycInfo, Medline, Cumulative Index to Nursing and Allied Health Literature (CINAHL) and the Cochrane Library. PsycInfo is the most extensive database, focusing mainly on references in the field of psychology and psychiatric nursing (Andrews et al. 2004). It contains over 4 million records from 2,500 journals (American Psychological Association 2018). Medline is an extensive database in the medical field (Andrews et al. 2004) containing over 24 million records from 5,600 journals (U.S. National Library of Medicine 2018). CINAHL is mainly focused in the nursing field (Andrews et al. 2004), containing 3.7 million records from 3,100 journals (EBSCO Health 2017). The Cochrane Library is a composition of six databases focusing on systematic reviews and randomized controlled trials in health care, and it consists of a total of 1.2 million records (Cochrane Library 2018). (Paper I.)

In **Phases II and III**, six adolescent psychiatric outpatient clinics in the area of two hospital districts in Finland formed the study setting. In 2015, one of the hospital districts consisted of 24 municipalities and had a catchment area with a population of 1.6 million (Kuntaliitto 2017). Per 1000 capita, 33.4 patients were treated in psychiatric outpatient care in 2014. Per 1000 people aged 13–17 years old, 75.5 patients were treated in outpatient care. The other hospital district consisted of 23 municipalities, and a catchment area with a population of half a million (Kuntaliitto 2017). Per 1000 capita, 26.1 patents were treated in psychiatric outpatient care in 2014. Per 1000 people aged 13–17 years old, 62.3 patients were treated in outpatient care. (Papers II–IV.)

4.5 Population, sampling methods and participants

In **Phase I**, the population was formed from the papers reporting studies about web-based interventions supporting the mental health of adolescents and young people. In total, 1,458 papers were identified after removing duplicates and were screened for eligibility for review. Selective sampling methods were used, and 27 articles (22 original studies) were included in the review based on inclusion and exclusion criteria. Articles were included in the review if they reported randomized controlled trials (RCT) and were published in peer-reviewed journals. The papers were written in English. The study participants in the eligible studies were 10 to 24-year-old adolescents or young people with diagnosed depression or symptoms of depression or anxiety. The total number of participants in the studies was $n =$

7,097. The interventions aimed to support the mental health of the study participants. The interventions were delivered through digital services. Further, 16 articles (15 original studies) were included in the meta-analysis. Studies were included if the web-based intervention had been compared to a non-web-based control condition. (Paper I.)

In **Phases II** and **III**, the population was made up of adolescents visiting adolescent psychiatric outpatient clinics who had been allocated into the intervention condition of the Depis.Net RCT. The adolescents were included if they were from 15 to 17 years old, had symptoms of depression or anxiety and were able to speak and write Finnish. They were excluded if the state of mental disorder was severe, such as having psychotic depressions, bipolar disorder, substance abuse or a primary eating disorder. Out of 158 adolescents who gave informed consent to participate, 75 adolescents were allocated to the intervention group. Adolescents in the intervention group used a web-based support system in addition to their treatment as usual. Out of this group, 70 adolescents defined their life concerns and hopes in the first session of the web-based support system. They formed the participants in Paper I. Out of the 70 adolescents, 29 completed an exercise about social relationships, and they formed the participants in Paper III. Lastly, out of the 70 adolescents, 46 adolescents gave feedback on the web-based support system and formed the participants of study reported in Paper IV.

Purposive sampling methods were used to reach participants with specific health problems and because of the possibility the methods have to offer rich information related to the research questions of this study (Setia 2016, Palinkas et al. 2015). Accurately, a criterion sampling strategy was used. The participants who had used specific sections of the Depis.Net and produced reflections and experiences regarding specific questions on the web-based support system were chosen for the study (Palinkas et al. 2015, Polit & Beck 2012). (Papers II–IV.)

4.6 Instruments

In **Phase I**, three instruments were used in the literature review. First, a data extraction template was created for collecting study characteristics. Authors, publication years, country, purpose of the study, setting, target group including age and number of randomized participants (N), number allocated to intervention (n) and to the control condition (n); and the attrition rate was extracted from all studies included in the review. The CONSORT-EHEALTH checklist V 1.6.1. (Eysenbach 2011) was and modified for the purpose of this study. (Paper I.)

Second, a data extraction template was created on the basis of the TIDieR checklist (Hoffman et al. 2014) for collecting information from the intervention descriptions. Authors and publication years, intervention name, background theory or rationale of intervention, materials and procedures used, provider, modes of delivery, location, dose and length of the program and fidelity and use, were extracted. (Paper I.)

Third, the outcomes of depression, anxiety, stress, moods and feelings, leaving the study early and costs were gathered. Measures were collected at three time points: short-term (post intervention), mid-term (3–5 months after intervention) and long-term (6 months or longer after intervention). (Paper I.)

In **Phase II**, two instruments were used. Both of them were created primarily to be instructions to guide the adolescents' working through the themes and exercises on the Depis.Net web-based support system. The content was selected based on the adolescents' needs, literature on existing web-based interventions, interviews of professionals working with adolescents (Välimäki et al. 2012) and the self-determination theory (Deci & Ryan 2008). First, needs based on concerns and hopes were gathered using open ended instructions. The adolescents were asked to think of a concern or problem, such as relating to school, parents or friendships, and how they would be willing to change or work with it. Adolescents had the possibility to write their answers straight into the support system. There was space to freely write as much they wanted. (Paper II.)

Second, needs based on social relationships were gathered in an exercise about social relationships. The exercise included two parts: a network map and open-ended questions. Adolescents were instructed to create a visual network map using an Excel platform by identifying people important to them and putting them on the network map. Furthermore, they were asked to take into account the distances between the marks (between the adolescent themselves and a connected person) on the network map. The participants were asked to use smileys to describe the quality of their social relationships. They were also asked to reflect on their social relationships and write about elements they were satisfied with and/or things they would want to change. (Paper III.)

In **Phase III**, two instruments were used to collect the adolescents' feedback on the web-based support system. First, a structured instrument was developed and modified for the purpose of gathering feedback from the adolescents about their use of the web-based support system. The instruments were modified based on the Quality Criteria of Public Online Services (The Finnish Ministry of Finance 2004) and the Quality Criteria for Health Related Websites (Commission of the European

Communities, Brussels, Europe 2002). The Quality Criteria of Public Online Services were purposed to support the development and evaluation of web-services and enhance clients' satisfaction. The modified version consisted of 40 items in five assessment areas: Use, Content, Management, Production and Benefits of web-services. A maximum of five points were given according to how well each item was realized (The Finnish Ministry of Finance 2004). The criteria was utilized in the Finnish government's strategy on web-services (Finnish Government 2004) and in several Finnish theses. The criteria have been updated regarding specific items (Ministry of Finance 2012).

The Quality Criteria for Health Related Websites were purposed as an appraisal tool for users and service providers to enhance the validity and reliability of websites offering health information. It consisted of 14 items in six categories of quality criteria: transparency and honesty, authority, privacy and data protection, updating of information, accountability, and accessibility (Commission of the European Communities, Brussels, Europe 2002). Websites aiming to support physical activity of breast cancer survivors were appraised using five of these quality criteria. The number of items filled due to sites were rated, and any lacking indications of updates of websites or funding sources were identified (Sylvester et al. 2017). The quality of cancer risk assessment websites was appraised using four criteria, and overall, the quality of the websites was found to be poor (Ekman et al. 2005). The content of the two quality criteria above was used to guide the development of the instrument.

Five quality criteria were represented in the instrument of this study and were measured by 36 items. Content (4 items), Structure (6 items), Presentation (10 items), Use (9 items) and Information (7 items) were appraised. A Likert scale was used as an estimation scale, and the criteria were appraised with five alternatives (5 = totally agree, 4 = agree, 3 = neither agree nor disagree, 2 = disagree, 1 = totally disagree). The instrument was located on web-based support system, but it could also be used in printable paper form.

Second, feedback was also gathered with eight open-ended questions. The questions were related to the adolescents' experiences on the use of the support system, and their ideas of modifying the sites in future. The questions were created to complement the structured instrument and make it possible for adolescents to freely describe their experiences on the web-based support system. The instrument was located on the web-based support system, but it could also be used in printable paper form (Paper IV).

4.7 Data collection

In **Phase I**, the data were collected on 1 September 2015, and the search was updated on 10 February 2017. Four electronic databases focusing on health topics were searched through (Andrews et al. 2004). The systematic search was conducted with the assistance of an information specialist from University of Helsinki. The search terms were defined based on the PICO strategy for reaching best possible information available related to the research questions (Santos et al. 2007).

Studies were selected according to Cochrane Collaborations' typical study selection process based on the predetermined inclusion and exclusion criteria (Higgins & Green 2011). The selection was carried out by two independent researchers, and a third researcher was consulted in cases of disagreement. After removing duplicates, 1,458 titles and abstracts were examined, while 1,398 records were removed as irrelevant to research topic. Sixty full texts were examined, and 33 were excluded. This left 27 records reporting on 22 studies for the purpose of describing interventions. For the meta-analysis, out of 27 records 11 studies were excluded. This left 16 records, 15 studies, for the meta-analysis (Paper I).

In **Phases II** and **III**, data were collected between 2008 and 2010 through the Depis.Net web-based support system. Adolescents visited an adolescent psychiatric outpatient clinic, where they met a research assistant who introduced them to the support system. The adolescents got a username and password for access, and they started to use support system at their homes in addition to their treatment as usual. Instructions were written texts appearing before the questions or exercises on the website. The adolescents had the possibility do the exercises in their own space using computer at home or elsewhere. They reflected on their experiences by writing straight onto the website. (Papers II–IV.)

The data about the adolescents' concerns and hopes were gathered in the first session of the web-based support system, and this began the adolescents' working process. They were instructed to describe their daily concerns or problems that they were willing to work with during the period that they would use the web-based support system. (Paper II.)

The data of adolescents' social relationships were gathered on the web-based support system when they worked with the theme of *Home and family*. The adolescents completed an exercise about social relationships, where they identified their social relationships, and defined the quality of them with smileys. Further, they reflected on their social relationships based on network maps by writing free text. (Paper III.)

Third, the feedback on the web-based support system was collected by using a structured questionnaire and open-ended questions. The adolescents gave their feedback after using the support system. As an alternative to using the instruments on the website, there was the possibility to give feedback according to same questionnaires in a face-to-face interview with a research assistant or in paper format posted to them. (Paper IV.)

4.8 Data analysis

In **Phase I**, the interventions of the included studies were analyzed by using a thematic analysis (Braun & Clarke 2006). A deductive approach was used for getting a detailed analysis of the interventions, where themes were based on the TIDieR checklist (Hoffman et al. 2014). The five themes were as follows: background theory or rationale of intervention; materials and procedures; provider and modes of delivery; location, dose, length of the program; and fidelity and use. Two researchers independently coded the papers based on the themes. The codes represented the descriptions of the interventions, such as “The program consists of a range of interactive activities” or “Each session lasts approximately 30–45 minutes.” After that, the themes were discussed by the researchers and modified to find a consensus. A report was produced and detailed in a grid by the themes and is presented in a broad outline in the results section. (Paper I.)

The impact of the web-based interventions was analyzed using a meta-analysis method (Higgins & Green 2011). The data from the original studies was entered into Review Manager 5.3 software (RevMan) (Higgins & Green 2011). As a continuous outcome, the mean differences (MDs) were used to examine the effects of the intervention compared to control groups. Similar scales or measurements with small differences were used to find out the impact of the web-based interventions. Random effects were used to allow heterogeneity of the original studies (Ades et al. 2005). Standard deviations (SDs) and sample sizes were used to compute the weight of every original study in the meta-analysis. I^2 values were calculated for measuring the heterogeneity of the studies (Higgins et al. 2003). The quality of the studies included in the meta-analysis were appraised by using the Risk of Bias tool in Review Manager (RevMan) version 5.3 (Cochrane community 2018). (Paper I.)

In **Phases II** and **III**, a thematic analysis was used. It offers a flexible method for collating, understanding and detailed reporting of adolescents’ experiences related to the specific context of adolescent mental health services (Vaismoradi et al. 2013). An inductive approach was followed in **Phase II** to find out adolescents’ needs based on their concerns, hopes and social relationships without a predefined

theoretical interest (Hsieh & Shannon, 2005) (Papers II and III). In **Phase III**, a deductive approach was followed to find out specific aspects of adolescents' feedback according to predefined issues (Hsieh & Shannon, 2005) (Paper IV). A thematic analysis was carried out flexibly and iteratively following the steps laid out by Braun and Clarke (2006). The codes were handled in a Word text document. The results were presented as a written report according to themes, sub-themes, and codes based on the level of issues describing the wholeness of the detailed information of the issues. Compact and comprehensive information about adolescents' experiences was created. Citations were used to demonstrate adolescents' experiences. (Papers II–IV.)

4.9 Ethical considerations

In every phase of the research process of this doctoral thesis, the guidelines of the Finnish Advisory Board of Research Integrity to confirm the fulfillment of responsible conduct of research were followed. The entire research process was carried out with integrity and carefulness, and all required permits were obtained. The research methods chosen for this study are scientifically competent and were followed with accuracy (Räsänen & Moore 2016, Finnish Advisory Board on Research Integrity 2012). Adolescents and young people with mental health problems are at the center of this study. Throughout this study, the human dignity and autonomy of the adolescents was respected (ETENE 2011). The study was sought to give them a voice to adolescents on issues affecting them (ETENE 2009, United Nations 1989), whereas they are found to be a group at risk to not hear their opinions (Raphael et al. 2006).

