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EVALUATION OF WEB-BASED PSYCHOEDUCATION INTERVENTIONS RELATED TO SCHIZOPHRENIA SPECTRUM DISORDERS

Anna Laine

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To my family

UNIVERSITY OF TURKU
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ABSTRACT

The aim of this study was to modify a psychoeducation website and to evaluate web-based psychoeducation interventions. The study had two phases. User-centered design with mixed methods was adapted. In the first phase, needs and expectations for web-based psychoeducation and ideas to improve existing psychoeducation website were gathered with interviews, educational sessions, and a questionnaire separately from adolescent patients and health care professionals. The data were analysed inductively. In the second phase, the modified website and web-based psychoeducation interventions for patients and caregivers were tested. Feedback were evaluated with numeral and written data. Feasibility of the intervention was evaluated by patients' commitment to the study. Acceptability of the interventions were evaluated by patients' and caregivers' commitment on the interventions. Further, impact of web-based course on health care professionals (pre-post intervention with an online questionnaire) and preliminary impact of the intervention on patients (a quasi-experimental cluster study with a self-reported questionnaire) were evaluated. Lastly, life experiences of caregivers were described based on their writings. Statistical methods were used to analyze quantitative data. Inductive content analysis and thematic analysis were used to analyze qualitative data.

Needs and expectations towards web-based psychoeducation and ideas to improve existing website were related to content, usability, design of the website and its use in psychoeducation. The existing website was modified based on these results and with an iterative process. Feedback was mainly positive. Patients' commitment on the study was low with high refusal and dropout rates. Out of 33 patients, 31 (94%) attended all five web-based psychoeducation sessions. Out of 30 caregivers, 25 (83%) completed at least one main module and 18 of them (60%) completed all five modules of the course. Health care professionals' self-efficacy improved significantly ($P = 0.02$). Patients' self-efficacy ($P = 0.003$), knowledge level ($P = 0.002$), and subscale helplessness ($P = 0.03$) in illness cognition changed significantly in intervention group. The changes were not significant from the control group (n = 24). Caregivers' writings included experiences related to their own wellbeing, relationship with the person with schizophrenia spectrum disorders, and health care services. The content of the website seems to be mainly sufficient and to meet users' needs and expectations. The web-based psychoeducation interventions are suitable to use for patients and caregivers. More research with sufficient power is needed to confirm the results related to patients' wellbeing.

KEYWORDS: internet, psychoeducation, mental health, schizophrenia

TURUN YLIOPISTO
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TIIVISTELMÄ

Tutkimuksen tarkoituksena oli muokata psykoedukaatiosivusto ja arvioida internetpohjaisia psykoedukaatiointerventioita. Tutkimuksen aineisto kerättiin kahdessa vaiheessa. Tutkimuksessa hyödynnettiin käyttäjäkeskeistä suunnittelua, ja se toteutettiin monimenetelmällisesti. Ensimmäisessä vaiheessa koottiin nuorisopsykiatrian potilaiden ja hoitajien tarpeita ja odotuksia internetpohjaista potilasopetusta kohtaan sekä ideoita olemassa olevan ohjelman muokkaamiseksi tapaamisen, haastattelujen ja kyselyn avulla. Toisessa vaiheessa testattiin muokattua sivustoa sekä internetpohjaisia interventioita keräämällä numeerista ja kirjallista palautetta potilailta, hoitohenkilökunnalta ja omaisilta. Intervention toteutettavuutta arvioitiin sen perusteella, miten potilaat sitoutuivat tutkimukseen. Interventioiden hyväksyttävyys arvioitiin sillä, miten potilaat ja omaiset sitoutuivat interventioihin. Lisäksi arvioitiin verkkokoulutuksen vaikutuksia henkilökuntaan (pre-post-tutkimusasetelma, internetpohjainen kyselylomake) sekä intervention alustavia vaikutuksia potilaisiin (kvasikokeellinen tutkimusasetelma, kyselylomake). Lopuksi omaisten elämänkokemuksia kuvattiin heidän kirjoittamien kirjoitusten perusteella. Aineistojen analysointiin käytettiin tilastollisia menetelmiä sekä sisällön analyysia ja temaattista analyysia.

Tarpeet ja odotukset internetpohjaista psykoedukaatiota kohtaan sekä ideat sivuston muokkaamiseksi liittyivät ohjelman sisältöön, käytettävyyteen, ulkoasuun ja käyttöön. Sivusto muokattiin hyödyntäen näitä tuloksia sekä iteratiivisen prosessin avulla. Sivustosta saatu palaute oli pääasiassa positiivista. Potilaiden tutkimukseen osallistumisen kieltäytymisprosentti oli korkea ja suuri osa osallistuneista jättäytyi pois kesken tutkimuksen. 33 potilaasta 31 (94 %) osallistui kaikkiin viiteen tapaamiseen. 30 omaisesta 25 (83 %) suoritti vähintään yhden kurssiosion ja 18 (60 %) suoritti kurssin kokonaan. Hoitohenkilökunnan (n = 33) minäpystyvyys kehittyi tilastollisesti merkitsevästi ($P = 0.02$). Interventioon osallistuneiden potilaiden minäpystyvyys ($P = 0.003$), tieto sairaudesta ($P = 0.002$) sekä avuttomuus ($P = 0.03$) muuttuivat tilastollisesti merkitsevästi. Ero ei ollut tilastollisesti merkitsevä kontrolliryhmän potilaisiin (n = 24) verrattuna. Omaisten kokemukset liittyivät heidän omaan hyvinvointiinsa, suhteeseen skitsofreniaryhmän sairautta sairastavaan läheiseen sekä terveydenhuoltoon. Sivuston sisältö vaikuttaa olevan pääasiassa riittävä ja kohtaavan käyttäjien tarpeet ja odotukset. Internetpohjaiset psykoedukaatiointerventiot soveltuvat potilaille ja omaisille. Tarvitaan lisää tutkimusta vahvistamaan tuloksia potilaiden hyvinvointiin liittyen.

AVAINSANAT: internet, psykoedukaatio, mielenterveys, skitsofrenia

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Abbreviations

CINAHL	Cumulative Index to Nursing and Allied Health Literature
ECTS	European Credit Transfer and Accumulation System
EU	European Union
FinFami	The Finnish Central Association of Families with People with Mental Illness
ICD-10	International Classification of Diseases-10
ICN	International Council of Nurses
NICE	National Institute for Health and Care Excellence (the United Kingdom)
OSF	Official Statistics of Finland
SD	Standard deviation
STM	Ministry of Social Affairs and Health (Finland)
THL	National Institute of Health and Welfare (Finland)
TIDieR	Template for Intervention Description and Replication
Valvira	National Supervisory Authority for Welfare and Health
WHO	World Health Organization

List of Original Publications

This dissertation is based on the following original publications, which are referred to in the text by their Roman numerals:

I Laine A, Anttila M & Välimäki M. Modification of an Internet-based patient education program for adults with schizophrenia spectrum disorder to suit adolescents with psychosis. *Informatics for Health and Social Care*, 2016; 41(3): 230–246.

II Laine A, Välimäki M, Löyttyniemi E, Pekurinen V, Marttunen M & Anttila M. The impact of a web-based course concerning patient education for mental health care professionals: Quasi-experimental study. *Journal of Medical Internet Research*, 2019; 21(3): e11198.

III Laine A, Välimäki M, Pekurinen V, Löyttyniemi E, Marttunen M & Anttila M. Feasibility, acceptability and preliminary impacts of web-based patient education on patients with schizophrenia spectrum disorder: Quasi-experimental cluster study. *Journal of Medical Internet Research*, 2019; 21(10): e13073.

IV Laine A, Anttila M, Hirvonen H & Välimäki M. Evaluating the use of an online psychoeducation course for caregivers of people with schizophrenia spectrum disorder: a mixed methods study. Submitted.

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1 Introduction

Schizophrenia spectrum disorders are serious mental disorders (National Institute for Health and Care Excellence [NICE] 2014) causing significant burden for persons with the disorder, their caregivers and for society. The disorders impact on person's thoughts, comprehension, emotions, speech, sense of self, and behavior (World Health Organization [WHO] 2019a). The caregivers have problems with their own health (Lerner et al. 2018, Hegde et al. 2019, Gonçalves-Pereira et al. 2013, Wan & Wong 2019), economic concerns (Opoku-Boateng et al. 2017, Brain et al. 2018), and decreased social relationships (Wan & Wong 2019). In addition to humane burden, schizophrenia spectrum disorders cause major financial costs to society (Chong et al. 2016, Olesen et al. 2012).

The treatment of schizophrenia spectrum disorders combines medication, psychosocial interventions and supported employment programs (Schizophrenia: Current Care Guidelines 2020, Chien & Yip 2013, Chien et al. 2013, NICE 2014). Psychoeducation is one of the psychosocial interventions and it has found to decrease patients' relapses, readmission, medical nonadherence, and the duration of hospital stays (Xia et al. 2011). Therefore, it is an important part of treatment when many patients with schizophrenia spectrum disorders have difficulties to adhere their treatment (Lieberman et al. 2005, Higashi et al. 2013, Velligan et al. 2009).

The use of internet has grown rapidly during the past years (Statista 2020). Internet is used in our daily basis for information source about health related subjects (Amante et al. 2015, Official Statistics of Finland [OSF] 2019). However, the quality of information related to schizophrenia in internet is not generally adequate (Athanasopoulou et al. 2013) and people are suspicious about the trustworthiness of information (Montagni et al. 2016). There are, however, trustworthy and effective web-based programs and interventions for wide range of health care, but most of them are not freely available in internet (Rogers et al. 2017). Further, even though, the web-based interventions are already used, increased use of web-based services in health care is one of the main priorities worldwide (WHO 2019b), in EU (European Commission 2020), and in Finland (Ministry of Social Affairs and Health 2014). At the same time, the importance of trustworthiness and quality of the services has been realized (Ministry of Social Affairs and Health 2014, European

Commission 2016). In Europe, a directive for the accessibility of the websites and mobile applications of public sector bodies was launched in 2016 to guarantee that all people are able to access the public sectors' web-based services (European Commission 2016). Therefore, it would be important to be able to offer accessible trustworthy web-based interventions that satisfy users' needs.