In **Phase I**, the purpose of literature review was to gain information that could be used to improve mental health treatment of adolescents and promote their wellbeing (World Medical Association 2013). The study enhances research evidence in the field of digitalization in adolescents' mental health services, something that is demanded by legislation in Finland (FINLEX 1326/2010). The review was conducted according to the Cochrane Collaboration Handbook (Higgins & Green 2011) to ensure proceedings in line with scientifically competent guidelines in regard to data collection, analyses, quality appraisal of included studies and reporting of the results (Finnish Advisory Board on Research Integrity 2012). (Paper I.)

In **Phases II and III**, ethical approval was granted by the ethics committee of the hospital district (R08075H). Permissions were obtained from the hospital administrators of the hospital districts. Adolescents and their parents were informed about the study process orally and in writing by research nurses and the staff of the

adolescent psychiatric outpatient clinics. Written informed consent was requested from all adolescents. The adolescents had the possibility to withdraw from study at any time without needing to give a reason (FINLEX 488/1999).

The adolescents in this study were considered to be a vulnerable group (Flaskerud et al. 1998) with the risk of experiencing increased stigmatization (Dardas et al. 2017), a lack of support in their social relationships (Kouros & Garber 2014) and difficulties in everyday life (Khan et al. 2017). With these concerns in mind (Flaskerud et al. 1998), their welfare was a priority and their conditions were monitored by the research nurses; the staff were contacted if any alarming signs occurred, including suicidal thoughts or worsening of their condition (World Medical Association 2013, FINLEX 488/1999). Conducting research on adolescent depression treatment is understood to benefit adolescents themselves (World Medical Association 2013). Studying and developing interventions for them can be seen as a prompt to reduce vulnerability (Raphael et al. 2006). (Papers II–IV.)

The data consisting of sensitive material related to the mental health of adolescents were handled and stored carefully, respecting and protecting the private lives of the participants (Finnish Advisory Board on Research Integrity 2012, FINLEX 523/1999). The adolescents' access to the web-based support system was protected with personal usernames and passwords. The adolescents were identified by using ID-numbers, and, to protect anonymity, the names and identity numbers did not appear on the materials. The adolescents' exercises were stored automatically on the web-based support system, to which research nurses, moderators and researchers had access by using personal usernames and passwords. The access to the web-based support system was deactivated for the adolescents after the research project. Baseline information and some optional questionnaires were conducted using a paper format. The data on the web-based support system and in paper format were transferred to SPSS, Excel or Word documents and stored securely on a memory stick at the university. For the purpose of this study, the data were delivered to the researcher in an anonymized electronic format with ID- numbers. (Papers II–IV.)

5 RESULTS

5.1 Characteristics of study participants

In **Phase I**, 2,087 records were identified, and after removing duplicates, 1,458 records were left. After selection, 27 articles (22 RCT studies) met the inclusion criteria and were included in the narrative review. Out of these, 16 articles (15 RCT studies) were included in the meta-analysis. The study characteristics are described in a Multimedia Appendix in Paper I. The studies were then selected for inclusion in the meta-analysis. The total number of participants in the studies was 7,097, and of those, 4,979 participants were in the studies included in the meta-analysis. The age of participants in included studies ranged from 11 to 24 years (Paper I).

In **Phase II** and **III**, the participants were the adolescents who participated in the Depis.Net RCT study (Välimäki et al. 2012). They were mostly females: 54 (77%) in Paper II, 28 (97%) in Paper III and 34 (74%) in Paper IV. Gender, age, education and previous use of mental health services of the participants in Papers II–IV are described in Table 2.

Table 2. Characteristics of study participants in Papers II–IV.

Participant characteristic		Paper II N = 70 (%)	Paper III N = 29 (%)	Paper IV N = 46 (%)
Gender	Female	54 (77)	28 (97)	34 (74)
	Male	16 (23)	1 (3)	12 (26)
Age	15 years	22 (31)	12 (41)	15 (33)
	16 years	27 (39)	7 (24)	16 (34)
	17 years	21 (30)	10 (35)	15 (33)
Education	Comprehensive school	31 (44)	12 (41)	19 (42)
	High school	29 (42)	14 (49)	18 (39)
	Vocational school	8 (11)	3 (10)	8 (17)
	Other/not known	2 (3)	0 (0)	1 (2)
Previous use of mental health services	Yes	51 (73)	18 (62)	33 (72)
	No	15 (21)	9 (31)	11 (24)
	Not known	4 (6)	2 (7)	2 (4)

5.2 Description and impact of the web-based interventions

In the systematic review, 22 studies (27 articles) focused on 17 different web-based interventions. Cognitive Behavior Therapy (CBT) was most commonly used as the background theory or rationale for the interventions. The materials and procedures of the interventions included various software, such as websites, chats, or text message programs in mobile application. Some of the interventions were supplemented by workbooks.

The interventions were module-based, fantasy games or interaction through chat, e-mail or text messages. Information, exercises, and questionnaires were included in the interventions. Some interventions included the possibility to get feedback or technical support. The providers of the interventions were professionals working in schools, in health care organizations or in community settings. Delivery was conducted via CD-ROM, mobile phones, chat rooms or e-mails. The interventions included up to 14 modules each, and the amount of time spent on one module or task varied between three minutes and three hours. The interventions varied in timespans from three to ten weeks (Paper I).

Web-based interventions were compared to control conditions in 15 randomized controlled trials (RCT) (16 articles). Depression, anxiety, stress, moods and feelings, leaving the study early and costs were measured at three time points (Paper I).

Depressive symptoms were measured at all three time points. Statistically significant short-term improvement was shown regarding depressive symptoms in the intervention groups when compared to the control groups at the same time ($p=.02$, median 1.68, 95% CI 3.11–0.25). However, a decrease in depressive symptoms was not statistically significant at the mid-term measurement point ($p=.08$, median 2.91, 95% CI 6.19–0.36). In the long-term, the improvement was again statistically significant ($p=.01$, median 1.78, 95% CI 3.20–0.37). (Paper I.)

Regarding anxiety symptoms, statistically significant improvement favoring the intervention groups was measured in the short-term ($p=.001$, median 1.47, 95% CI 2.36–0.59), but not at the mid-term measurement. Studies reporting long-term effects on anxiety were not included in the meta-analysis. The decrease in short-term stress symptoms was not statistically significant in the intervention groups when compared to that of the control groups. Studies reporting results of mid-term or long-term effects on stress were not included in the meta-analysis. Regarding moods and feelings, statistically significant improvement was found ($p=.04$, median 5.55, 95% CI 10.88–0.22) in the short-term. Studies reporting mid-term or long-term effects on moods and feelings were not included in the meta-analysis.

Leaving the study early was measured in at short-term and mid-term time points. The participants in web-based intervention groups left the study earlier than in those in the control groups measured in the short-term ($p=.007$, median 1.31, 95% CI 1.08–1.58). Also, at the mid-term measurement, studies were left earlier in the intervention groups than in control groups ($p=.02$, median 1.65, 95% CI 1.09–2.49). (Paper I.)

5.3 Adolescents' needs based on concerns, hopes and social relationships

Adolescents' concerns and hopes were described in four main themes: relationships, daily actions, identity, and wellbeing. Furthermore, nine themes and sub-themes of concerns and hopes were formed. The adolescents brought up a number of concerns. In addition, they also described hopes regarding to every theme. The main themes and secondary themes of adolescents' concerns and hopes are presented in Figure 2. (Paper II.)

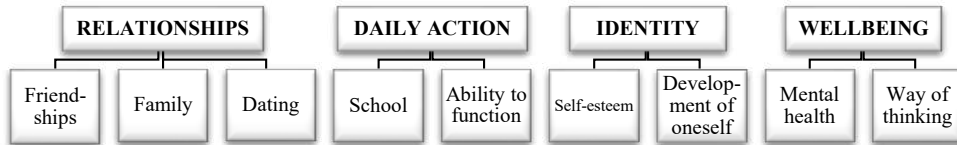


Figure 2. Adolescents' concerns and hopes in main themes and secondary themes.

The number of social relationships plotted on the network maps ranged from 2 to 21. Based on the written text, a few adolescents also reflected on their lack of relationships. Five sub-themes were created to identify adolescents' social relationships based on the marks they plotted on the network maps, and what they included in the written texts: family, relatives, peers, other social relationships and lack of social relationships (Paper III).

The quality of adolescents' social relationships was described in three themes based on smileys plotted on the network maps, and the what they wrote: positive, negative and neutral relationships. Out of the 99 smileys placed on the network maps, 59% were positive, 10% were negative, and 31% were neutral. The themes

and sub-themes of quality of social relationships are presented in Figure 3 (Paper III).

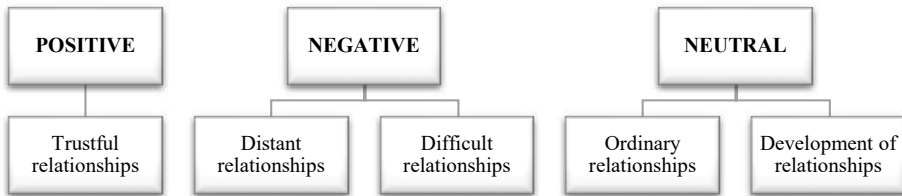


Figure 3. Quality of adolescents' social relationships.

5.4 Adolescents' feedback on the web-based support system

The quality criteria (Content, Structure, Presentation, Use, and Information) were appraised with a structured questionnaire (Range 1–5). Figure 4 shows the adolescents' agreement and disagreement regarding each item, and that the majority of the adolescents were in agreement with the items (Figure 4). (Paper IV.)

Regarding the strengths of the web-based support system, the item most agreed with (totally agree and agree in structured questionnaire) was that the support system was usable at home (95% out of 44 respondents). The second most agreed with item was that the support system targets adolescents (93% out of 45 respondents)—this was appraised as good. This item was followed that which stated that the use of the system was safe (91% out of 45 respondents) and reliable (91% out of 45 respondents). In addition, the adolescents described, in written texts, several strengths of the web-based support system. The strengths were related issues such as ease of use and appreciation of self-reliant working. The support system was seen as a good alternative to treatment as usual, one that made it possible to reflect on thoughts and ease the condition (Paper IV).

Regarding weaknesses of the web-based support system, the adolescents most often disagreed or totally disagreed with the statement that the web-based support system is usable at a friend's home (29% out of 45 respondents). After that the most disagreeable items were that they are going to use the support system in

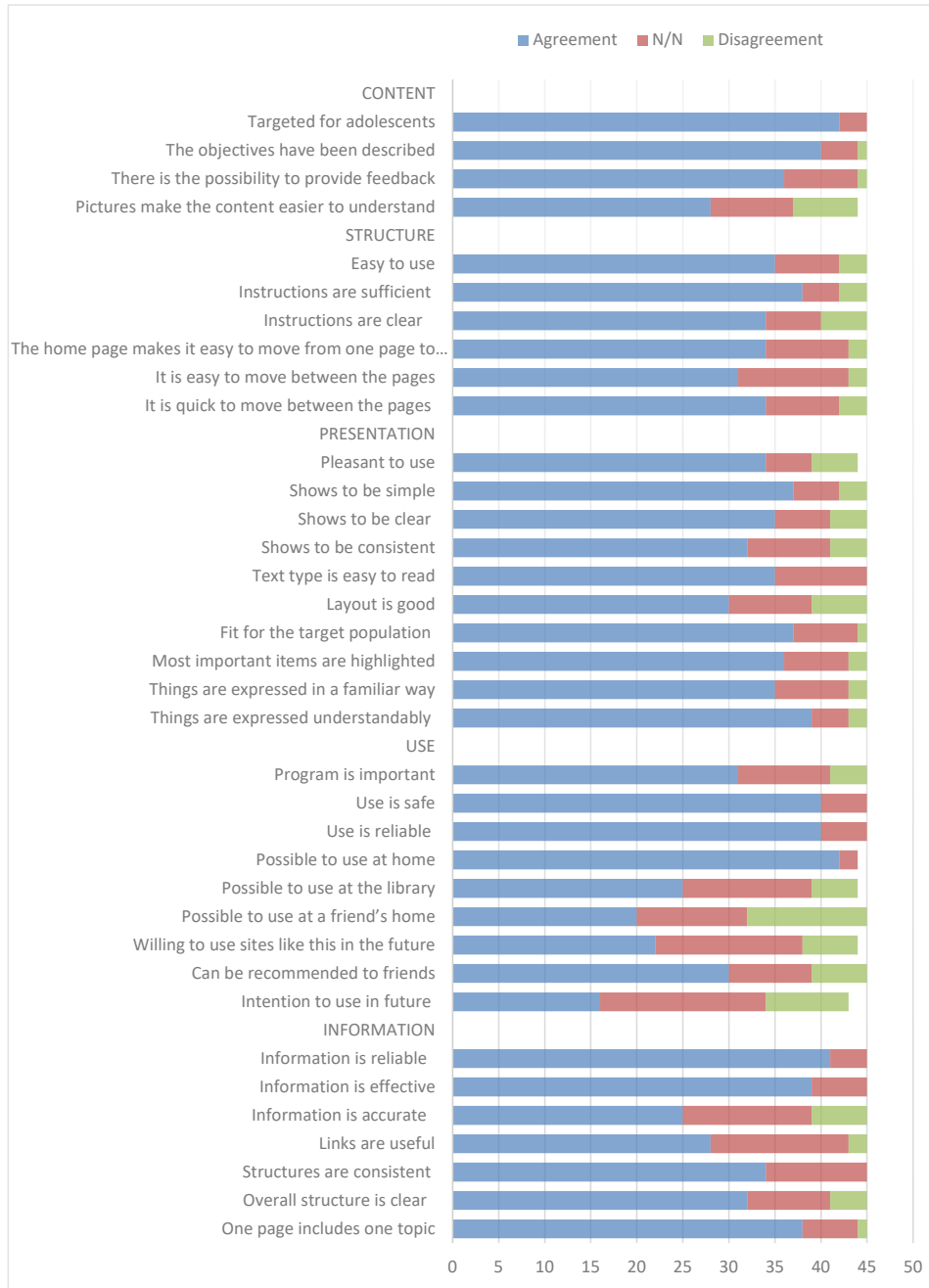


Figure 4. Agreement and disagreement in content, structure, presentation, use and information of the web-based support system (Modified from unpublished Paper IV)

future (21% out of 43 respondents), followed by the statement that the pictures made the content easier to understand (16% of 44 respondents) and willingness to use sites like this in future (14% out of 44 respondents). The weaknesses expressed in written texts related to challenges on using the support system. Unclear instructions, technical obstacles and the poor condition of adolescents were described as challenges that the adolescents faced in relation to the system. The support system did not meet the needs of every adolescent, and it was not experienced as helpful in every case. (Paper IV.)

Ideas for future modification of the web-based support system were offered in the written texts. Ideas about modifications were related to feedback from professionals and increasing communication with peers. There were ideas for enhancing the layout of the websites. In addition, the adolescents offered ideas for developing the information provided on the support system. (Paper IV.)

6 DISCUSSION

6.1 Validity and reliability of the study

The validity and reliability of this study are discussed concerning the research process and methods used in this study. A mixed methods design was used as a methodological approach. Using both quantitative and qualitative methods can be seen as a strength of this study as it enhances validity (Fettes et al. 2013, Zohrabi 2013). Validity and reliability are discussed in every study phase in this section.

In **Phase I**, the methodological quality of the studies included in the systematic literature review was first appraised based on the Risk of Bias tool in Review Manager (RevMan) version 5.3 by Cochrane Collaboration (Cochrane community 2018). The internal validity of the studies was appraised according to selection bias (random sequence generation and allocation concealment), performance bias (blinding of participants and personnel), detection bias (blinding of outcome assessment), attrition bias (incomplete outcome data), reporting bias (selective reporting), and other bias (such as, bias related to research funding) (Higgins & Green 2011). The lack of internal validity of included studies may have an effect on the confidence of the results of this systematic literature review. This should be considered to avoid an overestimation of the results (Ryan et al. 2013). The studies were classified as having a low, high or unclear risk of bias. Almost all included studies lacked in their quality. A low risk of bias was found in 13 studies of random sequence generation, in 7 studies of allocation concealment, in 14 studies of blinding of participants and personnel, in 12 studies of blinding outcome assessment, in 9 studies with in-complete outcome data, in 4 studies of selective reporting and in 7 studies of other bias. Only one study was appraised as high in all criteria. The risk of bias for each study are described in detail in Paper I. (Paper I.)

A high quality of reporting was ensured (Christensen 2001). This study was guided by the Handbook of Cochrane Reviews, and followed detailed process of systematic literature review (Higgins & Green 2011). Search terms and modifications used in each database are precisely described in Multimedia Appendix 1 in Paper 1 to enable replication of the search process (Paper 1). A search and an updated search were conducted with the assistance of an information specialist. To minimize errors, two independent researchers carried out the study selection and data extraction (Higgins & Green 2011). In cases of disagreement, a third researcher was consulted. The flow of the study selection is described in the PRISMA Flow diagram (Moher et al. 2009). The quality of the quantitative data (Christensen 2001) might have been lowered because of the wide variety of instruments used in the included studies to measure the outcomes in the meta-analysis. (Paper I.)

In **Phase II**, regarding credibility, the intention was to bring out adolescents' needs from their own perspective (Graneheim 2017). The participants were adolescents using the Depis.Net web-based support system in addition to their treatment as usual at adolescent psychiatric outpatient clinics. They were able to describe their real-life experiences on the topic. This was also ensured by choosing to concentrate on manifest expressions instead of interpreting the latent content of the written texts offered by the adolescents (Graneheim 2017). (Papers II and III.)

Regarding the thematic analysis, it was not possible to collect participant feedback on the themes. If it would have been possible, it could have been used to confirm the representativeness of the adolescents' needs regarding the themes and sub-themes in the final results (Zohrabi 2013, Thomas & Maligvy 2011) (Papers II and III). Due to the inductive approach of the thematic analysis, there was a threat of leaving themes too wide or superficial (Graneheim 2017). When coding the data, there was an effort to bring out the core of the participants' views and experiences. The codes were defined as every expression of adolescents that describe their experiences. (Papers II and III.)

Dependability throughout the research process can be confirmed as the criteria of reporting qualitative research was followed (Tong et al. 2007). The rationales for creating the themes and sub-themes in the thematic analysis were discussed with other researchers and with the participants in scientific seminar groups to avoid subjectivity, as were the effects of personal previous experiences on the analysis of the qualitative data (Hill et al. 2005) (Papers II and III). The reliability of the smileys used to appraise the quality of social relationships was verified. Adolescents ($n = 31$) from the main population were asked to classify the smileys to represent positive, neutral or negative meanings of social relationships. (Paper III.)

Regarding the transferability of results, the small number of participants may be seen as a limitation (Thomas & Maligvy 2011). There were 75 adolescents in the intervention group of the Depis.Net RCT that formed a study population. Out of them, 70 (93%) participated and 5 (7%) did not in the study, as reported in Paper II. In Paper III, 29 (45%) participated and 41 (55%) did not. The drop-out rates in this study are generally in line with average rate of 31% in psychological web-based interventions (Melville et al. 2010). (Paper II and III.)

In **Phase III**, the feedback was collected from adolescents who used the Depis.Net web-based support system. The participants were able to provide experiences from their own perspective in the use of the web-based support system (Graneheim 2017). Because of the deductive approach of the thematic analysis regarding the qualitative data, there was a threat that not all expressions would fit into the themes based on the ready-made model (Graneheim 2017). This was taken into account,

but all information suited the themes, which were broadly based on the quality criteria of the structured questionnaire. (Paper IV.)

The reliability of the structured instrument measuring five quality criteria was appraised regarding internal consistency. The Cronbach's alpha for each sum score is as follows: Content 0.73, Structure 0.86, Presentation 0.91, Use 0.85, and Information 0.82. All Cronbach's alpha values regarding the instrument used in this study are at least acceptable (Content) or at a good level (Structure, Use and Information), and went up to a strong level (Presentation) (Taber 2017). (Paper IV.)

Regarding the transferability of results, there are some limitations to take into consideration (Thomas & Maligvy 2011). Out of 75 adolescents in the study population, 46 (68%) offered their feedback, but 24 (32%) did not. That is almost the same as the average drop-out rate in psychological web-based interventions (Melville et al. 2010). Regarding the adolescents participating in this study, symptoms or suspicion of depression or anxiety were reasons for referrals and recruitment, but severity of depression was not appraised in this study. Previously, severity of psychological disorders has been found to predict drop-out rates (Melville et al. 2010). The reasons for not continuing to use the support system are not clear, but some expressed in their written texts that if their condition was not good, they were not able to use the web-based support system. (Paper IV.)

6.2 Discussion of the main results

In this study, a systematic literature review was conducted to describe web-based interventions and examine the impact of interventions to support the mental health of adolescents with depression. The interventions were found to be diverse in dosage, content and delivery methods. The interventions included were based on several background theories. In this light, the interventions represent a wide range of treatment methods. This result is in line with a few previous studies (i.e., Vigerland et al. 2016, Rice et al. 2014, Barak & Grohol 2011), where web-based interventions were described based on their elements and delivery methods. In addition, this result is in line with other results regarding existing depression treatments, usually conducted face-to-face, which are also based on different background theories (Shomaker et al. 2017, Chorpita et al. 2011) and a variety of methods (Jones et al. 2017, Hetrick et al. 2016, Cox et al. 2014, Ames et al. 2014). The diversity of web-based interventions poses some challenges in identifying the elements that support the mental health of adolescents with depression. In this study, web-based interventions were described using the TIDieR checklist, which makes it possible to systematically describe interventions. Previously, interventions have been found to be poorly described, even though systematic descriptions are essential for the

replicability of interventions, their implementation in practice and for studying interventions. (Hoffman et al. 2014.)

In the meta-analysis, some decrease in symptoms of depression were found among the participants who used the web-based intervention compared to those who did not. The decrease was statistically significant in the short-term and long-term, but not at the mid-term check point. A statistically significant decrease was found in anxiety symptoms and in moods and feelings, but not in stress symptoms in the short-term. Previously conducted meta-analysis has shown a decrease in both depression and anxiety symptoms when using web-based interventions for adolescent depression (Pennant et al. 2015). However, non-statistically significant decreases in depression symptoms (Ye et al. 2014) and mixed effects have also been found in systematic reviews (Best et al. 2014). In this study, the decrease of depression symptoms varied at the different measurement time points. As with depression symptoms, the decrease in anxiety symptoms did not continue to the mid-term measurement point. Also, a lack of long-term outcome measurements makes the knowledge about impact of web-based interventions slightly insufficient. The diversity of the web-based interventions found in this study makes it difficult to know which elements are effective. In addition, different levels of therapist support during the use of web-based interventions may have impacted the outcomes (Vigerland et al. 2016). The results of this study support the use of web-based interventions for the purpose of decreasing adolescents' symptoms of depression and anxiety, but more research is needed to figure out why the outcomes are not stable.

Attention should be given to the question of why leaving the study early was more common in the web-based intervention group than in the control group in the meta-analysis. In addition, in the empirical study, the drop-out rates were notable, as most of all adolescents (97%) began working in the web-based support system, but only 45% completed the exercises about social relationships, and 68% gave feedback on the web-based support system. Adolescents' reasons for withdrawal were not explored in this study. However, web-based interventions are often self-directed (MacDonell & Prinz 2017), contrary to much of the face-to-face treatment that is currently provided (Pylkkänen & Haapasalo-Pesu 2016). The impact of dosage of therapist support on continuation in web-based interventions is not known (Vigerland et al. 2016). Previously, a lack of concern, getting help from elsewhere or an unwillingness to change one's own life were found to be reasons for early withdrawal from web-based interventions (Al-Asadi et al. 2014). Further, severity of psychiatric symptoms (Melville et al. 2010), personal reasons or users' dissatisfaction with the intervention content may have an impact on early withdrawal (Postel et al. 2010). We can assume that the reasons for early withdrawal found in previous studies are similar to those reasons for withdrawal in this study, but more

research is needed to confirm this. This study strengthens the previous knowledge that adolescents using web-based interventions are at risk of dropping out. It is essential for health care professionals to recognize those adolescents at risk of early withdrawal. They may need support to continue with the web-based intervention or they may be in need of more traditional treatment.

Adolescents' needs based on concerns, hopes and social relationships were described on the web-based support system developed for adolescents with depression. According to the Socio-Technical Theory (Leavitt 1965), the people in this study were adolescents whose experiences described from their own perspectives were of interest in this study (Davis & Grey 2017). Knowing users' attitudes, skills (Cipriano 2012, Boström et al. 2009) and feelings (Leavitt 1965) is essential for optimizing social and technical aspects for the purpose of ensuring the best possible use of digital services (Boström et al. 2009). Knowing adolescents' needs makes it possible to develop mental health services for them (NICE 2018a, Nair et al. 2015) and support them in continuing treatment (Al-Asadi et al. 2014). In light of the global concern that adolescents are not getting sufficient treatment for depression (Center for Behavioral Health Statistics and Quality 2016, Burnett-Zeigler et al. 2012), understanding their needs may enhance the development of user-friendly services (NICE 2018a) and get more adolescents to access treatment. Previously, unmet needs were found to be one of the most important obstacles for the engagement with digital services in health care (Long et al. 2017). The burden of depression has previously been described in several studies (Dardas et al. 2017, De Crescenzo et al. 2017, Holt et al. 2016, Greenberg et al. 2015, Balázs et al. 2013, Rawal et al. 2013, Lépine & Briley 2011, Wingenfeld & Wolf 2011), but the focus of this study was to gain understanding about the subject from adolescents' own perspectives.

Several concerns regarding relationships, daily actions, identity and wellbeing were defined by adolescents in this study. Although adolescents were asked to describe their concerns, they defined hopes regarding all the fields mentioned above. The quality of social relationships was described negatively, neutrally and positively. The extent of adolescents' social relationships ranged from a lack of relationships to 21. These findings provide information about adolescents needs. Using this knowledge when providing treatment or developing services for them may enhance adolescents' satisfaction regarding the services provided to them. Further, this enhances the adolescents' role as experts in planning and making decisions about their own treatment (Davis & Grey 2017). The power of social relationships in supporting adolescents with depression (Cupito et al. 2016, Maurizi et al. 2013) can be seen in the light of the results of this study. Although there was wide variation in adolescents' social relationships, the adolescents intended to positively develop their relationships. Further, social relationships can be harmful and even

worsen the condition of adolescents (Fosco et al. 2016, Kouros & Garber 2014). In addition to the variation in social relationships, the results of this study showed that changing the social relationships of adolescents is possible. Based on the results of this study, the needs of adolescents with depression can be seen as their individual concerns greatly affecting their life. However, their hopes can be seen as signs of efforts to get better and improve their life.