One of the ways to improve quality of web-based interventions and to guarantee ideal user experience is to involve users to the improvement process (Garrett 2011, Interaction design foundation 2018). User-centered design can be used for this purpose (Garett 2011, Interaction design foundation 2018). It has previously been used for example to explore users' needs for virtual reality-based training platform (Moore et al. 2020) and users' needs (Ledel Solem et al. 2019) and experiences related to pain-management intervention (Ledel Solem et al. 2020). The aim of this study was to modify a psychoeducation website and to evaluate web-based psychoeducation interventions related to schizophrenia spectrum disorders. In this study, the participants were patients with schizophrenia spectrum disorders, health care professionals and caregivers. The theoretical framework of this study was based on user experience design with user-centered design as a methodological framework (Garett 2011, Interaction design foundation 2018). This study will give information about users' needs and experiences related to web-based psychoeducation interventions, their impacts, and life experiences of caregivers living with a person with schizophrenia spectrum disorder.

This study was conducted in the discipline of nursing science. In this study, the main nursing metaparadigm concepts (person, health, environment and nursing) (Fawcett 1984) are seen as follows: *Person* means patients, health care professionals and caregivers. Patients are persons who are diagnosed with schizophrenia spectrum disorders, health care professionals are educated professionals who are treating patients with schizophrenia spectrum disorders, and caregivers are family members or close ones of persons with schizophrenia spectrum disorders. *Health* means mental or physical health or wellbeing of the persons. *Environment* is care environment in psychiatric hospital or supporting environment in local family associations. *Nursing* is treatment or support realized with web-based psychoeducation intervention.

The study was a part of Mieli.Net project and funded by University of Turku. The aim of the project is to generate high quality health services. To gain that, the target is to produce information about clinical outcomes and cost-effectiveness of use of web in mental health care. This study focused on perspectives of patients, health care professionals and caregivers. It gives information about their user experiences and impacts of web-based interventions. This information can be used to improve web-based interventions and when planning future studies with aim to gain information about clinical outcomes and cost-effectiveness of web-based interventions.

2 Review of the Literature

2.1 Schizophrenia spectrum disorders

2.1.1 Schizophrenia spectrum disorders and their impacts

Schizophrenia spectrum disorders are severe mental disorders (NICE 2014). In 10th version of International Classification of Disorders' (ICD), the disorders are presented with diagnosis numbers F20–29. The diagnosis are schizophrenia, schizotypal disorder, persistent delusional disorders, acute and transient psychotic disorders, induced delusional disorder, schizoaffective disorders, other nonorganic psychotic disorders, and unspecified nonorganic psychosis. (WHO 2016.)

Worldwide, there are about 20 million people affected by schizophrenia alone (GBD 2017 Disease and Injury Incidence and Prevalence Collaborators). In year 2016 the global age-standardized point prevalence of schizophrenia was 0.28% (Charlson et al. 2018). In Europe, the prevalence of psychotic disorders has been estimated to be 1.2% (Wittchen et al. 2011) with 5 million persons (Olesen et al. 2012). In Finland, the prevalence of psychotic disorders is found to be 3.06%. This number includes substance-induced psychotic disorders and affective disorders with psychotic symptoms in addition to schizophrenia spectrum disorders. (Perälä et al. 2007.) The prevalence varies from 2.17% (Southwest) to 4.56% (Northern) depending on the geographical part of Finland (Perälä et al. 2008). The lifetime prevalence is for schizophrenia 0.87%, for schizoaffective disorder 0.32%, for delusional disorder 0.18%, and for schizophreniform disorder 0.07% (Perälä et al. 2007).

The onset of schizophrenia spectrum disorders, especially in schizophrenia, is usually in early adulthood when people are still learning their independent life (NICE 2014). Although, the onset is possible in earlier age. The prognosis of the disorder is worse if its onset is in childhood or in adolescence. One-third of adolescents with schizophrenia spectrum disorder have severe impairments and they need strong social and psychiatric support. (NICE 2013.) Before the first psychosis, there is usually a prodromal period (Larson et al. 2010) which can last from few days to 18 months. The prodromal period includes decrease of personal functioning with e.g. short duration and / or lower intensity of psychotic symptoms, social withdrawal and concentration problems. The period is followed by acute period with psychotic symptoms. (NICE 2014.) Lopez-Castroman et al. (2019) found in their study with 26 163 patients with schizophrenia that 56,7% of the patients had received a previous mental health diagnoses before diagnosed with schizophrenia. Most of the previous diagnoses were mood disorders, anxiety and other schizophrenia spectrum disorders.

The symptoms of schizophrenia spectrum disorders are divided to positive and negative symptoms (NICE 2014). Positive symptoms (hallucinations and delusions) can be seen as perceptions, cognitions and behaviors that are added to normal mental functions. Negative symptoms (e.g. social withdrawal, emotional apathy impairment of affect, interest, and motivation) are opposite to positive symptoms and can be seen as loss of normal functions or decreased functions. (Lewis et al. 2017.) Lack of insight (Lewis et al. 2017) and nonadherence are remarkable problem in treatment of schizophrenia spectrum disorders (Lieberman et al. 2005, Higashi et al. 2013, Velligan et al. 2009) causing relapses and increased hospitalizations (Morken et al. 2008).

Schizophrenia spectrum disorders affect on person's personal, social and occupational lives (NICE 2014). In a recent meta-analysis of 15 comparative studies Dong et al. (2019) studied quality of life between persons with schizophrenia and healthy controls. They found that persons with schizophrenia had significantly lower physical health, psychological health, social relationships, and environment domains compared to persons in control group. The life expectancy of persons with schizophrenia is found to be 10–20 years shorter than persons' in general population (Hjorthøj et al. 2017, Laursen et al. 2012). Major cause for the lost years are somatic diseases (Dieset et al. 2016, Laursen et al. 2012 Heiberg et al. 2019), unhealthy lifestyle, side effects of antipsychotic medication, and suicides (Laursen et al. 2012). Social relationships of persons with schizophrenia spectrum disorders are affected. Most of them feel loneliness (Badcock et al. 2015, Stain et al. 2012) and more than half have feelings of being stigmatized or self-stigmatized (Gerlinger et al. 2013). The unemployment rates among persons with schizophrenia spectrum disorders are higher than rates in general population (Marwaha et al. 2007). In Finland, Hakulinen et al. (2019) studied in their nationwide cohort study in 1988–2015 employment of persons with schizophrenia spectrum disorders. They found that in ages from 25 to 50 the rate of not being in employment ranged from 89% to 94% among persons diagnosed with schizophrenia and from 76% to 84% among persons diagnosed with other schizophrenia spectrum disorders. Their rates for not completing some secondary education ranged from 43% to 54% among persons diagnosed with schizophrenia and from 30% to 42% among persons with other schizophrenia spectrum disorders. Further, the median earnings were close to zero and their total income was under 10 000 € per year.

More than half of family members of patients with schizophrenia suffer from moderate or severe burden (Shamsaei et al. 2015, Yu et al. 2017). The burden is caused by financial concerns (Opoku-Boateng et al. 2017, Brain et al. 2018), heavy responsibilities (Awad & Vorungati 2008) or stigmatized experiences (Thunyadee et. al. 2015). Family members suffer also from health problems such as psychological distress (Lerner et al. 2018, Hegde et al. 2019, Gonçalves-Pereira et al. 2013, Wan & Wong 2019), insomnia (Wan & Wong 2019), anxiety (Wan & Wong 2019), or depression (Rodrigo et al. 2013, Sharma et al. 2018, Gonçalves-Pereira et al. 2013, Souza et al. 2017). Further, family members have decreased social relationships (Wan & Wong 2019). In a study of Wan & Wong (2019) most common reasons for conflicts between caregivers and persons with schizophrenia spectrum disorders were studied from caregivers' point of view. They found out that caregivers' own lack of knowledge related to symptoms of the disorder were the most common reason for conflicts.

Schizophrenia spectrum disorders cause enormous economic burden for society with direct and indirect costs (Chong et al. 2016). In Europe, Olesen et al. (2012) have calculated that the total costs of psychotic disorders were 93 927 million euros in year 2010. In a review by Chong et al. (2016) the economic burden caused by direct and indirect costs of schizophrenia were estimated to range from 0.02% to 1.65% of the gross domestic product in countries reviewed in their study. Indirect costs covered from 50% to 85% of the total costs. Based on the review, direct costs include costs from pharmacy, and inpatient, outpatient, and home- and community-based care. Direct nonmedical costs include costs for example related to homelessness, social care, and suicides. Indirect costs include costs from informal care, loss of productivity related to absenteeism, premature deaths and unemployment.

2.1.2 Treatment of patients with schizophrenia spectrum disorders

Schizophrenia spectrum disorders are multiform and therefore their treatment should combine different kind of methods in different kind of situations and stages of the disorders (Schizophrenia: Current Care Guidelines 2020, NICE 2014). Central in a treatment of schizophrenia spectrum disorders are medication, psychosocial interventions with individual and family interventions and supported employment programs (Schizophrenia: Current Care Guidelines 2020, Chien & Yip 2013, Chien et al. 2013, NICE 2014). In long term care it is important to support patients to commit to the treatment and prevent new hospital periods. Further, the prevention and care of physical symptoms are important. (Schizophrenia: Current Care Guidelines 2020, NICE 2014.)

Based on the Finnish Current Care Guidelines for Schizophrenia (2020), the treatment of a patient with schizophrenia spectrum disorder is planned individually based on patient's needs and examinations done by psychiatry and multi-professional team. The treatment plan is done together with the patient and his / her family and it includes goals of the treatment and rehabilitation and ways to achieve them. Further, the plan is made related to topics as psychiatric symptoms, psychosocial development before getting ill, overall situation of social relationships, studies and work, psychosocial situation and cultural background of patient and his / her family, needs of medication psychosocial interventions, needs of vocational rehabilitation, and physical health and needs of treatment.

Psychoeducation is one of the main psychosocial interventions in treatment of schizophrenia spectrum disorders. Accordingly, it is part of several care guidelines (e.g. Schizophrenia: Current Care Guidelines 2020, NICE 2014, American Psychiatric Association 2019). The treatment with psychoeducation consists originally of four phases: connection with the family, teaching survival skills for living with schizophrenia, reentry and application of survival skills themes to individual families, and continued treatment or disengagement (Anderson et al. 1980). The aim is to engage patients in behavior change which requires learning. Therefore, knowledge is central in psychoeducation. During the psychoeducation intervention, patients get information and their understanding increases as they learn about their disorder. Different kind of methods are used to realize psychoeducation individually or in groups of patients and their family members. For example, written materials, videos, and web-based programs are used. Psychoeducation has been found to decrease relapses, readmission, medical nonadherence, and the duration of hospital stays of patients with schizophrenia spectrum disorders. It is more effective when family members are included. (Xia et al. 2011.) Psychoeducation for caregivers of patients with psychosis have found to reduce caregivers' global morbidities, negative caregiving experiences and expressed emotion (Sin et al. 2017).

The psychoeducation website used in this study, was developed to offer information and to improve treatment processes. The website includes five information themes based on users' needs assessment: 1) mental disorder, 2) treatment, 3) wellbeing, 4) patient's rights, and 5) daily life. In addition to information, the website includes links for other reliable websites, tasks, and audio-recorded stories of other patients. (Välimäki et al. 2008.) During the web-based psychoeducation intervention, the patients use the website together with a health care professional. The intervention includes five sessions where each theme is meant to be a topic of one session. The theme of each session is not selected in advance. Instead of that, patients are allowed to decide the orientation of the themes. In addition, patients are encouraged to ask questions or identify concerns related to the themes to ensure that they get the information they are interested in. Health care professionals help patients to find answers to the questions and discuss about the topics of the themes together with the patients. The active role of patients supports their learning as it is known that based on constructive approach, learning is seen as an active process. Instead of being a passive target of knowledge, the learner has an active role when he or she builds new knowledge on previously learned or experienced (Zhou & Brown 2015). In this study the website was modified to suit also adolescent patients in addition to adult patients with schizophrenia spectrum disorder.

2.2 Mental health services for patients with schizophrenia spectrum disorders

The Finnish public authorities must guarantee adequate public social, health and medical services for all people (The Constitution of Finland 731/1999). Municipalities are responsible to arrange health care for their residents and the services are funded by tax revenues of state and municipalities, statutory and voluntary insurance payments, and employer and customer payments (Pekurinen 2014). Municipalities can arrange the services producing public health care themselves or in collaboration with other municipalities. The services can also be bought from other municipalities, private companies or organizations. (Ministry of Social Affairs and Health 2020a.)

Public health services are divided into primary health services and specialized medical care. Primary health services are provided by about 150 health centers. Specialized medical care is provided at hospitals and outpatient clinics. Most of them are owned by municipalities or shared joint municipal authorities. There are 20 hospital districts in Finland and every municipality is part of one of them. There is one central hospital and other hospitals in every hospital district. The hospital district is responsible to organize hospital services. (Ministry of Social Affairs and Health 2020a.) Mental health services include guidance and advice, psychosocial support, examination, care and rehabilitation (Ministry of Social Affairs and Health 2020b).

Patients with schizophrenia spectrum disorders are cared primarily in outpatient care (Schizophrenia: Current Care Guidelines 2020) in primary health care services as in health centers (Ministry of Social Affairs and Health 2020b). To support outpatient care, patients can have social services including for example housing services, home care and rehabilitative work activities (Ministry of Social Affairs and Health 2020c).

Patients can have outpatient and inpatient care from specialized medical care in psychiatric clinics and in psychiatric hospitals if the services in primary health care are insufficient (Ministry of Social Affairs and Health 2020b). The admission to specialized medical care requires always a referral from a doctor. In a case of an emergency, patient can be admitted to hospital via emergency health care services. (Health Care Act 1326/2010). The patient can also be admitted to care involuntary if the criteria defined in law are met (Mental Health Act 1116/1990).

Family members of persons with schizophrenia spectrum disorders get support for example from family associations. The Finnish Central Association of Families with People with Mental Illness (FinFami) is a central organization for local families' associations, and a lobby organization for family members of persons with mental health disorders. The association consists of the central association and 18 regional local families' associations located all over Finland. The local families' associations provide support and assistance for family members and family members are able to participate different group activities, courses and events hosted by the local families' associations. (FinFami 2020.)

This study was conducted in hospital environments in specialized medical care and in cooperation with local families' associations. Patients whose state of illness is not in balance and who might benefit from psychoeducation to increase their adherence and knowledge of the disorder are treated in specialized medical care. Therefore, psychiatric hospital was chosen for data collection from patients with schizophrenia spectrum disorders and health care professionals treating them. Many caregivers of persons with schizophrenia spectrum disorders are members of the local families' associations to get support to their lives. Therefore, we cooperated with the associations to reach caregivers who might benefit from the psychoeducation course.

2.3 Health care professionals in care of patients with schizophrenia spectrum disorders

In Finland, health care professionals are educated in vocational institutions, universities of applied sciences (polytechnics) and universities. Practical nurses are educated in vocational institutions with title of vocational qualification in social and health care. The education of practical nurse is upper secondary level qualification with 180 competence points. Out of these, 145 competence points are from vocational units. Out of vocational units, 75 competence points are from two units that are compulsory based on competence area student have decided to study (e.g. competence area of mental health and substance abuse work. (Finnish National Agency for Education 2017.) Vocational education is competence-based. Therefore, students' earlier acquired competences are assessed and credited and only acquired missing competences are studied before demonstrating the skills in practical work. (Finnish National Agency for Education 2018, Vocational Education and Training Act 531/2017.) Therefore, the length of studies varies but without any earlier competences the education lasts about 2.5 years (Studyinfo 2020).

Bachelors of Health care, such as registered nurses, public health nurses, midwives, paramedics, occupational therapists and physiotherapists are educated in universities of applied sciences. People are able to apply to university of applied sciences after completing earlier studies such as Finnish matriculation examination or vocational upper secondary qualification. The standard completion of Bachelor's degree varies from 3.5 to 4.5 years and 210–270 ECTS credits. (Studyinfo 2020a.) The degree of registered nurse requires 210 ECTS and the degree of public health nurse (240 ECTS), paramedic (240 ECTS) and midwife (270 ECTS) includes the registered nurse's qualification (Finnish Nurses Association 2020). The studies of Bachelor's degree include basic, professional and optional studies, internships and a Bachelor's thesis (Studyinfo 2020a).

Psychologists are educated in universities. The students must study first Bachelor's degree and after that it is possible to continue to Master's degree. Bachelor's degree in psychology includes 180 ECTS and lasts about three years. Master's degree in psychology includes 150 ECTS and lasts about two and half years. The studies include studies from basic to advanced level in major and minor subjects, language and communication studies, other studies (e.g. philosophy, research methods), internship, and Bachelor's and Master's thesis. (Studyinfo 2020b.)

All professionals working in health care need to be granted by National Supervisory Authority for Welfare and Health (Valvira). Valvira grants registered nurses, public health nurses, midwives, paramedics, occupational therapists, physiotherapists and psychologists the right to work as a licensed or authorised professional. For practical nurses, Valvira grants the use of the occupational title of health care professional (Act on Health Care Professionals 559/1994, Valvira 2020). The Act on health professionals (559/1994) sets that health care professionals need to maintain and develop their professional competence after graduating. Also, Ministry of Social Affairs and Health (2004) has published a recommendation for further education for health care professionals.

2.4 Internet use and web-based technology in care of schizophrenia spectrum disorders

The use of internet has grown rapidly during the last decades. In 2005 there were about 1 billion internet users and in year 2019 the amount had grown to 4.13 billion (Statista 2020). In Finland, in year 2019 almost all (96–100%) working aged (16–64 years old) people used internet (OSF 2019). Also, most (87%) of the persons with schizophrenia spectrum disorders use internet and 95% of them have internet access at home (Athanasopoulou et al. 2017). Finnish people use internet for everyday errands, communication, following the media, and searching information about health, disorders and nutrition (OSF 2019). In a study of Athanasopoulou et al. (2017) use of internet among persons with schizophrenia spectrum disorders was found to be similar when the most common reasons to use internet were banking, sending emails, and searching information related to their interest but not health related. However, in other studies persons with schizophrenia spectrum disorders have found to use internet also for searching information related to their disorder (Kalckreuth et al. 2014, Villani & Kovess-Masfety 2017, Athanasopoulou et al. 2017, Välimäki et al. 2017). Caregivers use internet to find health information (Kim et al. 2017, Park et al. 2016) for themselves and for others (Bangerter et al. 2019, Shaffer et al. 2018). Health care professionals use actively internet for information seeking in their work (Gilmour et al. 2016, Younger 2010).

Web-based technology and its increased use is one of the main priorities in EU. Health care is one of the areas included to this agenda. The aims are to secure data accessing and sharing when citizens are able to access their own health data and health care professionals are able to exchange the data across the EU, to improve faster research, diagnosis and care with shared health data, and to strengthen citizens' empowerment and individual care with communication and monitoring through digital services. (European Commission 2020.) In Finland, The Ministry of Social Affairs and Health has built a strategy for information management in healthcare and social welfare. The strategic aims for year 2020 are that citizen use services in internet and produce data for health care professionals and for their own use, trustworthy information about wellbeing and services supporting its use are available, and information about quality and availability are available nationwide (Ministry of Social Affairs and Health 2014). Patients' medical and prescription data are already collected and saved in digital national databank. Health care professionals save medical information and make prescriptions through the system and patients are able to browse their own medical information and prescriptions (Kanta Services 2020). Mental health services are also realized using web-based sources. These services are for example web-based therapies (Mental Hub 2020) and physician appointments (Ministry of Social Affairs and Health 2015). Based on the review by Berry et al. (2016), the acceptability of web-based interventions targeted for persons with schizophrenia spectrum disorders is mostly high, especially if remote online support is provided.