Adolescents' feedback regarding strengths, weaknesses and ideas for future modification of the web-based support system was explored. According to the Socio-Technical Theory (Leavitt 1965), the feedback was gathered to enhance the understanding of the use of the web-based support system from the adolescents' own perspectives (Cipriano 2012). Although adolescents' participation in service development is essential, only a few studies (Kenny et al. 2016, Havas et al. 2011, Iloabachie et al. 2011) have focused on their feedback and experiences regarding web-based interventions. This study fills a gap by collecting adolescents' feedback straight from them after using web-based interventions. No studies describing experiences of adolescents with depression in the Finnish context were found, so this may be the first study in this field in Finland.

Mainly positive experiences were attributed to the web-based support system based in the quantitative questionnaire. Free texts written by adolescents provided useful examples and raised understanding about the strengths, weaknesses and ideas for future modification of the web-based support system. The results may be encouraging regarding the use of web-based interventions with adolescents with depression. This is in line with a few studies, where adolescents' experiences with using web-based interventions have been found to be positive (Kenny et al. 2016, Iloabachie et al. 2011). In addition to the strengths of web-based support system described by adolescents, in this study, a minority of them brought out weaknesses and experiences in not getting help. This highlights the fact that web-based interventions are not suitable for all, and other treatment alternatives should remain available. In a previous study, adolescents provided specific examples of important issues to them regarding web-based interventions, such as privacy, colors of websites and peer support (Kenny et al. 2016). The specific strengths, weaknesses and ideas for future modification described by adolescents in this study provide new knowledge about their experiences with the purpose of developing web-based interventions for them.

6.3 Strengths and limits of the study

The strengths of this study are as follows. First, the topic of this doctoral thesis is current, and it is a reaction to the need to develop adolescent mental health services

and adds knowledge on this subject (Finnish Government 2018a). The study provides insight into the clinical practices of health care, and the knowledge it adds enhances the understanding of previously-found geographically equal, cost-effective and easily accessible interventions for depression treatment (Imison et al. 2016).

Second, in the empirical study included in this doctoral thesis, adolescents were given a channel to express their experiences and feedback on the use of the web-based support system. Getting them to participate in the development and evaluation of their own health services is in line with the Criteria for the Global Standards for improving the quality of adolescent health (Nair et al. 2015).

Third, using both quantitative and qualitative research methods can be seen as a strength of this study. A mixed methods design was used as a methodological approach (Fettes et al. 2013, Zohrabi 2013), and more accurate results were able to be obtained than would have been possible if another approach alone had been used (Choy 2014). Understanding the nature of knowledge based on different philosophical orientations (Risjord 2002, Patton 1999) brings comprehensive quality to the study (Fettes et al. 2013).

As for the limitations of the study, first, contextual or personal factors may have caused some risk of ideological bias in this doctoral thesis (Linville & Grant 2017). The choice of the subject is in line with reforming health care services that emphasize digitalization (Finnish Government 2018a, McGorry et al. 2013). Tendencies of digitalization in policy (Klein & Chiang 2004), especially health policy, may have had some effect on personal attitudes towards and interest in digitalization in mental health services. The main researcher of this study may have had more positive attitudes towards digitalization because of following information from that specific perspective. This may have increased the tendency for the researcher to find and read studies supporting this subject (Klein & Cihang 2004). Personal or situational factors in this study may have added to the risk of ideological bias. The objectivity of the research process was confirmed by conducting the analysis with a research group or double-checking with two researchers. This was done to avoid personal ideas or motives directing the proceedings of the study (Gilbert & Malone 1995).

Second, girls were overrepresented in the empirical study. Out of 70 participants in the study reported in Paper II, 77% were girls. Among the 29 participants in Paper III, 97% were girls, and in Paper IV, 46 adolescents participated and out of those 76% were girls. The skewness of gender in this study is in line with the underestimation of depression among boys in middle adolescence (14–17 years) (van Beek et al. 2012). This study lacks knowledge about experiences among boys with depression, and it would be important to better understand the differences in

experiences between the genders (Kouros & Garber 2014) and take into account the notable risk of suicide that exists among depressed boys (WHO 2016b, Viner et al. 2011).

6.4 Implications of the study

Clinical practice

The results provide new knowledge about the use of web-based interventions supporting the mental health of adolescents with depression. The results may encourage professionals in mental health services to deploy the use of web-based interventions in treatment of adolescents with depression. The results of this study are based on a comprehensive systematic literature review and adolescents' own descriptions. In other words, the knowledge to be gained from this study has been produced using research and commonly used research methods. This is notable as health care professionals have been previously found to be negatively inclined to use web-based interventions in practice.

Some concerns are important to recognize regarding the use of web-based interventions in practice with adolescents with depression. Although there was some decrease in symptoms of depression compared to for those on a waitlist or treatment as usual found in this study and also previously, it is not clear which elements in the interventions are effective. Furthermore, although the majority of adolescents in this study found more strengths than weaknesses and wrote positive feedback about the web-based support system, a minority of adolescents did not experience getting help. It is essential to know adolescents' actual needs when planning treatment for them and when seeking appropriate ways to provide treatment.

Health care administration

This study provides new knowledge on deploying web-based interventions as a part of adolescents' mental health services. Knowledge about the impact of web-based interventions and, further, about needs and feedback provided from the adolescents' perspective, can be utilized to enhance the use of web-based interventions in this setting. In line with the previously described advantages of digital services in health care, such as: cost-effectiveness, easy access, geographical equality and appropriate management of resources (Imison et al. 2016), this study increases the advantages and encourages to use digital services.

Web-based interventions are one noteworthy option for supporting mental health of adolescents with depression and complement current interventions that are available. Enhancing the use of appropriate interventions as treatment of adolescents with depression may be one response to the global concern of adolescents' mental health. However, successful use of web-based interventions requires organizations to notice both social and technical factors regarding the use of digital services.

It is important that treatment alternatives for adolescents with depression are available. Differences in needs should be taken into account when planning effective interventions for them. Adolescents themselves are recommended to participate actively in the service development (NICE 2018a, Nair et al. 2015). In this light, the strengths, weaknesses and ideas for future modification they provided in this study are worth when considering the development of these services. Developing services to better respond to adolescents' needs can make it easier for them to use the services that can ease access and engagement to treatment.

Nursing science

Regarding health, this study provides new knowledge on recognizing web-based interventions as methods to support the mental health of adolescents with depression. The people in this study were adolescents with the health concern of diagnosed depression or symptoms of depression or anxiety. They form a specific group whose diverse needs in health care are an interest of future research. This study responds to the importance of adolescent participation in the development of mental health services.

Regarding care, web-based interventions are one possibility for providing treatment to adolescents. In line with evidence-based nursing, the adolescents' experiences about their treatment were of interest in this study. Furthermore, this study increases the knowledge about the impact of web-based interventions. The environment of this study was formed by mental health services for adolescents. This study provides knowledge that can be used to strengthen digital services in health care regarding the treatment of adolescents with depression.

Nursing education

The knowledge about interventions to support mental health of adolescents with depression is essential in nursing education. This study provides information about the impact of web-based interventions and also about how these interventions are

constructed. This study increases knowledge about adolescents' needs based on their concerns, hopes and social relationships. It is important to future nurses to know their adolescent patients and use this information when they are constructing treatment plans for individuals. Adolescent participation is a valuable part of service development. This study provides ideas for the future development of web-based interventions that were provided by adolescents themselves.

Future research

More research is still needed on this topic. First, more studies and meta-analyses are needed to enhance the knowledge about the effectiveness of web-based interventions and variations in outcomes. The diversity of interventions should be taken into account to understand what the elements that support mental health are and which ones are effective. In addition to dosage, delivery and content of the interventions, the level of therapist support during the interventions needs to be explored in more detail, also in effectiveness studies.

Second, adolescents are at risk of dropping out of web-based interventions. The reasons for this need to be explored in more detail, specifically from the adolescents' perspective. Knowing more about the potential obstacles to continuing with a web-based intervention makes it possible to understand reasons of withdrawal, support the user in continuing, or recognize the need to provide other treatment alternatives. According to the previously found predictors of severe disorders for withdrawal from psychological web-based interventions (Melville et al. 2010) and some adolescents' experiences in this study of not getting help or having fatigue, using a web-based intervention requires some skills to function and the ability to work in a self-directed manner. These skills may be weakened in people with severe mental conditions. In future research, it would be notable to compare adolescents' feedback on web-based interventions with severity of depression.

Third, no studies included in the meta-analysis measured costs as an outcome. Currently, saving costs in health care is central. Research about the cost-effectiveness of web-based interventions is needed to understand the intervention use more specifically from an economic perspective. Furthermore, it would be useful to compare costs of web-based interventions to costs of more traditional interventions, i.e., those that are mainly provided by human resources.

Fourth, the adolescents' participation in the development of web-based interventions for depression is recommended. It would be important to know their needs and ideas for future development even more specifically. The adolescents of this study represent those who have already been referred to adolescent psychiatric

care. Those adolescents with depression who are not yet in the area of care make up one group whose needs could be analyzed regarding the difficulty level of seeking of depression treatment. Also, the reasons for why some were not willing to use web-based interventions and why some experienced not getting help from using the web-based interventions are important topics to study more in the future. This is important for finding appropriate ways of providing depression treatment for all adolescents with a variety of needs.

6.5 Conclusions

Web-based interventions have potential to support the mental health of adolescents with depression and complement current services. The deployment of them should be enhanced in adolescents' mental health services. Based on the meta-analysis, it can be concluded that it is possible to reduce symptoms by using web-based interventions. After intervention, statistically significant improvements were shown among adolescents with depression regarding their symptoms of depression, anxiety, and moods and feelings. It is unclear which elements in interventions have an impact and why the impact varies between different follow-up times. In addition, this study indicates that web-based interventions may be agreeable for many adolescents. Along with many strengths described by the adolescents after the intervention, they found the web-based intervention to be a good method of reflect their thoughts and a good alternative to treatment as usual.

Knowing adolescents' needs is essential for successful use of web-based interventions in mental health services. It is not appropriate to provide web-based interventions to all adolescents. Based on the empirical study, we know that some of them may experience web-based intervention as not agreeable. Weaknesses brought out in this study may form obstacles to use. Adolescents who use web-based interventions are at risk of dropping out before completing the intervention. Reasons for that are not clear. Adolescents in this study described a great diversity of concerns, hopes and social relationships, but also hopes and willingness to change. The diversity of their needs is essential to consider when developing mental health services and planning treatment for adolescents with depression. The knowledge about adolescents' needs and their feedback on the web-based support system provided in this study can be used for future development of web-based interventions. Respond adolescents' needs and taking them into account in service development may help adolescents seeking treatment and may positively affect engagement in the treatment of adolescents with depression.

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REFERENCES

- Aalbers S, Fusar-Poli L, Freeman RE, Spreen M, Ket JCF, Vink AC, Maratos A, Crawford M, Chen X, Gold C. 2017. Music therapy for depression. *Cochrane Database Systematic Reviews*, (11): CD004517.
- Adaba GB, Kebebew Y. 2017. Im-proving a health infor-mation system for real-time data entries: An action re-search project using socio-technical systems theory. *Informatics For Health & Social Care*, 42(2): 1–13.
- Ades AE, Lu G, Higgins JP. 2005. The interpretation of random-effects meta-analysis in decision models. *Medical Decision Making*, 25(6):646–654.
- Adman P, Warren L. 2000. Participatory sociotechnical design of organizations and information systems - an adaptation of ethics methodology. *Journal of Information Technology*, 15(1):39–51.
- Ajzen J. The theory of planned be-haviour: Reactions and re-flections. *Psychology and Health*, 26(9):1113–1127.
- AL-Asadi AM, Klein B, Meyer D. 2014. Pretreatment attrition and formal withdrawal during treatment and their predictors: an exploratory study of the anxiety online data. *Journal of Medical Internet Research*, 16(6):e152.
- Ambresin AE, Bennett K, Patton GC, Sanci LA, Sawyer SM. 2013. Assessment of youth-friendly health care: a systematic review of indicators drawn from young people's perspectives. *Journal of Adolescent Health*, 52(6):670–81.
- American Psychological Assosiation. 2018. PsycInfo, a world-class resource for behavioral and social science research. <http://www.apa.org/pubs/databases/psycinfo/psycinfo-printable-fact-sheet.pdf>. Accessed 12.8.2018.
- Ames C, Richardson J, Payne S, Smith P, Leigh E. 2014. Mindfulness-based cognitive therapy for depression in adolescents. *Child & Adolescent Mental Health*, 19(1):74–78.
- Andrews G, Cuijpers P, Craske M, McEvoy P, Titov N. 2013. Computer therapy for the anxiety and depressive disorders is effective, acceptable and practical health care: a meta-analysis. *PLoS One*, 5(10):e3196.
- Andrews M, Burr J, Janetos DH. 2004. Searching electroni-cally for information on transcultural nursing and health subjects. *Journal of Transcultural Nursing*, 15(3):242–247.
- Appelbaum SH. 1997. Socio-technical systems theory: an intervention strategy for organizational development. *Management Decision*, 35(6):452–463.
- Aromataris E, Pearson A. 2014. The systematic review: an overview. *American Journal of nursing*, 114(3):53–58.
- Avenevoli S, Swendsen J, He J-P, Burstein M, Merikangas KR. 2015. Major depression in the national comorbidity survey- adolescent supplement: prevalence, correlates, and treatment. *Journal of the American Academy of Child & Adolescent Psychiatry*, 54(1):37–44.
- Barrett EAM. 2002. What is nursing science. *Nursing Science Quarterly*, 15(1):51–60.