2.4.1 Web-based psychoeducation programs for patients with schizophrenia spectrum disorders

A literature review with databases CINAHL, Pubmed (Medline) and Web of Science was conducted for this chapter in April 2020. First, the titles of the searched articles were screened. Second, the abstracts of the potential articles were screened, and last, full-texts were read to certain the inclusion and exclusion criteria. Also, manual search was conducted screening the reference lists of review articles and checking the previous articles written about each intervention or program found by the search. Studies were selected based on the following inclusion criteria: Web-based educational interventions or programs targeted for persons with schizophrenia spectrum disorders and / or their caregivers, study is related to needs and expectations related to web-based psychoeducation, feedback, and / or, development process, age group adults and adolescents, English language. Studies were excluded based on exclusion criteria: intervention or program targeted to improve physical health only, programs used only with a smartphone app. The search strategies with more details are presented in Appendix 1. In total, 29 studies with 13 scientifically reported psychoeducation programs targeted for persons with schizophrenia spectrum disorders (later patients) were found. To find studies with more details, see Appendix 2.

Web-based psychoeducation programs were targeted for patients (Álvarez-Jiménez et al. 2013, McEnery et al. 2019a, 2019b, Baumel et al. 2016, Thomas et al. 2016), their caregivers (Chan et al. 2016, Glynn et al. 2010, Honary et al. 2018, Lobban et al 2011, 2020, Sin 2013, Sin et al. 2019a, 2019b), or both patients and their caregivers (de Leeuw et al. 2012, Rotondi et al. 2010). The programs for patients were reported to be used alone (Arnold et al. 2019, Gottlieb et al. 2013, Rotondi et al. 2005, Sin et al. 2013, 2019) or with a health care professional (Baumel et al. 2016, Thomas et al. 2016, Anttila et al. 2012). Programs were reported to be used with a password (Kuosmanen et al. 2010, Sin et al. 2019) or with a personal user name and password (van der Krieke et al. 2012, Glynn et al. 2010, Lederman et al. 2014, Lobban et al. 2020, Rotondi et al. 2010, Sin et al. 2013). One program was partly open and partly secured with a username and password (de Leeuw et al. 2012). For more detailed characteristics of the programs, see Appedix 3.

2.4.2 Iterative development processes of web-based psychoeducation programs for persons with schizophrenia spectrum disorders

Many of the previous web-based psychoeducation programs have been reported to been designed using different frameworks and guidelines, such as Medical Research Council's Framework for Complex Interventions (Lederman et al. 2014, Sin et al. 2013, 2019), user-centered design (Honary et al. 2018, McEnery et al. 2019), participatory design principles (Álvarez-Jiménez et al. 2013), guideline of Rotondi et al. (2007) (Thomas et al. 2016, Gottlieb et al. 2013, Chan et al. 2016). The design processes based on these guidelines have used iterative techniques during the process. Common to all iterative processes is that during the process, information and experiences are collected from different user groups and experts. In previous studies, iterative processes have been realized with patients and / or their caregivers (Honary et al. 2014, Chan et al. 2016), patients, their caregivers and health care professionals (Sin et al. 2014, Thomas et al. 2016, Välimäki et al. 2008, Rotondi et al. 2007, de Leeuw et al. 2012), and patients, their caregivers, health care professionals and information technology experts (van der Krieke et al. 2012, Sin et al. 2019, Lederman et al. 2014). The design processes have included also other professionals, such as writers and cartoonists (McEnery et al. 2019).

First, the iterative processes typically start with a literature review (Chan et al. 2016, Lobban et al. 2011, McEnery et al. 2019, Sin et al. 2014, 2019b, Rotondi et al. 2007, Välimäki et al. 2008) and evaluation of users' needs and expectations to find out the needed content of the program (Rotondi et al. 2007, Välimäki et al. 2008, Lobbban et al. 2011, van der Krieke et al. 2012). The users' needs and expectations for web-based psychoeducation programs have been studied with focus groups (de Leeuw et al. 2012, Lederman et al. 2014, Lobban et al. 2011, Sin 2013, Álvarez-Jiménez et al. 2013), interviews (Rotondi et al. 2005), and workshops and in-depth discussion (Honary et al. 2018). Thomas et al. (2016) used conceptual framework of CHIME and Álvarez-Jiménez et al. (2013) and McEnery et al. (2019) used moderated web-based social therapy model to guide the content of their program.

Second, the program or its prototype is been designed. Third, typically, the prototype has been tested with patients, their caregivers, health care professionals and / or other professionals to gather feedback for possible revisions. The methods used for testing vary and most of the studies have combined multiple methods. The testing of the programs or their prototypes have been conducted with heuristic evaluation (Honary et al. 2018, van der Krieke et al. 2012, Sin et al. 2019), think aloud -tests (Honary et al. 2018, Sin et al. 2019), focus goups (McEnery et al. 2019, de Leeuw et al. 2012), interviews (Thomas et al. 2016, Chan et al. 2016, Lederman et al. 2014, Rotondi et al. 2007), observation (van der Krieke et al. 2012, Rotondi et al. 2007), written feedback via email (Honary et al. 2018), questionnaires (de Leeuw et al. 2012, Kuosmanen et al. 2010, Sin et al. 2014, 2019, Thomas et al. 2016, van der Krieke et al. 2012, Chan et al. 2016, Rotondi et al. 2005), collecting data from usage of the program (Sin et al. 2014, Thomas et al. 2016, de Leeuw et al. 2012, Chan et al. 2016, Lederman et al. 2012, Rotondi et al. 2005), recording the time user needs to find a right page (Chan et al. 2016), collecting information about intervention dropouts (Thomas et al. 2016). In addition, some of the studies evaluated clinical impacts of the program on its users (Thomas et al. 2016, Rotondi et al. 2005, McEnery et al. 2019).

2.4.3 Needs and expectations towards web-based psychoeducation programs

Patients and their caregivers and health care professionals have needs and expectations towards web-based psychoeducation programs. In addition to needs and expectations, common concern for patients, caregivers and health care professionals is that web-based program would replace face-to-face support or decrease contacts with health care professionals (de Leeuw et al. 2012, Berry et al. 2017, Berry et al. 2019, Koivunen et al. 2007, Lobban et al. 2011, 2020b). Health care professionals have also been afraid that use of web-based program could strengthen patients' paranoia (de Leeuw et al. 2012).

The needs and expectations of patients and caregivers are towards content and design of the programs. Both patients and caregivers have expressed that content of web-based psychoeducation program should include information related to the disorder including e.g. symptoms, treatment and medication (Álvarez-Jiménez et al. 2012, Honary et al. 2018, Lobban et al. 2011, Sin 2013). The information should be evidence-based (Sin 2013) and updated (Álvarez-Jiménez et al. 2012, Sin 2013). Patients have a need to enhance their daily living skills and have suggested that program could include tips for example for cooking and cleaning (Berry et al. 2019). Caregivers have a need for information about support sources and mental health services (Honary et al. 2018, Lobban et al. 2011, Sin 2013) and legal aspects, such as patients and caregivers' rights (Honary et al. 2018, Sin 2013, Lobban et al. 2011). Further, caregivers need information how to manage in difficult situations with the patients (Lobban et al. 2011, Sin 2013), how to support the patients in recovery (Sin 2013), how to recognize early signs of relapse (Lobban et al. 2011), how to talk to other people about being a caregiver for someone with mental disorder (Lobban et al. 2011), and how to support their own wellbeing (Lobban et al. 2011, Sin 2013). Both patients and caregivers have a need to contact with peers and to hear others' experiences (Álvarez-Jiménez et al. 2012, Honary et al. 2018, Lobban et al. 2011, Berry et al. 2019). So, patients and caregivers expect that the programs include possibility for peer support (Álvarez-Jiménez et al. 2012, Lobban et al. 2011, Sin 2013, Sin et al. 2019). Also, the ability to contact health care professionals is important for patients (Álvarez-Jiménez et al. 2012). Caregivers have expressed that the web-based program should include ability to ask questions from professionals (Sin 2013) and a section for frequently asked questions (Sin 2013). Patients (Berry et al. 2019) and caregivers (Honary et al. 2018) have also stated that the focus should be in positive outcomes and recovery.

Based on previous studies, the web-based psychoeducation programs should look professional, be simple and easy to use (Lobban et al. 2011, Honary et al. 2018). The content should be easy to understand (Sin 2013), robust and flexible so that users could find information related to their needs (Sin 2013, Lobban et al. 2011). The information should be in one place where it would be easy to find (Lobban et al. 2011, Sin 2013). The professional design would give the impression of reliable and legitimate program (Honary et al. 2018). The program should be secure and the possible discussion forum should be moderated by professional (Álvarez-Jiménez et al. 2012, Sin 2013, Honary et al. 2018, Berry et al. 2019).

2.4.4 Testing of web-based psychoeducation programs

There have been difficulties to recruit patients with schizophrenia spectrum disorders to test web-based psychoeducation programs while the engagement of the patients has been successful. In a study of Glynn et al. (2010), the researcher had difficulties to get participants in their study. However, those who participated, engaged to use the program. Also, in other studies users of the programs have engaged to use web-based psychoeducation programs and most of them have completed interventions realized with the programs (Anttila et al. 2012, Baumel et al. 2016, Gottlieb et al. 2013, Glynn et al. 2012, Thomas et al. 2016, Mc Enery et al. 2019b). In a study of Rotondi et al. (2010), the average time spent in the website was 46 hours for patients and 14 hours for their caregivers in one year. The use of the programs tends to decrease when time passes (Rotondi et al. 2005, Arnold et al. 2019).

In previous studies, most visited modules or sites of web-based psychoeducation programs have found to be discussion forums (Arnold et al. 2019, Sin 2014, Lobban et al. 2020), question-answer site (Sin et al. 2014) and sites related to information about disorder (Álvarez-Jiménez et al. 2013, Lobban et al. 2020, McEnery et al. 2019), and recovery (Arnold et al. 2019). Least visited modules or sites of programs have been related to general overview (Álvarez-Jiménez et al. 2013), life values and goals, recovery and stress (Arnold et al. 2019). Even though the discussion forums are highly visited, only part of users post comments actively on them (Arnold et al. 2019, Lobban et al. 2020).

Previous studies have collected qualitative and quantitative feedback from patients and their caregivers related to web-based psychoeducation programs. Feedback have found to be mostly positive. Majority of patients and their caregivers are satisfied with the programs (Baumel et al. 2016, de Leeuw et al. 2012, van der Krieke et al. 2012, McEnery et al. 2019b, Sin et al. 2014, Thomas et al. 2016, Glynn et al. 2010), think that information would help persons using the program (van der Krieke et al. 2012), and would recommend program to others (Álvarez-Jiménez et al. 2013, Chan et al. 2016, Gottlieb et al. 2013, McEnery et al. 2019b, Thomas et al. 2016, van der Krieke et al. 2012, Sin et al. 2014, Sin et al. 2019).

Patients and caregivers have found the programs to be e.g. helpful (McEnery et al. 2019b, Sin et al. 2014, 2019, Gottlieb et al. 2013, van der Krieke et al. 2012), useful (Sin et al. 2014, 2019, Gottlieb et al. 2013, de Leeuw et al. 2012, Chan et al. 2016), relevant (Sin et al. 2014, 2019), supportive and meaningful (van der Krieke et al. 2012). Patients have found the programs helping them in their situations (McEnery et al. 2019b, Thomas et al. 2016).

Patients and caregivers have appreciated when they have found program safe (Lobban et al. 2020, Sin et al. 2019), user friendly (Sin et al. 2019), simple (van der Krieke 2012), flexible, accessible (Sin et al. 2019) and easy to use (Sin et al. 2019, Chan et al. 2016, Lobban et al. 2020), and when they include structured (de Leeuw et al. 2012) and sufficient information (Chan et al. 2016, Lobban et al. 2020), and variety of information forms (Lobban et al. 2020). In addition, caregivers have appreciated that they have had ability to have their own program focused on caregivers (Sin et al. 2019). In a study of de Leeuw (2012) caregivers were able to see information about their relative with schizophrenia spectrum disorders if he / she authorized it. Most patients did not allow it because they did not want caregivers to know everything about their care or thought that caregivers were not motivated to be involved.

Improvement ideas have been related to technical aspects (de Leeuw et al. 2012, van der Krieke et al. 2012, Sin et al. 2019, Kuosmanen et al. 2010), varied terms and place of certain buttons (Sin et al. 2019), amount of information, missing sections, and layout of the program (van der Krieke et al. 2012), information about updating dates and references, and appearance of the program (Kuosmanen et al. 2010). Users have also suggested that online communication source between patients and clinicians should be added (van der Krieke et al. 2012) and that content should be more personal (de Leeuw et al. 2012) or include more information about specific topics (Koivunen et al. 2007). Users have varying opinions about the layout of the program when some of them would prefer more colors and others plain and clean layout (van der Krieke et al. 2012).

Health care professionals have been satisfied with the content of the psychoeducation programs (Koivunen et al. 2007, de Leeuw et al. 2012). They have found the use of web-based psychoeducation programs to be modern way to connect with patients (de Leeuw et al. 2012). Health care professionals have also noticed that patients take more control of their own treatment when they use the program (de Leeuw et al. 2012) and that the use of the program together with the patient brings them closer to each other (Anttila et al. 2008). In a study of Anttila et al. (2008), from health care professionals' point of view, the advantages for patients were that the program was usable and it was a broad information source and self-help aid for patients. They also expressed advantages for themselves when they got to know the patient better during the discussions when using the program together. The use of the program was also motivating and supportive for themselves. However, the successful use of the program was dependent with the mental state, motivation and computer skills of the patient and some health care professionals had negative attitude against web-based psychoeducation. Further, some health care professionals felt that the use of the program was time consuming and took too much time from their basic work which has also been found in a study of de Leeuw et al. (2012). In a study of Kuosmanen et al. (2010), health care professionals were the most critical group when evaluating the usability of the program. In their study, the other users were patients and nursing students.

In small pilot evaluations, clinical statistically significant impacts have been found in patients' personal recovery, alienation (Thomas et al. 2016), stress levels (Thomas et al. 2016, Rotondi et al. 2005), clinical status (Glynn et al. 2010), social anxiety symptoms (McEnery et al. 2019), positive symptoms, knowledge of schizophrenia (Rotondi et al. 2010), auditory hallucinations, overall psychopathology, knowledge about hallucinations, and knowledge of cognitive behavioral therapy for psychosis (Gottlieb et al. 2013). The statistically significant impacts in caregivers have been found in decrease of distress (Glynn et al. 2010) and increase in knowledge about prognosis (Rotondi et al. 2010).

2.4.5 Frameworks for designing web-based psychoeducation programs for persons with schizophrenia spectrum disorders

A number of frameworks have been used for designing web-based psychoeducation programs for persons with schizophrenia spectrum disorders. The framework found in literature review of this study were Medical Research Council's Framework for Complex Interventions (Lederman et al. 2014, Sin et al. 2013, 2019), participatory design (Álvarez-Jiménez et al. 2013), guideline of Rotondi et al. (2007) (Thomas et al. 2016, Gottlieb et al. 2013, Chan et al. 2016), and user-centered design (Honary et al. 2018, McEnery et al. 2019).

Medical Research Council's Framework for Complex Interventions was first published in year 2000 (Campbell et al. 2000) to guide evaluations of complex interventions in health care, especially with randomized controlled trials. The framework has been updated afterwards. The framework includes four phases: development, feasibility and piloting, evaluation, and implementation (Craig et al. 2008). In the development phase, the intervention is developed after identifying evidence-based knowledge and an appropriate theory. In feasibility and piloting phase, the intervention is tested with a series of pilot studies targeting on every key uncertainties in the design. After that, evaluations are made with exploratory and definitive evaluations. And lastly, in implementation, the results are spread widely with long-term follow-up and monitoring the implementation (Craig et al. 2008).

Participatory design has its roots in Scandinavia where researchers involved workers of organization to direct participation in all development phases of computerized tools and systems in 1970's and 1980's (Sundblad 2010, Bannon & Ehn 2013). In participatory design (also named as co-operative design), all stakeholders (for example employees, partners, customers, citizens) are involved in the design process. The stakeholders co-operate with researchers and designers during the process to define the problem and ideas for solution, and to evaluate the proposed solutions. (Dell'Era & Landoni 2014.) The design processes and methods of participatory design varies (Spinuzzi 2005). In health care, a process to develop web-based programs has for example been realized with iterative process with four phases. First, the needs of the stakeholders are evaluated. Second, the ideas and prototypes are generated with the stakeholders. Third, the prototypes are tested and retested with pilot studies and reflection. Fourth, the effectiveness and contribution to quality of care are assessed. (Clemensen et al. 2017.)

Guideline of Rotondi et al. (2007) was originated when the researchers wanted to design a psychoeducation website for persons with schizophrenia. The researchers wanted to take account that the persons with schizophrenia might have cognitive deficits that might affect their ability to use the website effectively, and they have unique needs for website. Their development process started with a needs assessment which they used to select the main content of the website. After that the website was designed with sequence of usability tasks. Participants were involved to the usability testing which was divided to two phases. First, the terminology and organizational concepts were tested to be user-based. Second, the navigation of the website was tested. The results of usability testing were used to modify the website to address the weaknesses found.

User-centered design was originated in USA by the researcher Donald Norman and his research laboratory (Norman & Draper 1986). User-centered design (also named as human-centered design [Norman 2013]) is an iterative design process where users are involved in every step of the development process (Garrett 2011). The process includes four activities: 1) Observation, 2) Idea generation, 3) Prototyping, and 4) Testing (Norman 2013). First, the aim of the observation is to know the target users to understand their interests and needs (Norman 2013), and to know what kind of support the upcoming program could provide (Preece et al. 2015). This activity should be done in users' natural environment where the program will be used (Norman 2013) and it can include, for example observation (Norman 2013) and interviews (Preece 2015). Second, in idea generation, potential solutions are generated. In this activity, the aim is to generate and suggest many ideas, being creative without rejecting any ideas too early. In this activity different kind of brainstorming can be used to collect all ideas and to generate them to potential solutions. (Norman 2013, IDEO.org 2015.) Third, in prototyping, a prototype of the program will be produced. The aim of the prototype is that users can have a real vision about the program (Norman 2013, Preece et al. 2015). Fourth, in testing, the aim is to evaluate the program. The meaning of this last activity is to evaluate usability and acceptability of the program (Norman 2013, Preece et al. 2015). In this phase, quantitative and qualitative data can be gathered for example with questionnaires (Preece et al. 2015). After all four activities are finished it is possible to iterate the activities or the whole process if needed (Norman 2013).