- Baxter G, Sommerville I. 2011. So-cio-technical systems: from design methods to systems engineering. *Interacting with Computers*, 23(1):4–17.
- Balázs J, Miklósi M, Keresztény Á, Hoven CW, Carli V, Wasserman C, Apter A, Bobes J, Brunner R, Cosman D, Cotter P, Haring C, Iosue M, Kaess M, Kahn J, Keeley H, Marusic D, Postuvan V, Resch F, Saiz PA, Sisask M, Snir A, Tubiana A, Varnik A, Sarchiapone M, Wasserman D. 2013. Adolescent subthreshold-depression and anxiety: psychopathology, functional impairment and increased suicide risk. *Journal of Child Psychology and Psychiatry*, 54(6):670–677.
- Barak A, Grohol JM. 2011. Current and future trends in internet-supported mental health interventions. *Journal of Technology in Human Services*, 29(3):155–196.
- Best P, Manktelow R, Taylor B. 2014. Online communication, social media and adolescent wellbeing: a systematic narrative review. *Children and Youth Services Review*, 41:27–36.
- Bolton R, Foxon TJ. 2015. A socio-technical perspective on low carbon investment challenges – insight for UK energy policy. *Environmental Innovation and Societal Transitions*, 14:165–181.
- Borg A-M. 2016. Perusterveydenhuollon interventiot. In: Kumpulainen K, Aronen E, Ebeling H, Laukkanen E, Marttunen M, Puura K, Sourander A. (Eds.), *Lastenpsykiatria ja nuorisopsykiatria*, 1st edition, 485–491. Kustannus oy Duodecim, Helsinki.
- Boström RP, Saurabh G, Thomas D. 2009. A meta-theory for understanding information systems within socio-technical systems. *Journal of Management Information Systems*, 26(1):17–47.
- Braun V, Clarke V. 2006. Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2):77–101.
- Burnett-Zeigler I, Walton MA, Ilgen M, Barry KL, Chermack ST, Zucker RA, Zimmerman MA, Booth BM, Blow FC. 2012. Prevalence and correlates of mental health problems and treatment among adolescents seen in primary care. *The Journal of Adolescent Health: Official Publication of The Society for Adolescent Medicine*, 50(6):559–564.
- Center for Behavioral Health Statistics and Quality. 2016. Key substance use and mental health indicators in the United States: results from the 2015 national survey on drug use and health. HHS Publication No. SMA 16-4984, NSDUH Series H-51. <http://www.samhsa.gov/data/>. Accessed 12.8.2018.
- Cheek C, Bridgman H, Fleming T, Cummings E, Ellis L, Lucassen MF, Shepherd M, Skinner T. 2014. Views of young people in rural Australia on SPARX, a fantasy world developed for New Zealand youth with depression. *JMR Serious Games*, 2(1):e3.
- Chorpita BF, Daleiden EL, Ebesutani C, Young J, Becker KD, Nakamura BJ, Phillips L, Ward A, Lynch R, Trent L, Smith RL, Okamura K, Starace N. 2011: Evidence based treatments for children and adolescents: an updated review of indicators of efficacy and effectiveness. *Clinical Psychology: Science and Practice*, 18(2):154–172.
- Choy LT. 2014. The strengths and weaknesses of research methodology: comparison and complimentary between qualitative and quantitative approaches. *IOSR Journal of Humanities and Social Science*, 19(4):99–104.

- Chuttur MY. 2009. Overview of the technology acceptance model: origins, developments and future directions. Indiana University, USA. Sprouts: Working Papers on Information Systems, 9(37):1–21.
- Cipriano PF. 2012. The importance of knowledge-based technology. *Nursing Administration Quarterly*, 36(2):136–146.
- Clarke AM, Kuosmanen T, Barry MM. 2015. A systematic review of online youth mental health promotion and prevention interventions. *Journal of Youth and Adolescence*, 44(1):90–113.
- Commission of the European Communities, Brussels, eEurope. 2002. Quality criteria for health related web-sites. *Journal of Medical Internet Research*, 4(3):e15.
- Christensen 2001. Quality of reporting of meta-analyses: the QUOROM statement. Will it help? *Journal of Hepatology*, 34(2):342–345.
- Crosby R, Noar SM. 2011. What is a planning model? An introduction to PRECEDE-PROCEED. *Journal of Public Health Dentistry*, 71(Suppl 1):7–15.
- Cochrane Community. 2018. RevMan5. <https://community.cochrane.org/help/tools-and-software/revman-5> RevMan5. Accessed 12.8.2018.
- Cochrane Library. 2018. About the Cochrane Library. <https://consumers.cochrane.org/about-cochrane-library>. Accessed 12.8.2018.
- Cox GR, Callahan P, Churchill R, Hunot V, Merry SN, Parker AG, Hetrick SE. 2014. Psychological therapies versus antidepressant medication, alone and in combination for depression in children and adolescents. *Cochrane Database Systematic Reviews*, (11):CD008324.
- Cupito AM, Stein GL, Gonzalez LM, Supple AJ. 2016. Familism and Latino adolescent depressive symptoms: the role of maternal warmth and support and school support. *Cultural Diversity & Ethnic Minority Psychology*, 22(4):517–523.
- Current Care Guidelines. 2016. Depression. <http://www.kaypa-hoito.fi/web/kh/suosituksset/suositus?id=hoi50023>. Accessed 12.8.2018.
- Dardas LA, Silva SG, Smoski MJ, Noonan D, Simmons LA. 2017. Personal and perceived depression stigma among Arab adolescents: associations with depression severity and personal characteristics. *Archives of Psychiatric Nursing*, 31(5):499–506.
- Davies K, Gray M. 2017. The place of service-user expertise in evidence-based practice. *Journal of Social Work*, 17(1):3–20.
- Davis F. 1985. A Technology Acceptance Model for empirically testing new end-user information systems: theory and results. Doctoral dissertation: MIT Sloan School of Management, Cambridge, MA.
- Davis FD, Bagozzi RP, Warshaw PR. 1989. User acceptance of computer technology: a comparison of two theoretical models. *Management Science*, 35:982–1003.
- Deci EL, Ryan RM. 2008. Self-determination theory: a macrotheory of human motivation, development, and health. *Canadian Psychology*, 49(3):182–185.
- De Crescenzo F, Serra G, Maisto F, Uchida M, Woodworth H, Casini MP, Baldessarini RJ, Vicari S. 2017. suicide attempts in juvenile bipolar versus major depressive disorders: systematic review and meta-analysis. *Journal of the American Academy of Child and Adolescent Psychiatry*, 56(10):825–831.e3.

- DeSanctis G, Jackson B. 1994. Coordination of information technology management: team-based structures and computer-based communication systems. *Journal of Management Information Systems*, 10(4):85–110.
- Dwivedi YK, Rana NP, Jeyaraj A, Marc Clement M, Williams MD. 2017. Re-examining the unified theory of Acceptance and Use of Technology (UTAUT): towards a revised theoretical model. *Information Systems Frontiers*, 1–16.
- EBSCO Health. 2017. CINAHL Database. <https://health.ebsco.com/products/the-cinahl-database>. Accessed 24.8.2017.
- Ekman A, Hall P, Litton J. Can we trust cancer information on the Internet? 2005. A comparison of interactive cancer risk sites. *Cancer Causes & Control*, 16(6):765–772.
- Engström Y. 2000. Activity theory as a framework for analyzing and redesigning work. *Ergonomics*, 43(7): 960–974.
- Erikson E, Arnkil T. 2012. *Huoli puheeksi. Stakesin opas 60*, THL, 2012. http://www.julkari.fi/bitstream/handle/10024/90845/URN_URN_978-951-33-1792-8.pdf?sequence=1. Accessed 12.8.2018.
- Erskine HE, Baxter AJ, Patton G, Moffitt TE. 2016. The global coverage of prevalence data for mental disorders in children and adolescents. *Epidemiology and Psychiatric Sciences*, 26(4):395–402.
- Escobar-Rodriguez T, Romero-Alonso M. 2013. Modeling nurses' attitude toward using automated unit-based medication storage and distribution systems. *Computers, Informatics, Nursing*, 31(5):235–243.
- ETENE 2009. Ministry of Social Affairs and Health, and National Advisory Board on Social Welfare and Health Care Ethics. *Mental health ethics – you and I have a moral responsibility*. ETENE publications 27. ISBN 978-952-00-3019-3. <http://etene.fi/documents/1429646/1571616/Publication+27+Mental+health+ethics+you+and+I+have+a+moral+responsibility%2C+2009.pdf/3fca8528-ee0e-43b5-9fa3-b03e87c76da0>. Accessed 22.2.2018.
- ETENE 2011. National Advisory Board on Social Welfare and Health Care Ethics. *Sosiaali- ja terveystieteiden perusta*. <http://etene.fi/documents/1429646/1559058/ETENE-julkaisu+32+Sosiaali-ja+terveysalan+eettinen+perusta.pdf/13c517e8-6644-4fa5-8c5f-193cfdce9841>. ISBN 978-952-3195-4. Accessed 22.2.2018.
- Eysenbach G, CONSORT-EHEALTH Group. 2011. CONSORT-eHEALTH: improving and standardizing evaluation reports of Web-based and mobile health interventions. *Journal of Medical Internet Research*, 3(4):e126.
- Fettes MD, Curry LA, Creswell JW. 2013. Achieving integration in mixed methods designs—principles and practices. *Health Services Research*, 48(6 Pt 2):2134–2156.
- The Finnish Ministry of Finance. 2004. *Julkisten verkkopalvelujen laatukriteerit*. Ministry of Finance. Public Management Department. Working party memoranda 8/2004. http://webit.pkky.fi/ai-kojtt-matskut/tiety_uusi/mod2/2309_Julkistenverkkop8_2004.pdf. Accessed 14.5.2018.
- The Finnish Ministry of Finance. 2012. *Verkkopalvelujen laatukriteeristö - Väline julkisten verkkopalvelujen kehittämiseen ja arviointiin*. Ministry of Finance publications 4a/2012. <file://Downloads/verkkokriteerist.pdf>. Accessed 14.5.2018.

- FINLEX 1989/1062. Act on Specialized Medical Care. <https://www.finlex.fi/en/laki/kaannokset/1989/19891062>. Accessed 22.2.2018.
- FINLEX 417/2007. Child Welfare Act. <https://www.finlex.fi/fi/laki/ajantasa/2007/20070417>. Accessed 12.8.2018.
- FINLEX 1326/2010. Health Care Act. <https://www.finlex.fi/fi/laki/kaannokset/2010/en20101326.pdf>. Accessed 12.8.2018.
- FINLEX 488/1999. Medical Research Act. Ministry of Social Affairs and Health, Finland. <https://www.finlex.fi/fi/laki/kaannokset/1999/en19990488.pdf>. Accessed 12.8.2018.
- FINLEX 1287/2013. Oppilas- ja opiskelijahuoltolaki. <https://www.finlex.fi/fi/laki/alkup/2013/201312>. Accessed 12.8.2018.
- FINLEX 1116/1990. The Mental Health Act. Ministry of Social Affairs and Health, Finland. <https://www.finlex.fi/fi/laki/kaannokset/1990/en19901116.pdf>. Accessed 12.8.2018.
- FINLEX 523/1999. Personal Data Act. <https://www.finlex.fi/fi/laki/kaannokset/1999/en19990523.pdf>. Accessed 12.8.2018.
- The Finnish Association for Mental Health. 2018. Avun hakeminen mielenterveysongelmista kärsivälle nuorelle. <https://www.mielenterveysseura.fi/fi/tukea-ja-apua/apua-mielenterveyden-ongelmiin/avun-hakeminen-mielenterveysongelmista-k%C3%A4rsiv%C3%A4lle-0>. Accessed 12.8.2018.
- Finnish Government. 2018a. Maakunta- ja sote-uudistuksen yleisesittely. <http://alueuudistus.fi/uudistuksen-yleisesittely>. Accessed 22.2.2018.
- Finnish Government. 2018b. Sote-uudistuksen tavoitteet. <http://alueuudistus.fi/soteuudistus/tavoitteet>. Accessed 22.2.2018.
- Finnish Government. 2005. Valtioneuvoston kanslian verkkopalvelustrategia 2005–2008. Valtioneuvoston kanslian raportteja 4/2005. http://vnk.fi/documents/10616/622942/R0405_Valtioneuvoston%20kanslian%20verkkopalvelustrategia%202005-2008.pdf/93eff6b1-0b47-473c-b1ab-bbddd2ef13c. Accessed 14.5.2018.
- Flaskerud JH, Winslow BJ. 1998. Conceptualizing vulnerable populations health-related research. *Nursing research*, 47(2):69–78.
- Fosco GM, Van Ryzin MJ, Connell AM, Stormshak EA. 2016. Preventing adolescent depression with the family check-up: examining family conflict as a mechanism of change. *Journal of Family Psychology*, 30(1):82–92.
- Geels FW. 2004. From sectoral systems of innovation to socio-technical systems Insights about dynamics and change from sociology and institutional theory. *Research Policy*, 33(6-7):897–920.
- Gilbert D T, Malone PS. 1995. The correspondence bias. *Psychological Bulletin*, 117(1):21–38.
- Goodhue DL, Thompson RL. 1995. Task-technology fit and individual performance. *MIS Quarterly*, 19(2): 213–236.
- Grady P. 2017. Investigating the determinants of health: the role of nursing science. *Nursing Outlook*, 65(5): 489–491.
- Graneheim UH, Lundman B. 2004. Qualitative content analysis in nursing research: Concepts, procedures and measures to achieve trustworthiness. *Nurse Education Today*, 24(2):105–112.
- Graneheim UH, Lindgren BM, Lundman B. 2017. Methodological challenges in qualitative content analysis: A discussion paper. *Nurse education today*, 56:29–34.