3 Aims

The overall aim of this study was to modify and evaluate a psychoeducation website and web-based psychoeducation interventions related to schizophrenia spectrum disorders. The study adapts user-centered design with different target groups (patients, health care professionals and caregivers). The study had two phases (Figure 1) with specific goals as follows:

Phase I. Pre-design

1. To describe patients' and health care professionals' expectations for web-based psychoeducation. (Paper I)
2. To describe patients' and health care professionals' ideas to improve existing psychoeducation website. (Paper I)
3. To modify existing psychoeducation website to suite adolescent patients in addition to adult patients with schizophrenia spectrum disorder. (Paper I)
4. To create web-based courses for health care professionals and caregivers (Paper II, IV)

Phase II. Testing

1. To evaluate patients', health care professionals' and caregivers' feedback on the psychoeducation website and web-based psychoeducation interventions. Papers II–IV)
2. To evaluate the impact of web-based course related to web-based psychoeducation on health care professionals' self-efficacy, self-esteem, and team climate. (Paper II)
3. To evaluate feasibility and acceptability of web-based psychoeducation interventions. (Paper III, IV)
4. To evaluate preliminary impact of web-based psychoeducation intervention on patients' self-efficacy, self-esteem, illness cognition, and knowledge level. (Paper III)
5. To describe life experiences of caregivers living with a person with schizophrenia spectrum disorder. (Paper IV)

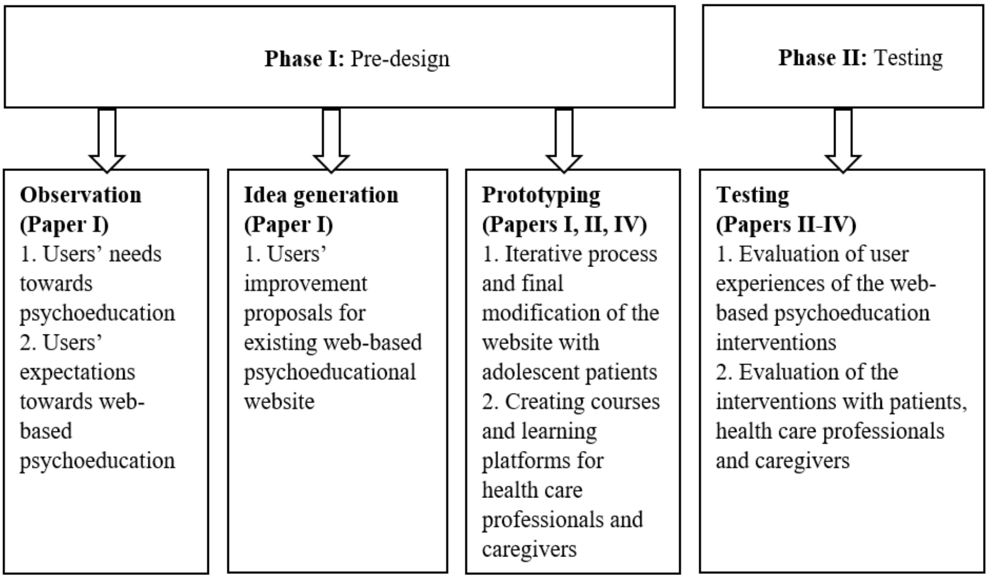

Figure 1. Summary of the study phases.

4 Materials and Methods

4.1 Theoretical and methodological approach

User experience design was used as a theoretical framework in modification and evaluation process of the web-based psychoeducation interventions. The aim of user experience design is to produce a service or product with ideal experience for users. User experience design is usable for all kinds of programs and services but is mostly used when producing web products or applications. (Garrett 2011, Interaction design foundation 2018.)

Psychoeducation is important part of care of patients with schizophrenia spectrum disorders (Schizophrenia: Current Care Guidelines 2020, NICE 2014) and there is a need for web-based interventions in mental health care (Mental Health Europe 2020). Also, patients with schizophrenia spectrum disorders are interested to use internet as an information source related to their disorder (Villani & Kovess-Masfety 2017). Therefore, it is important to generate usable web-based interventions for care of patients with schizophrenia spectrum disorders.

The main methodology to create an ideal user experience is user-centered design (Garett 2011, Interaction design foundation 2018). Therefore, user-centered design was used as a methodological framework in this study. The four activities were divided into two phases. Observation, idea generation, and prototyping were included to pre-design phase which was followed with testing. The prototyping included modification of an existing psychoeducation website (later website) and creating web-based courses for health care professionals and caregivers. User-centered design include both quantitative and qualitative methods (Norman 2013). Therefore, the methodology of this study was based on mixed-method approach (Fetters et al. 2013). Mixed methods approach is useful because it offers a wide understanding from the subject (Fetters et al. 2013) and is suitable when researching subjects related to nursing practice (Fawcett 2015) and mental health (Kettles et al. 2011). The mixed methods approach combines qualitative and quantitative methods. It allows to research human experiences and the extent of the subject. (Fetters et al. 2013.)

4.2 Study design

In Phase I, a qualitative study design was used in three activities based on user-centered design. (Paper I). First, it was used to find out what kind of needs adolescent patients and health care professionals have for psychoeducation and what kind of expectations they have related to web-based psychoeducation. Second, it was used to find out what kind of ideas for improvement health care professionals and adolescent patients would make to the existing website. Third, it was used to modify and update the website. The design was chosen because with qualitative approach, it is possible to provide comprehensive understanding about the topic (Jormfeldt 2019).

In Phase II, mixed methods were used to collect written and numeral feedback about the website and to test usefulness of the web-based interventions. First (Paper II), a non-randomized, pre-post intervention design was used to describe the impact of web-based psychoeducation course on health care professionals' self-efficacy, self-esteem and team climate. Also, qualitative study design was used to collect possible advantages and disadvantages after the course. The mixed methods design was chosen because it can be used to evaluate the benefits of specific intervention (Harris et al. 2006). Second (Paper III), a single-blind, parallel, quasi-experimental cluster study design was used to test feasibility and acceptability of a web-based psychoeducation intervention. The cluster study design was chosen because it is usable when the aim is to avoid information and experience flow from participants in intervention group to control group (Keogh-Brown et al. 2007). Third (Paper IV), a mixed methods design was used to evaluate caregivers' use of web-based psychoeducation course. Quantitative methods were used to evaluate engagement with log records. Both quantitative and qualitative methods were used to evaluate feedback of the course. Qualitative methods were used to describe caregivers' experiences with living with a person with schizophrenia spectrum disorder. Qualitative methods were chosen because they are suitable when wanting to deepen understanding (Holloway & Galvin 2018) and when aiming to produce information about how people experience aspects of their life (Teherani et al. 2015).

4.3 Setting

In Phase I, there were two different settings. First, the study was conducted in an adolescents' psychiatric rehabilitation unit in one university hospital. The university hospital offers specialized care for its 24 member municipalities. The rehabilitation unit includes inpatient ward with eight beds and an outpatient clinic. The unit offers psychiatric care (e.g. psychosocial groups) for adolescents (aged from 13 to 17 years) with psychosis or severe neuropsychiatric problems. Second, the data were collected at University of Turku as part of the educational seminar for mental health care professionals. The seminar aimed to disseminate the latest study results and achievements related to psychoeducation. Health care professionals from different organizations from all around Finland were invited to join the seminar.

In Phase II, there were three different settings. First, three closed inpatient wards (a total of 41 beds) in one psychiatric hospital participated in the study. The wards were rehabilitation wards and one acute ward. Adult patients with mental disorders were treated in the wards. Second setting was six inpatient wards including the same three wards as in first setting as intervention wards. Other three wards (a total of 44 beds) were selected for control group as they were similar with the intervention wards. Third setting (Paper IV) was a family association for families of people recovering from mental illness. The central association has 18 local member association all over Finland (FinFami 2020) and five of them participated the study. The local associations aim to support families and develop local activities, such as group activities, courses and events for caregivers of people with mental disorders. A compilation of the settings is presented in Table 1.

Table 1. Settings of the study.

Phase	Paper	Setting
I	I	Adolescents' rehabilitation unit Educational seminar in university
II	II	Three closed inpatient wards (2 rehabilitation wards and 1 acute ward)
	III	Six closed inpatient wards (4 rehabilitation wards, 2 acute wards)
	IV	Family association for families of people recovering from mental illness

4.4 Population and sampling methods

In Phase I, the population consisted of adolescent patients, health care professionals working in the adolescents' rehabilitation unit and health care professionals participating the psychoeducation seminar held at University of Turku. Purposive sampling was used for all population groups to be sure that relevant data could be gathered from participants who were aware of the topic (Parahoo 2006). Inclusion criteria for adolescent patients were that they were admitted to the rehabilitation unit, age of 15 or older, diagnosed with schizophrenia spectrum disorders or psychotic symptoms, able to read, write and speak Finnish, voluntary participation, and willingness to give written informed consent. Adolescent patients were excluded if their diagnosis was unclear, they had insufficient Finnish skills, or they were unable to give informed consent. Health care professionals working in the adolescents' rehabilitation unit (N = 25) and participating in a psychoeducation seminar (N = 41) were invited to participate the study.

In Phase II, first (Paper II), the population consisted of health care professionals (N = 46) working in the study wards. Consecutive sampling was used to recruit all health care professionals who were participating the web-based course and accessible when the data were collected (Polit & Beck 2017). Inclusion criteria were working in the study wards, participating the web-based course, Finnish speaking, and willingness to participate the study. Exclusion criteria was temporary working in the study wards.

Second (Paper III), the population consisted of patients treated in the six study wards. Consecutive sampling was used to recruit all patients who were treated in the study wards during the base line data collection (Polit & Beck 2017). Inclusion criteria for participation were 18 years old or older, a primary diagnosis of schizophrenia spectrum disorder (F20–F29, ICD10 [WHO 2016]), ability to write, read and speak Finnish, voluntary participation to the study with a written informed consent. The patients were excluded if they had unclear diagnosis, an impaired mental state (assessed by health care professionals of the wards), a short hospital period (less than one week when there was not enough time for a proper process of informed consent and to run the intervention), or they were not willing to participate the study.

Third (Paper IV), the population consisted of caregivers who were members of the local family associations. Consecutive sampling was used to recruit all caregivers of persons with schizophrenia spectrum disorders in the local family associations (Polit & Beck 2017). The recruitment process was realized by contact persons in local family associations. Inclusion criteria for participation were age of 18 years or older, having a close relationship (e.g. parent, child or spouse) to a person with schizophrenia spectrum disorder (F20–F29, ICD-10), ability to read and write Finnish, and willingness to participate the study. The populations, sampling methods, and inclusion criteria of the phases are presented in Table 2.

Table 2. Populations, sampling methods, inclusion criteria and samples of the phases.

Phase	Population	Sampling method	Inclusion criteria	Sample
I	Adolescent patients	Purposive sampling	Admitted to the rehabilitation unit Age of 15 or older diagnosed with schizophrenia spectrum disorders or psychotic symptoms Able to read, write and speak Finnish Voluntary participation, willing to give written informed consent.	N = n/a n = 6 adolescent patients in interviews n = 2 adolescent patients in iterative interviews
	Health care professionals	Purposive sampling	Worked in the study ward	N = 25 n = 12 in first educational session n = 10 in second educational session n = 8 in third educational session
	Health care professionals	Purposive sampling	Participated educational seminar in University of Turku	N = 41 n = 13
II	Health care professionals	Consecutive sampling	Working in the study wards Participating the web-based course Finnish speaking Willingness to participate the study	N = 46 n = 33
	Patients	Consecutive sampling	18 years old or older A primary diagnosis of schizophrenia spectrum disorders (F20–F29, ICD10) Ability to write, read and speak Finnish Voluntary participation, willing to give written informed consent.	N = 213 n = 57
	Caregivers	Consecutive sampling	18 years old or older A primary diagnosis of schizophrenia spectrum disorders (F20–F29, ICD10) Ability to write, read and speak Finnish Voluntary participation, willing to give written informed consent.	N = n/a n = 30

4.5 Data collection

In Phase I, data were collected between February and October 2013. First, needs and expectations were gathered separately from adolescent patients and health care professionals working in the study unit. Six adolescent patients participated interviews in adolescents’ rehabilitation unit in one interview with two adolescent patients and in five individual interviews. The interviews were conducted with a schema including three questions: 1) What kind of needs adolescent patients have for psychoeducation?, 2) What kind of expectations adolescent patients have related to internet in health care? and, 3) What kind of ideas adolescent patients have for web-based psychoeducation? The interviews lasted from 29 to 62 minutes, all together 226 min. The interviews were audio recorded.

The data concerning health care professionals' needs and expectations were gathered in two educational sessions with lessons and group discussions. The first session started with a lesson about psychoeducation. After the lesson, health care professionals were asked to discuss in small groups about the possible strengths, weaknesses, opportunities and threats (SWOT analysis) (van Wijngaarden et al. 2012) related to web-based psychoeducation and to write down memos about their discussions. After that, groups shared their ideas with other groups. The second session started with a lesson about interventions previously used in psychoeducation, different web-based programs for adolescents, and how the existing website has been used in practice. After the lesson, health care professionals were asked to discuss in small groups about 1) How web-based technology could be used as a part of a nursing intervention together with health care professionals and adolescent patients, and 2) What kind of tasks adolescent patients could do independently and for what kind of tasks they need professional help. Health care professionals were informed to write down memos about their discussions. After that, groups shared again their ideas with others. The researchers wrote down notes about the discussion in both sessions and at the end of both sessions, the memos of health care professionals were collected. These notes and memos formed the dataset from health care professionals.

Second, the ideas to improve existing website were gathered separately from adolescent patients and health care professionals. Two adolescent patients gave their feedback in iterative interviews. In the beginning of the first interview, the website was introduced to the adolescent patients. After that, adolescent patients were asked to discuss about the website and to share their ideas. This was replicated three times. In the beginning of each following session, the modifications were introduced. Written notes were taken from each interview. Second, the health care professionals working in the study ward were invited to third session. In the beginning of the session, the existing website was introduced to them. After that, they were asked to freely describe their feedback and ideas for improvement. Lastly, health care professionals taking part of the psychoeducation seminar, were able to test the existing website for a week. After the week, a structured questionnaire with open-ended questions was sent via email to them. The questionnaire included questions related to content and usability of the website and open-ended questions such as: "Did you find the website useful?", "Would you use the website in the future?", and "What kind of improvement ideas do you have for the website?"

In Phase II, the data were collected in three parts before and / or after the interventions. Summary about interventions is presented in Table 3 based on modified Template for Intervention Description and Replication (TIDieR) (Hoffmann et al. 2014). First, the data concerning health care professionals (Paper II) were collected between April and October 2015. A link to an online questionnaire was sent by email in base line and 8 weeks and 6 months after. The data collection was monitored by a researcher who sent reminder messages for health care professionals to ensure the data collection. The measurement points were decided to find possible short-term and long-term impacts of the course (Monsen 2018).

Second, the data concerning patients (Paper III) were collected between May 2015 and May 2016 during recruitment and follow-up process in base-line and 8 weeks and 6 months after. The measurement points were decided to find possible short-term and long-term impacts of the intervention (Monsen 2018). Each study ward had a contact person who was responsible about the patient recruitment. Contact persons checked if the patients fulfilled the inclusion criteria and informed the eligible patients about the study. The contact person asked patient to sign informed consent form if he / she was willing to participate the study and after that, the base line questionnaire. In intervention wards, patients and health care professionals filled out also a questionnaire after every psychoeducation session and gave their feedback about the website when all five sessions were finished. During the data collection, the researcher visited the wards weekly and checked that the recruitment protocol was followed. Over the visits, she got information about the eligible participants and met them if they wanted to talk with her before signing the informed consent. When visiting the wards, she also brought the follow-up questionnaire to those patients who were still in the hospital during the follow-ups. For those patients who had left the hospital, she sent the questionnaire to the address the patients had written to the informed consent form.

Third, the data concerning caregivers (Paper IV) were collected in November and December 2015 during and after the web-based psychoeducation course for caregivers. The course included orientation and five modules with independent written tasks. Log information and amount of finalised tasks were collected from the course platform. The data concerning caregivers' experiences with person with schizophrenia was collected from the writings caregivers produced when completing the tasks. In addition, background information and numeral and written feedback of the web-based psychoeducation course were asked.

Self-reported questionnaires (Table 4) were chosen to gain health care professionals', patients' and caregivers' own perspectives (Holbrook 2008). Open-ended questions were used to find out health care professionals' perceptions about advantages and disadvantages of the web-based psychoeducation interventions, and to gather more detailed feedback from health care professionals, patients and caregivers.

Table 3. Summary of the interventions in Phase II based on TIDieR checklist.

Target group	Health care professionals	Patients	Caregivers
Brief name	Web-based course related to web-based psychoeducation	Web-based psychoeducation	Web-based psychoeducation course
Rationale	To improve health care professionals' competence to deliver psychoeducation for patients with schizophrenia spectrum disorders.	To improve patient's understanding and coping with the disorder.	To offer information about schizophrenia spectrum disorders and peer support to caregivers.
Materials	Written information in Moodle platform, and information related to schizophrenia spectrum disorders in MentalNet website. Course was divided into four modules: 1) psychoeducation (including methods, effectiveness, and realization), 2) initialization of information technology in mental health work, 3) web-based psychoeducation in practice, and 4) practical training of web-based psychoeducation.	MentalNet website including information divided to five themes: 1) mental disorder, 2) treatment, 3) wellbeing, 4) patients' rights, and 5) daily life.	Written information in Moodle platform, and information related to schizophrenia spectrum disorders in MentalNet website. Course was divided into six modules based on the website: 1) orientation, 2) mental illness, 3) treatment, 4) daily life, 5) wellbeing, and 6) patient and caregiver rights.
Procedure	Individual and group studying and tasks based on health care professionals' own time schedules, and practical training of web-based psychoeducation with five sessions with a patient using the MentalNet website.	Health care professional and patient had a psychoeducation session using MentalNet with its five themes. The order of the themes was not set in advance. Instead, the theme for each session was selected based on patient's preference.	Individual learning. Tutors encouraged caregivers with email or text message if needed. A course coordinator answered caregivers' questions and informed them about the phases of the course.
Provider	Trained tutors with background in mental health practice and research	Health care professionals trained to realize web-based psychoeducation	Trained tutors with background in mental health practice and research
How	Web-based learning with individual and group studies. PowerPoint presentations, reading material, and a manual on how to realize psychoeducation in clinical practice. Individual and interactive tasks, including a reflective diary and discussions on the forums.	Patients were encouraged to discuss and identify questions or concerns he or she may have related to the selected theme. The health care professional's role was to help the patient focus on his or her questions, to help the patient use the website, and to search for information and answers to his or her questions.	Web-based learning with individual tasks based on information on MentalNet website and reflections of caregivers' own experiences.

Where	Web-based at home or at work on the Moodle platform, usable with personal user accounts and passwords.	In a psychiatric hospital. In peaceful place with a computer with internet access.	Web-based at home on the Moodle platform, usable with personal user accounts and passwords. Caregivers signed in with pseudonyms.
When and how much	Length of the course was two months. Two weeks for each module with three European Credit Transfer and Accumulation System credits, 72 hours.	Length of the intervention was five weeks. One psychoeducation session per week (each session about 45–60 min).	Length of the course was eight weeks. One week for each module except orientation which lasted two weeks.
Tailoring and modification	The course was held over a 9-month period due to vacations and health care professionals working in three shifts in the hospital.	A tighter schedule was made (e.g. once a day) if patient’s inpatient stay was planned to be shorter than a week.	The deadlines of tasks that were tailored if the caregiver needed more time for them.

Table 4. Outcomes and instruments used in Phase II (Papers II–IV).