References

- Greenberg PE, Fournier A, Sisitsky T, Pike CT, Kessler RC. 2015. The economic burden of adults with major depressive disorder in the United States (2005 and 2010). *Journal of Clinical Psychiatry*, 76(2):155–162.
- Green Paper. 2017. Transforming children and young people's mental health provision: a Green Paper. Presented to Parliament by the Secretary of State for Health and Secretary of State for Education by Command of Her Majesty ISBN 979-1-5286-0061-3 https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/664855/Transforming_children_and_young_people_s_mental_health_provision.pdf. Accessed 12.8.2018.
- Hasan H, Kazlauskas A. 2014. Activity theory: who is doing what, why and how. In H. Hasan (Eds.), *Being Practical with Theory: A Window into Business Research* (pp. 9-14). Wollongong, Australia: THEORI. <http://eurekaconnection.files.wordpress.com/2014/02/p-09-14-activity-theory-theori-ebook-2014.pdf> Accessed 12.8.2018.
- Havas J, de Nooijer J, Crutzen R, Feron, F. 2011. Adolescents' views about an Internet platform for adolescents with mental health problems. *Health Education*, 111(3):164–176.
- Hayley AC, Skogen JC, Sivertsen B, Wold B, Berk M, Pasco JA, Øverland S. 2015. Symptoms of depression and difficulty initiating sleep from early adolescence to early adulthood: a longitudinal study. *SLEEP*, 38(10):1599–1606.
- Hendricks CB. 2001. A study of the use of music therapy techniques in a group for the treatment of adolescent depression. *Dissertation Abstracts International*, 62(2-A):472.
- Hendricks CB, Robinson B, Bradley B, Davis K. 1999. Using music techniques to treat adolescent depression. *Journal of Humanistic Counseling, Education and Development*, 38(1):39–46.
- Hetrick SE, Cox GR, Witt KG, Bir JJ, Merry SN. 2016. Cognitive behavioural therapy (CBT), third-wave CBT and interpersonal therapy (IPT) based interventions for preventing depression in children and adolescents. *Cochrane Database Systematic Review*, (8):CD003380.
- Hickey S. 2006. System development as a business capability. In Mumford E, with Hickey S, Mat-thies H. 2006 a. *Designing human systems. An agile approach to ETHICS*. Amazon Fulfillment. Poland.
- Higgins JPT, Green S. 2011. *Cochrane Handbook for Systematic Reviews of Interventions*. Version 5.1.0. <http://handbook.cochrane.org/>. Accessed 12.8.2018.
- Higgins JP, Thompson SG, Deeks JJ, Altman DG. 2003. Measuring inconsistency in meta-analyses. *British Medical Journal*, 327(7414):557–560.
- Hill CE, Knox S, Thompson BJ, Williams EN, Hess SA, Ladany N. 2005. Consensual qualitative research: an update. *Journal of Counseling Psychology*, 52(2):196–205.
- Ho FY-Y, Yeung W-F, Ng TH-Y, Chan CS. 2016. The efficacy and cost-effectiveness of stepped care prevention and treatment for depressive and/or anxiety disorders: a systematic review and meta-analysis. *Scientific Reports*, 6:29281.
- Holt RJ, Graham JM, Whitaker KJ, Hagan CC, Ooi C, Wilkinson PO, van Nieuwenhuizen AO, Lennox BR, Sahakian BJ, Goodyer IM, Bullmore ET, Suckling J. 2016. Functional MRI of emotional memory in adolescent depression. *Developmental Cognitive Neuroscience*, 19:31–41.

- Hoffmann T, Glasziou P, Boutron I, Milne R, Perera R, Moher D, Altman D, Barbour V, Macdonald H, Johnston M, Lamb S, Dixon-Woods M, McCulloch P, Wyatt J, Chan A, Michie S. 2014. Better reporting of interventions: template for intervention description and replication (TIDieR) checklist and guide. *BMJ*, 348:g1687.
- Hsiao, Chen 2016. Critical factors influencing physicians' intention to use computerized clinical practice guidelines: an integrative model of activity theory and the technology acceptance model. *BMC Medical Informatics and Decision Making*, 16:3.
- Hsieh H-F, Shannon SE. 2005. Three approaches to qualitative content analysis. *Qualitative Health Research*, 15(9): 1277–1288.
- Iloabachie C, Wells C, Goodwin B, Baldwin M, Vanderplough-Booth K, Gladstone T, Murray M, Fogel J, Van Voorhees BW. 2011. Adolescent and parent experiences with a primary care/Internet-based depression prevention intervention (CATCH-IT). *General Hospital Psychiatry*, 33(6):543–555.
- Imison C, Castle-Clarke S, Watson R and Edwards N. 2016. Delivering the benefits of digital health care. Nuffield Trust. <https://www.nuffieldtrust.org.uk/files/2017-01/delivering-the-benefits-of-digital-technology-web-final.pdf>. Accessed 18.5.2018.
- Internet World Stats. 2018. Internet growth statistics. <http://www.internetworldstats.com/emarketing.htm>. Accessed 22.2.2018.
- Jeong Y, Hong S, Lee M, Park M, Kim Y, Suh C. 2005. Dance movement therapy improves emotional responses and modulates neurohormones in adolescents with mild depression. *The International Journal of Neuroscience*, 115(12):1711–1720.
- Jones DA, DeMaio D, Dee V, Roy Sr C, Watson J, Clark P, Wright B. 2012. Expert panel on nursing theory guided practice position paper: nursing knowledge and the impact on nursing's preferred future a plan for enhancing raise the voice phase II. *Nursing Outlook*, 60(4):228.
- Jones BR, Thapar A, Stone Z, Thapar A, Jones I, Smith D, Simpson S. 2017. Psychoeducational interventions in adolescent depression: a systematic review. *Patient Education and Counseling*, in press.
- Järvelin J. 2016. Psykiatrinen erikoissairaanhoido 2014. http://www.julkari.fi/bitstream/handle/10024/130535/Tr07_16_FL.pdf?sequence=1. Accessed 12.8.2018.
- Järvelin J, Heino A, Passoja S. Psykiatrinen erikoissairaanhoido 2015. 2017. Tilastoraportti 21/2017. http://www.julkari.fi/bitstream/handle/10024/134729/Tr21_17.pdf?sequence=1. Accessed 12.8.2018.
- Kaukonen P, Salmelin RK, Luoma I, Puura K, Rutanen M, Pukuri T, Tamminen T. Child psychiatry in the Finnish health care reform: national criteria for treatment access. *Health Policy*, 96(1):20–27.
- Khan A, Ahmed R, Burton N. 2017. Prevalence and correlates of depressive symptoms in secondary school children in Dhaka city, Bangladesh. *Ethnicity & Health*, 1–13.
- Kähtälä-Heino RK, Lindberg N. 2016. Nuorisopsykiatrinen osastohoido. In: Kumpulainen K, Aronen E, Ebeling H, Laukkanen E, Marttunen M, Puura K, Sourander A. (Eds.), *Lastenpsykiatria ja nuorisopsykiatria*, 1st edition, 673–680. Kustannus oy Duodecim, Helsinki.
- Karlsson L, Marttunen M, Karlsson H, Kaprio J, Hillevi A. 2010. Minor change in the diagnostic threshold leads into major alteration in the prevalence estimate of depression. *Journal of Affective Disorders*, 122(1-2):96–101.

References

- Kenny R, Dooley B, Fitzgerald A. 2016. Developing mental health mobile apps: exploring adolescents' perspectives. *Health Informatics Journal*, 22(2):265–275.
- Ketikidis P, Dimitrovski T, Lazuras L, Bath P. 2012. Acceptance of health information technology in health professionals: an application of the revised Technology Acceptance Model. *Health Informatics Journal*, 18(2):124–134.
- Kettles AM, Creswell JW, Zhang W. 2011. Mixed methods re-search in mental health nursing. *Journal of Psychiatric and Mental Health Nursing*, 18(6):535–542.
- Kim M, Sharman R, Cook-Cottone CP, Rao HR, Upadhyaya SJ. 2011. Assessing roles of people, technology and structure in emergency management systems: a public sector perspective. *Behaviour & Information Technology*, 31(12):1–14.
- Klein DB, Chiang E. 2004. The social science citation index: a black box— with an ideological bias? *Social Science Citation Index*, 1(1):134–165.
- Kok G. 2014. A practical guide to effective behavior change: How to apply theory- and evidence-based behavior change methods in an intervention. *European Health Psychologist*, 16(5):156–170.
- Kouros CD, Garber J. 2014. Trajectories of Individual Depressive symptoms in adolescents: gender and family relationships as predictors. *Developmental Psychology*, 50(12): 2633–2643.
- Kumpulainen K, Laukkanen E. Johdatus psykososiaaliin hoitomuotoihin. In: Kumpulainen K, Aronen E, Ebeling H, Laukkanen E, Marttunen M, Puura K, Sourander A. (Eds.), *Lastenpsykiatria ja nuorisopsykiatria*, 1st edition, 484. Kustannus oy Duodecim, Helsinki.
- Kuntaliitto 2017. Sairaanhoitopiirit 2017. https://www.kuntaliitto.fi/sites/default/files/media/file/Ervat_Sairaanhoitopiirit2017_0.pdf. Accessed 12.8.2018.
- Kurki M, Koivunen M, Anttila M, Hätönen H, Välimäki M. 2011. Usefulness of internet in adolescent mental health outpatient care. *Journal of Psychiatric and Mental Health Nursing*, 18(3):265–273.
- Kurki M, Anttila M, Koivunen M, Marttunen M, Välimäki M. 2017. Nurses' experiences of the use of an internet-based support system for adolescents with depression disorders. *Informatics for Health & Social Care*, 1–14.
- Kärkkäinen J. 2016. Sote-uudistus – mahdollisuus mielenterveys ja päihdepalveluille. <http://www.duodecimlehti.fi/api/pdf/duo13284>. Accessed 12.8.2018.
- Lam W, Dawson A, Fowler C. 2017. Approaches to better engage parent-child in health home-visiting programmes: a content analysis. *Journal of Child Health Care*, 21(1):94–102.
- Larun L, Nordheim LV, Ekland E, Hagen KB, Heian F. 2006. Exercise in prevention and treatment of anxiety and depression among children and young people. *Cochrane Database of Systematic Reviews* (3) Art. No.: CD004691.
- Lattie EG, Ho J, Sargent E, Tomasino KN, Smith JD, Brown CH, Mohr DC. 2017. teens engaged in collaborative health: the feasibility and acceptability of an online skill-building intervention for adolescents at risk for depression. *Internet Interventions*, 8:15–26.
- Leavitt H. 1965. Applied organizational change in industry: structural, technological and humanistic approaches. In: J.G. March (edit). *Hand-book of Organizations*. Chicago: Rand McNally & Company, s. 1140–1170.

- Leitch S, Warren MJ. 2014. ETHICS: the past, present and future of SocioTechnical Systems Design. Arthur Tatnall. IFIP WG 9.7 International Conference on History of Computing (HC) / Held as Part of World Computer Congress (WCC), Sep 2010, Brisbane, Australia. Springer, IFIP Advances in Information and Communication Technology, AICT-325,189–197.
- Leemann L, Hämäläinen R-M. 2015. Matalan kynnyksen palvelut. Sosiaalisen osallisuuden edistämisen koordinaatiohanke (Sokra). Terveystieteiden ja hyvinvoinnin laitos. https://www.thl.fi/documents/10531/1787240/Tietopaketti_Matalan_Kynnyksen_Palvelut.pdf/8bc8490c-c2e2-4ad5-ada8-0ce8df65435e. Accessed 12.8.2018.
- Leone de Voogd E, Wiers RW, Zwitter RJ, Salemink E. 2016. Emotional working memory training as an online intervention for adolescent anxiety and depression: a randomised controlled trial. *Australian Journal of Psychology*, 68(3):228–238.
- Lépine J-P, Briley M. 2011. The increasing burden of depression. *Neuropsychiatric Disease and Treatment*, 7(Suppl 1):3–7.
- Linville DL, Grant WJ. 2017. The role of student academic beliefs in perceptions of instructor ideological bias. *Teaching in Higher Education*, 22(3):274–287.
- Long S, Monsen K, Pieczkiewicz D, Wolfson J, Khairat S. 2017. An evaluation of overcoming barriers to engage consumers in the use of health care information technology. *Journal of Consumer Health on The Internet*, 21(4):369–388.
- Lynch, Clarke. 2006. estimating the economic burden of depression in children and adolescents. *American Journal of Preventive Medicine*, 31(6S1):143–151.
- MacDonell KW, Prinz R. 2017. A review of technology-based youth and family-focused interventions. *Clinical Child and Family Psychology Review*, 20(2):185–200.
- Matveinen P, Knape N. 2017. Terveystieteiden huollon menot ja rahoitus 2015. https://www.julkari.fi/bitstream/handle/10024/134862/Tr26_17.pdf?sequence=6. Accessed 12.8.2018.
- Maurizi LK, Grogan-Kaylor A, Granillo MT, Delva J. 2013. The role of social relationships in the association between adolescents' depressive symptoms and academic achievement. *Children and Youth Services Review*, 35(4):618–625.
- McGorry P, Bates T, Birchwood M. 2013. Designing youth mental health services for the 21st century: examples from Australia, Ireland and the UK. *The British Journal of Psychiatry*, 202(s54):30–35.
- McMullen J, Ickes M, Noland M, Erwin H & Helme D. 2017. Development of “College CHEF,” a campus-based culinary nutrition program. *American Journal of Health Education*, 48(1):22–31.
- Melville KM, Casey LM, Kavanagh DJ. 2010. Dropout from internet-based treatment for psychological disorders. *British Journal of Clinical Psychol*, 49(Pt 4):455–471.
- Meekums B, Vicky Karkou V, Nelson EA. 2015. Dance movement therapy for depression. *Cochrane Database of Systematic Reviews* (2): CD009895.
- Merikangas KR, Nakamura EF, Kessler RC. 2009. Epidemiology of mental disorders in children and adolescent. *Dialogues Clinical Neuroscience*, 11(1):7–20.
- Meru Health 2018. Meru Health - Online medical clinic specialized in depression treatment. <https://www.meruhealth.com/>. Accessed 12.8.2018.

References

- Merry SN, Stasiak K, Shepherd M, Frampton C, Fleming T, Lucassen MF. 2012. The effectiveness of SPARX, a computerised self help intervention for adolescents seeking help for depression: randomised controlled non-inferiority trial. *BMJ*, 344:e2598.
- Miah SJ, Gammack JG, Kerr D. 2012. A socio-technical approach to designing and evaluating industry oriented applications. *Electronic Journal of Information Systems Evaluation*, 15(2):163–175.
- Ministry of Social Affairs and Health. 2018a. Hoitoon pääsy (hoitotakuu). <http://stm.fi/hoitotakuu>. Accessed 12.8.2018.
- Ministry of Social Affairs and Health. 2018b. Lapsi- ja perhepalveluiden muutosohjelma. <http://stm.fi/hankeet/lapsi-ja-perhepalvelut>. Accessed 9.5.2018.
- Ministry of Social Affairs and Health. 2018c. Health services. <http://stm.fi/en/health-services>. Accessed 22.2.2018.
- Moher D, Liberati A, Tetzlaff J, Altman DG. 2009. The PRISMA Group. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA Statement. *PLoS Med*, 6(6):e1000097.
- Moody L, Turner A, Osmond J, Hooker L, Kosmala-Anderson J, Batehup L. 2015. Web-based self-management for young cancer survivors: consideration of user requirements and barriers to implementation. *Journal of Cancer Survivorship*, 9(2):188–200.
- Morgan DL. 2007. Paradigms lost and pragmatism regained: methodological implications of combining qualitative and quantitative methods. *Journal of Mixed Methods Research*, 1(1):48-76.
- Moses T. 2010. Being treated differently: stigma experiences with family, peers, and school staff among adolescents with mental health disorders. *Social Science & Medicine*, 70(7):985–993.
- Mumford E, with Hickey S, Matthies H. 2006 a. Designing human systems. An agile approach to ETHICS. Amazon Fulfillment. Poland.
- Mumford E. 2006 b. The story of socio-technical design: reflections of its success, failures and potential. *Information Systems Journal*, 16(4):317–342.
- Murray, CJL, Vos T, Lozano R, Naghavi M, Flaxman AD, Michaud C, Ezzati M, Shibuya K, Salomon JA, PhD, Abdalla S, Aboyans V, Abraham J, Ackerman I, Aggarwal R, Ahn SY, Ali MK, AlMazroa MA, Alvarado M, Ross H. Disability-adjusted life years (DALYs) for 291 diseases and injuries in 21 regions, 1990–2010: a systematic analysis for the Global Burden of Disease Study 2010. *The Lancet*, 380(9859): 2197–2223.
- Nair M, Baltag V, Bose K, Boschi-Pinto C, Lambrechts T, Mathai M. 2015. Improving the quality of health care services for adolescents, globally: a standards-driven approach. *Journal of Adolescent Health*, 57(3):288–298.
- National Institute for Health and Care Excellence (NICE). 2018a. Depression in children and young people: identification and management. <https://www.nice.org.uk/guidance/CG28/chapter/1-Recommendations#step-3-mild-depression>. Accessed 15.2.2018.
- National Institute for Health and Care Excellence (NICE). 2018b. What we do. <https://www.nice.org.uk/about/wh-at-we-do>. Accessed 11.3.2018.
- National Institute for Health and Welfare. 2018a. Mielenterveyspalvelut. <https://www.thl.fi/fi/web/mielenterveys/mielenterveyspalvelut>. Accessed 12.8.2018.

- National Institute for Health and Welfare. 2018b. Kouluterveydenhuolto. <https://thl.fi/fi/web/lapset-nuoret-ja-perheet/peruspalvelut/opiskeluhoolto/kouluterveydenhuolto>. Accessed 12.8.2018.
- National Institute for Health and Welfare. 2018c. Kasvatus- ja perheneuvonta. https://www.thl.fi/fi/web/lapset-nuoret-ja-perheet/peruspalvelut/sosiaalipalvelut/kasvatus_ja_perheneuvonta. Accessed 12.8.2018.
- National Institute for Health and Welfare. 2018d. New child and family services provide the right support at the right time, for every child, youth and family. https://thl.fi/documents/605877/3153365/170223_LAPE_MAIN_a3_rgb_ENG.pdf/8fc34c3d-8654-4021-ad47-b26f04ab1ab6. Accessed 9.5.2018.
- National Institute for Health and Welfare. 2018e. Erityis- ja vaativan tason palvelut. <https://thl.fi/fi/tutkimus-ja-kehittaminen/tutkimukset-ja-hankkeet/lapsi-ja-perhepalveluiden-muutosohjelma-lape-/erityis-ja-vaativan-tason-palvelut> Accessed 9.5.2018.
- National Institute for Health and Welfare. 2017. Kaikki kouluterveyskyselyn tulokset. <https://thl.fi/fi/web/lapset-nuoret-ja-perheet/tutkimustuloksia/kaikki-kouluterveyskyselyn-tulokset>. Accessed 22.2.2018.
- NIH Office of Behavioral and Social Sciences. 2018. Best practices for mixed methods research in the health sciences (2nd ed). Bethesda: National Institutes of Health. <https://www.obssr.od.nih.gov/wp-content/uploads/2018/01/Best-Practices-for-Mixed-Methods-Research-in-the-Health-Sciences-2018-01-25.pdf>. Accessed 12.8.2018.
- Nuorten mielenterveystalo. 2018. Nuorten mielenterveystalo. <https://www.mielenterveystalo.fi/nuoret/Pages/default.aspx>. Accessed 12.8.2018.
- Official Statistics of Finland (OSF): Causes of death. 6. Number of suicides has remained unchanged. 2013. ISSN=1799-5078. http://www.stat.fi/til/ksyyt/2013/ksyyt_2013_2014-12-30_kat_006_en.html. Accessed 12.8.2018.
- O’Kearny R, Kang K, Christensen H, Griffiths K. 2009. A controlled trial of a school-based internet program for reducing depressive symptoms in adolescent girls. *Depression and anxiety*, 26(1):65–72.
- Palinkas LA, Horwitz SM, Green CA, Wisdom JP, Duan N, Hoagwood K. 2015. Purposeful sampling for qualitative data collection and analysis in mixed method implementation research. *Administration and Policy in Mental Health*, 42(5):533–544.
- Pape K, Bjørngaard JH, Holmen TL, Krokstad S. 2012. The welfare burden of adolescent anxiety and depression: a prospective study of 7500 young Norwegians and their families: the HUNT study. *BMJ Open*, (2):e001942.
- Parkkari J, Sievänen H, Niemi S, Mattila VM, Kannus P. 2016. Injury deaths in the adolescent population of Finland: a 43-year secular trend analysis between 1971 and 2013. *Injury Prevention: Journal of the International Society for Child and Adolescent Injury Prevention*, 22(4):239–246.

References

- Parviainen P, Kääriäinen J, Honkatukia J, Federley M. 2017. Julkishallinnon digitalisaatio – tuottavuus ja hyötyjen mittaaminen. Valtioneuvoston selvitys ja tutkimustoiminnan julkaisusarja 3/2017 http://tietokayttoon.fi/documents/10616/3866814/3_Julkishallinnon+digitalisaatio+%E2%80%93+tuottavuus+ja+hy%C3%B6tyjen+mittaaminen/49e6b987-6d37-44dd-a86e-cc548fc66760?version=1.0. Accessed 12.8.2018.
- Patton MQ. Enhancing the quality and credibility of qualitative analysis. 1999. *Health Services Research* 34(5):1189–1208.
- Payne HE, Wilkinson J, West JH, Bernhardt JM. 2016. A content analysis of Precede-proceed constructs in stress management mobile apps. *mHealt*, 2:5.
- Pennant ME, Loucas CE, Whittington C, Creswell C, Fonagy P, Fuggle P, Expert Advisory Group. 2015. Computerised therapies for anxiety and depression in children and young people: a systematic review and meta-analysis. *Behaviour Research and Therapy*, 67:1–18.
- Phillips JL, Rolley JX, Davidson PM. 2012. Developing targeted health service interventions using the PRECEDE-PROCEED model: Two Australian case studies. *Nursing Research and Practice*, Article ID 279431, 8 pages.
- Phillips TM. The influence of family structure vs. family climate on adolescent well being. 2012. *Child & Adolescent Social Work Journal*, 29(2):103–110.
- Plano Clarke VL, Huddleston-Casas CA, Churchill SL, Green DO, Garrett AL. 2008. Mixed methods approaches in family science research. *Journal of Family Issues*, 29(11):1543–1566.
- Polanczyk GV, Salum Giovanni A, Sugaya LS, Caye A, Rohde LA. 2015. Annual research review: a meta-analysis of the worldwide prevalence of mental disorders in children and adolescents. *Journal of Child Psychology and Psychiatry*, 56(3):345–365.
- Polit DF, Beck CT. 2012. *Nursing research: generating and assessing evidence for nursing practice*. Wolters Kluwer Health/Lippincott Williams & Wilkins, Philadelphia Pa.
- Postel MG, de Haan HA, ter Huurne ED, Becker ES, de Jong CA. 2010. Effectiveness of a Web-based Intervention for Problem Drinkers and Reasons for Dropout: Randomized Controlled Trial. *Journal of Medical Internet Research*, 12(4):e68.
- Pylkkänen K. 2013. Quality of psychiatric outpatient services for adolescents in Finland [Nuorisopsykiatrisen avohoidon laatusuositus]. Quality indicators, measures, standards and outcomes. Report of the NALLE-project. Helsinki, Finland: Finnish association of adolescent psychiatry. http://www.nuorisopsykiatrisen-yhdistys.org/wp-content/uploads/2013/09/SNPY_laatusuositus_1013.pdf. Accessed 12.8.2018.
- Pylkkänen K, Haapasalo-Pesu K-M. 2016. Nuorisopsykiatrisen palvelujärjestelmä. In: Kumpulainen K, Aronen E, Ebeling H, Laukkanen E, Marttunen M, Puura K, Sourander A. (Eds.), *Lastenpsykiatria ja nuorisopsykiatria*, 1st edition, 443–451. Kustannus oy Duodecim, Helsinki.
- Päihdelinkki.fi. MoodGYM - oma-apuohjelma masennuksen ehkäisyyn 2013. <https://www.paihdelinkki.fi/keskustelu/viewtopic.php?f=110&t=33912&sid=408c8923dd6e159f642b53ebecbb9cd4>. Accessed 12.8.2018.

- Ranta K, Parhiala P, Pelkonen R, Seppälä T, Mäklin S, Haula T, Nikula M, Mäkinen M, Rintamäki T, Marttunen M. 2018. Nuorten masennus, mielenterveyden hoitoketjut ja näyttöön perustuvan hoidon integroitu implementaatio perustasolle. <http://tietokayttoon.fi/documents/10616/3866814/90-2017-Nuorten+masennus%2C+mielenterveyden+hoitoketjut.pdf/5cba5bf5-0156-4d53-945e-74d451671dcd?version=1.0>. Accessed 12.8.2018.
- Raphael B, Stevens G, Pedersen K. 2006. Vulnerability and mental health. *Vulnerable Children and Youth Studies*, 1(2):127–138.
- Rawal A, Collishaw S, Thapar A, Rice F. 2013. A Direct Method of Assessing Underlying Cognitive Risk for Adolescent Depression. *Journal of Abnormal Child Psychology*, 41(8):1279–1288.
- Reed P. 2018. Philosophical issues and nursing science. *Nursing Science Quarterly*, 31(1):31–35.
- Rice SM, Goodall J, Hetrick SE, Parker AG, Gilbertson T, Amminger GP, Davey CG, McGorry PD, Gleeson J, Alvarez-Jimenez A. 2014. Online and social networking interventions for the treatment of depression in young people: a systematic review. *Journal of Medical Internet Research*, 16(9):e206.
- Rice S, Gleeson J, Davey C, Hetrick S, Parker A, Lederman R, Wadley G, Murray G, Herrman H, Chambers R, Russon P, Miles C, D'Alfonso S, Thurley M, Chinnery G, Gilbertson T, Eleftheriadis D, Barlow E, Cagliarini D, Toh J, McAlpine S, Koval P, Bendall S, Jansen JE, Hamilton M, McGorry P, Alvarez-Jimenez M. 2016. Moderated online social therapy for depression relapse prevention in young people: pilot study of a 'next generation' online intervention. *Early Intervention in Psychiatry*, 10.1111/eip.12354.
- Risjord MW, Dunbar SB, Moloney MF. 2002. A new foundation for methodological triangulation. *Journal of Nursing Scholarship*, 34(3):269–275.
- Rocha TB-M, Graeff-Martins AS, Kieling C, Rohde LA. 2015. Provision of mental healthcare for children and adolescents: a worldwide view. *Current Opinion in Psychiatry*, 28(4):330–335.
- Ryan R, Hill S, Prictor M, McKenzie J; Cochrane Consumers and Communication Review Group. Study Quality Guide. May 2013 <http://cccr.org/cochrane.org/author-resources>. Accessed 15.1.2018.
- Räsänen L, Moore E. 2016. Critical evaluation of the guidelines of the Finnish Advisory Board on Research Integrity and of their application. *Research Integrity and Peer Review*, 1:15.
- Salamone-Violi G, Chur-Hansen A, Winefield H. 2015. 'I don't want to be here but I feel safe': referral and admission to a child and adolescent psychiatric inpatient unit: the young person's perspective. *International Journal of Mental Health Nursing*, 24(6):569–576.
- Sánchez-García S, García-Peña C, González-Forteza C, Jiménez-Tapia A, Gallo J, Wagner F. 2014. Depressive symptoms among adolescents and older adults in Mexico City. *Social Psychiatry and Psychiatric Epidemiology*, 49(6):953–960.
- Sandelowski M. 2004. Using qualitative research. *Qualitative Health Research*, 14(10):1366.
- Santos CMC, Pimenta CAM, Nobre MRC. 2007. The pico strategy for the research question construction and evidence search. *Revista Latino-Americana de Enfermagem*, 15(3):508–511.
- Sawyer SM, Afifi RA, Bearinger LH, Blakemore SJ, Dick B, Ezech AC, Patton GC. 2012. Adolescence: a foundation for future health. *Lancet*, 379(9826):1630–40.

References

- Sethi S, Campbell AJ, Ellis LA. 2010. The use of computerized self-help packages to treat adolescent depression and anxiety. *Journal of Technology in Human Services*, 28(3):144-160.
- Setia MS. 2016. Methodology series module 5: sampling strategies. *Indian Journal of Dermatology*, 61(5):505-509.
- Shih F-J. 1998. Triangulation in nursing research: issues in conceptual clarity and purpose. *Journal of Advanced Nursing*, 28(3):631-641.
- Shomaker LB, Bruggink S, BernPivarunas B, Skoranski A, Jillian Foss, Chaffin E, Bell C. 2017. Pilot randomized controlled trial of a mindfulness-based group intervention in adolescent girls at risk for type 2 diabetes with depressive symptoms. *Complementary Therapies in Medicine*, 32:66-74.
- Statista. 2018. Global digital population as of January 2018. <https://www-statista.com/statistics/617136/digital-population-worldwide/>. Accessed 12.8.2018.
- Statistics Finland. 2017. 1. Internetin käytön yleisyys, useus ja yleisimmät käyttötarkoitukset. http://www.stat.fi/til/sutivi/2017/13/sutivi_2017_13_2017-11-22_kat_001_fi.html. Accessed 12.8.2018.
- Stenberg J. 2016. Internet ja tietokone lasten ja nuorten hoidossa. In: Kumpulainen K, Aronen E, Ebeling H, Laukkanen E, Mart-tunen M, Puura K, Sourander A. (Eds.), *Lastenpsykiatria ja nuori-sopsykiatria*, 1st edition, 503-508. Kustannus oy Duodecim, Helsinki.
- Stenberg J, Blanco Sequeiros S, Holli M, Kampman O, Kiesepää T, Korkeila J, Mäki P, Wahlbeck K, Joffe G, Häll P, Joutsenniemi K. 2016. "Mielenterveyttä etänä?". *Suomen lääkäreilehti - Finlands läkartidning*, 71(35):2106-2111.
- Strudwick G. 2015. Predicting nurses' use of healthcare technology using the Technology Acceptance Model, an integrative review. *Computers, Informatics, Nursing*, 33(5):189-198.
- Su Y, Feng L, Hsu C-H, Yang C-C. 2013. Technology as an activity system for self-directed, expanding learning: an analysis based on activity theory. *Social and Behavioral Sciences*, 106:2575-2582.
- Sylvester B, Zammit K, Fong A, Sabiston C. 2017. An evaluation of the behaviour-change techniques used on Canadian cancer centre Web sites to support physical activity behaviour for breast cancer survivors. *Current Oncology*, 24(6):e477-e485.
- Taber KS. 2017. The use of Cronbach's Alpha when developing and reporting research instruments in science education. *Research in Science Education*, <https://doi.org/10.1007/s11165-016-9602-2>.
- Thapar A, Collishaw S, Pine DS, Thapar AK. 2012. Depression in adolescence. *Lancet*, 379(9820):1056-67.
- Thomas E, Magilvy JK. 2011. Qualitative rigor or research validity in qualitative research. *Journal for Specialists in Pediatric Nursing*, 16(2):151-155.
- Thomas N, Foley F, Lindblom K, Lee S. 2017. Are people with severe mental illness ready for online interventions? Access and use of the internet in Australian mental health service users. *Australasian Psychiatry: Bulletin of Royal Australian and New Zealand College of Psychiatrists*, 25(3):257-261.
- TENK. 2012. Finnish Advisory Board on Research Integrity. Responsible conduct of research and procedures for handling allegations of misconduct in Finland. http://www.tenk.fi/sites/tenk.fi/files/HTK_ohje_2012.pdf. Accessed 12.8.2018.

- Tong A, Sainsbury P, Craig J. 2007. Consolidated criteria for reporting qualitative research (COREQ): 32-item checklist for interviews and focus groups. *International Journal of Quality of Health Care*, 19(6):349–357.
- Torikka A, Kaltiala-Heino RK, Rimpelä A, Marttunen M, Luukkala T, Rimpelä M. 2014. Self-reported depression is increasing among socio-economically disadvantaged adolescents – repeated cross-sectional surveys from Finland from 2000 to 2011. *BMC Public Health*, 14:408.
- Town R, Midgley N, Ellis L, Tempest R, Wolpert M. 2017. A qualitative investigation of staff's practical, personal and philosophical barriers to the implementation of a web-based platform in a child mental health setting. *Counselling & Psychotherapy Research*, 17(3):218–226.
- Trowell J, Joffe I, Tsiantis J, et al. Childhood depression: a place for psychotherapy. An outcome study comparing individual psychodynamic psychotherapy and family therapy. *European Child & Adolescent Psychiatry*, 16(3):157–167.
- United Nations. 1989. Convention on the Rights of the Child. <http://www.ohchr.org/EN/ProfessionalInterest/Pages/CRC.aspx>. Accessed 12.8.2018.
- U.S. National Library of Medicine. 2018. Fact Sheet Medline. <https://www.nlm.nih.gov/pubs/factsheets/medline.html>. Accessed 16.2.2018.
- Vaismoradi M, Turunen H, Bondas T. 2013. Content analysis and thematic analysis: implications for conducting a qualitative descriptive study. *Nursing and Health Sciences*, 15(3):398–405.
- Valta, M. 2013. Sähköisen potilas-tietojärjestelmän sosiotekninen käyttöönotto. Seitsemän vuoden seurantatutkimus odotuksista omaksumiseen. Doctoral dissertation: Publications of the University of Eastern Finland, Dissertations in Social Sciences and Business Studies, No 62.
- van Beek Y, Hessen D, Hutteman R, Verhulp E, van Leuven M. 2012. Age and gender differences in depression across adolescence: real or 'bias'? *Journal of Child Psychology and Psychiatry*, 53(9):973–985.
- Vigerland S, Lenharda F, Bonnertbc M, Lalounibe M, Hedmaned E, Ahlene J, Olénf O, Serlachiusab E, Ljótsson B. 2016. Internet-delivered cognitive behavior therapy for children and adolescents: a systematic review and meta-analysis. *Clinical Psychology Review*, 50:1–10.
- Viner RM, Coffey C, Mathers C, Bloem P, Costello A, Santelli J, Patton GC. 2011. 50-year mortality trends in children and young people: a study of 50 low-income, middle-income, and high-income countries. *The Lancet*, 377(9772):1162–74.
- Vos T. 2015. Global, regional, and national incidence, prevalence, and years lived with disability for 301 acute and chronic diseases and injuries in 188 countries, 1990–2013: a systematic analysis for the Global Burden of Disease Study 2013. *Lancet*, 386(9995):743–800.
- Välimäki M, Kurki M, Hätönen H, Koivunen M, Selander M, Saarijärvi S, Anttila M. 2012. Developing an internet-based support system for adolescents with depression. *Journal of Medical Internet Research – Research Protocols*, 1(2):e22.
- Walper S, Thönnissen C, Alt P. 2015. effects of family structure and the experience of parental separation: a study on adolescents' well-being. *Comparative Population Studies*, 40(3): 335–364.

References

- Whetton S. 2005. Foundations of health informatics. In: Whetton S. 2005. Health Informatics. A socio-technical perspective. 1. (edit.). s.l. Oxford University Pres. 1–26.
- Whetton S, Hartnett J. 2005. Build-ing the knowledge base. In: Whetton S. 2005. Health In-formatics. A so-cio-technical perspective. 1. (edit.). s.l. Oxford University Pres. 48–75.
- Wingenfeld K, Wolf O. 2011. HPA axis alterations in mental disorders: impact on memory and its relevance for therapeutic interventions. *CNS Neuroscience & Therapeutics*, 17(6):714–722.
- Wirback T, Möller J, Larsson J-O, Galanti MR, Engström K. 2014. Social factors in childhood and risk of depressive symptoms among adolescents – a longitudinal study in Stockholm, Sweden. *International Journal for Equity in Health*, 13(Suppl 2):96.
- World Health Organization. 2015. Mental health atlas. http://apps.who.int/iris/bitstream/10665/178879/1/9789241565011_eng.pdf?ua=1&ua=1. Accessed 12.8.2018.
- World Health Organization 2016a. Adolescent health, mortality and DALYs in adolescents by WHO region, 2000 and 2012, aged 10-19 years. <http://apps.who.int/gho/data/view.wrapper.MortAdov?lang=en>. Accessed 12.8.2018.
- World Health Organization. 2016b. Suicide rates, age-standardized data by country. <http://apps.who.int/gho/data/node.main.MHSUI-CIDEASDR?lang=en>. Accessed 23.5.2018.
- World Health Organization 2018a. Adolescent and mental health. http://www.who.int/maternal_child_adolescent/topics/adolescence/mental_health/en/. Accessed 12.8.2018.
- World Health Organization 2018b. Mental health. http://www.who.int/mental_health/management/depression/en/. Accessed 12.8.2018.
- World Health Organization. 2013. Comprehensive Mental Health Action Plan 2013-2020. Geneva: World Health Organization. http://apps.who.int/iris/bitstream/10665/89966/1/9789241506021_eng.pdf?ua=1. Accessed 12.8.2018.
- World Health Organization. 2014. Mental health issues. <http://apps.who.int/adolescent/second-decade/section4/page1/Mental-health-issues.html>. Accessed 16.2.2018.
- World Health Organization and Calouste Gulbenkian Foundation. 2017. Policy options on mental health: a WHO-Gulbenkian Mental Health Platform collaboration. Geneva: World Health Organization. Licence: CC BY-NC-SA 3.0 IGO.
- World Medical Association 2013. WMA declaration of Hel-sinki - ethical principles for medical research involving human subjects. *JAMA*, 310(20):2191–4.
- Wozney L, Huguet A, Newton A, et al. How do ehealth programs for adolescents with depression work? A realist review of persuasive system design components in internet-based psychological therapies. 2017. *Journal Of Medical Internet Research*, 19(8):e266.
- Wright DR, Katon WJ, Ludman E, McCauley E, Oliver M, Lindenbaum J, Richardson LP. 2016. Association of adolescent depressive symptoms with health care utilization and payer-incurred expenditures. *Academic Pediatrics*, 16(1): 82–89.

-
- Ye X, Bapuji SB, Winters SE, Struthers A, Raynard M, Metge C, Kreindler SA, Charette CJ, Lemaire JA, Synyshyn M, Sutherland K. 2014. Effectiveness of internet-based interventions for children, youth, and young adults with anxiety and/or depression: a systematic review and meta-analysis. *BMC Health Services Research*, 14(1):313.
- Zohrabi M. 2013. mixed method research: instruments, validity, reliability and reporting findings. *Theory and Practice in Language Studies*, 3(2):254–2

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