Paper	Outcomes	Instruments
II	Self-efficacy	General Self-efficacy Scale (GSE)[1]
	Self-esteem	Rosenberg Self-Esteem Scale (SES)[2]
	Team climate	Team Climate Inventory (TCI-14)[3]
	Feedback of the website	Questionnaire with 5-point Likert scale
III	Feasibility	Refusal rate, participation on follow-ups and dropout rate
	Acceptability	Patients' and caregivers' commitment on the interventions
	Feedback of the sessions	Session Evaluation Questionnaire (Form 5) (SEQ)[4]
	Feedback of the website	Questionnaire with 5-point Likert scale
	Self-efficacy	General Self-efficacy Scale (GSE)[1]
	Self-esteem	Rosenberg Self-Esteem Scale (SES)[2]
	Illness cognition	The Illness Cognition Questionnaire (ICQ)[5]
	Knowledge level	Knowledge about Schizophrenia Questionnaire (KASQ)[6]
IV	Feedback of the website	Questionnaire with 5-point Likert scale

[1]Schwarzer & Jerusalem 1995, [2]Rosenberg 1965, Anderson & West 1998, [3]Kivimäki et al. 1999, [4]Stiles & Gordon 2002, [5]Evers et al. 2001, [6]Ascher-Svanum 1999

4.6 Data analysis

In Phase I, qualitative methods were used for data analysis. First, audio-recorded interviews of adolescent patients were analysed with inductive content analysis from transcribed data. Inductive content analysis was chosen because it is suitable method for descriptive qualitative study (Elo et al. 2014) that research a new phenomena (Elo & Kyngäs 2008). In addition, health care professionals' data from educational sessions were reorganized and inductively categorized to collect their needs related to psychoeducation and expectations related to web-based psychoeducation. Second, qualitative methods were used for data analysis to find out what kind of ideas for improvement adolescent patients and health care professionals have for the existing website. Adolescent patients' and health care professionals' (staff members and health care professionals participating the seminar) ideas for improvement were gathered and categorized inductively based on the type of the ideas and used for modification of the website. After that, the ideas from adolescent patients' iterative meetings were used to modify the website between the meetings.

In Phase II, quantitative and qualitative methods were used for data analysis. Patients', health care professionals' and caregivers' feedback about the website were evaluated using descriptive statistics (frequencies and percentages). Written feedback was analysed by categorizing all answers using inductive content analysis

(Elo & Kyngäs 2008). The hierarchical linear mixed model for repeated measures was used to evaluate possible impacts in health care professionals' self-efficacy, self-esteem and team climate (Paper II) and preliminary impacts on patients' self-efficacy, self-esteem, illness cognition and knowledge level (Paper III). The model was used in three time points. To determine the effects size of the intervention, Cohen *d* was assessed between base line and six months (Cohen 1988). Qualitative analysis was used to find out health care professionals' perceptions of advantages and disadvantages of the web-based course. The data were analysed by searching similarities in health care professionals' writings and collecting the answers into categories and sub-categories based on the study questions. Feasibility and acceptability of the intervention for patients were calculated with descriptive statistics used for numerical variables (median, mean and standard deviation), and categorical variables (counts, percentages and sum scores). Chi-square test (x^2) was used to compare session evaluations of patients and health care professionals. The Cronbach's alpha was calculated for all questionnaires. Descriptive analysis methods were used to evaluate caregivers' engagement in the web-based psychoeducation course (Paper IV). Frequencies of the logins to each module in the learning portal and number of caregivers visiting each module and completing tasks during the course were calculated. A thematic analysis was used to describe caregivers' experiences about their life with a person with schizophrenia spectrum disorder. Thematic analysis was chosen because it is suitable method to identify, analyse, organize, describe, and report themes found from qualitative data (Braun & Clarke 2006). Description of qualitative data and its analysing methods is presented in Table 5.

Table 5. Description of qualitative data and its analyzing methods.

	Source of the data	Topic of the data	Amount of data	Analysing method
Phase I	Adolescent patients	Interviews about needs and expectations towards web-based psychoeducation	45 pages, Times New Roman 12, spacing 1.5	Inductive content analysis
	Health care professionals	SWOT analysis related to web-based psychoeducation	1 page, Times New Roman 12, spacing 1	Reorganization and inductive categorizing
	Health care professionals	How web-based technology could be used as a part of a nursing intervention and tasks for adolescent patients in web-based psychoeducation	Half page, Times New Roman 12, spacing 1	Reorganization and inductive categorizing
	Adolescent patients	Feedback and ideas for improvement (iterative interviews)	5 pages, Times New Roman 12, spacing 1,5	Reorganization and inductive categorizing
	Health care professionals	Feedback and ideas for improvement	1 page, Times New Roman 12, spacing 1	Reorganization and inductive categorizing
	Health care professionals	Feedback and ideas for improvement	3 pages, Times new Roman 12, spacing 1	Reorganization and inductive categorizing
Phase II	Health care professionals	Advantages and disadvantages of the web-based course	15 pages, Times New Roman 12, spacing 1	Searching similarities and collecting the answers into categories and sub-categories based on the study questions
	Patients	Feedback on the website and web-based psychoeducation intervention	2 pages, Arial 11, spacing 1,5	Categorizing answers using inductive content analysis
	Health care professionals	Feedback on the website and web-based psychoeducation intervention	2 pages, Arial 11, spacing 1,5	Categorizing answers using inductive content analysis
	Caregivers	Feedback on the website and web-based psychoeducation course	2 pages, Arial 11, spacing 1,5	Categorizing answers using inductive content analysis
	Caregivers	Life experiences of caregivers living with a person with schizophrenia spectrum disorder	156 pages, Arial 11, spacing 1,5	Thematic content analysis

4.7 Ethical considerations

The basic principles of research ethics (The Finnish National Board on Research Integrity 2019, Academy of Finland 2003), the ethical guidelines for medical research (World Medical Association 2013, Council for International Organizations of Medical Sciences 2016, TUKIJA 2012), and Finnish research legislation (Medical Research Act 488/1999, Personal Data Act 523/1999) were followed throughout the study process. The ethical reviews were conducted in both phases. **In Phase I**, the ethical approval was granted by the Ethics Committee of the University of Turku. The conduct of the study was permitted by the hospital. **In Phase II**, the ethical approval was granted by the Ethics Committee of the Hospital District of Southwest Finland (ETMK:40/1801/2015, ETMK 56/2015). The permission for data collections concerning health care professionals and patients were granted by the research permission committee of the study organization. The permission for data collection concerning caregivers was granted by each local family association. In this study, the main ethical considerations were related to vulnerability of the adolescent and adult patients with schizophrenia spectrum disorders and their caregivers.

For research, it is fundamental that participants trust researcher and science. Participants' autonomy and dignity were respected and special attention was paid to minimize risk for any harm throughout the study process. The researcher's background was in psychiatric nursing and she was familiar with the target populations. (The Finnish National Board on Research Integrity 2019). When research is realized with vulnerable participants, as patients with schizophrenia spectrum disorders or their caregivers, there is an increased risk that research causes additional harm for participants or participants are misunderstood (World Medical Association 2013). Therefore, special attention was paid on participants' rights and patients' and caregivers' welfare was a priority in this study.

Due to the nature of schizophrenia spectrum disorders, some patients might be suspicious against the research, especially when they are in psychosis (NICE 2014). Therefore, it was important to pay extra attention on building confidence between the researchers and the participants. In both phases, the vulnerability of the participants was taken into account by ensuring that patients and caregivers understood that participation was voluntary. Possible participants got verbal and written information about the study and its practical arrangements including information about voluntary participation and possibility to withdraw at any phase of the study. For patients, the information included that their care was not affected because of possible refusal (Academy of Finland 2003).

In **Phase I**, voluntary participation was emphasized as the researcher worked in the study ward and had a nurse-patient relationship with some of the possible participants at the time of the interviews were conducted. Hence, the adolescent patients were informed about the researcher’s role in the study (Jack 2008) to ensure that researcher’s role would not affect their consent to participate (Polit & Beck 2017). There were all together four adolescent patients who informed their voluntary participation but decided to drop out from the interviews before giving their informed consent. Due the adolescent patients were over 15 years old minors, their parents / guardians were informed about the study (Medical Research Act 488/1999). In addition, adolescent patients were informed that interviews were confidential and that their anonymity would be protected (Council for International Organizations of Medical Sciences 2016).

In Phase II, contact persons, who were health care professionals, recruited patients and caregivers and gave written and verbal information about the study. Therefore, contact persons were informed about recruiting process including inclusion criteria as voluntary participation. Patients were informed that they have a possibility to meet the researcher if they want to discuss or need more detailed information before giving the written consent. The researcher visited the study wards weekly and met patients who wanted to discuss with her. At the same time she supported health care professionals in recruitment process and answered to their questions. Caregivers got information about the study from contact persons in local family associations. In addition, they had a possibility to meet researchers at the information meetings. Written information included also contact information of the researchers for the possibility for more detailed questions. The reasons for refusal were not asked from health care professionals, patients or caregivers as the participation was voluntary and research consent did not include it. Patients’ contact information were asked to ensure that the researcher was able to contact patients even if they were not in the hospital during the follow-up measurements.

The participants were not pressed in any phase but were supported if needed. In both phases patients were in psychiatric care and were not recruited if they were not able to give their informed consent for example because of their impaired mental state. In **Phase I**, the patients were in care as usual during the data collection. In **Phase II**, the patients in the intervention group continued their treatment as usual after the intervention and patients in the control group had their usual care throughout the data collection. The vulnerability and mental load of caregivers was taken into account as the researchers were in contact to some caregivers who brought up their situation. Due to educators’ ethical responsibility to pay attention to those who need care and protection (The Trade Union of Education in Finland 2020), the caregivers were supported by phone calls and informed how to get help for themselves.

During both phases, the confidential information was handled with care. The anonymity of the participants was secured when personal data was removed from the research data (The Finnish National Board on Research Integrity 2019) and it was saved with anonymous IDs (World Medical Association 2013). Each data was saved and reported anonymously by paying attention that there was not possibility to identify participants. The study findings were also reported in a respectful way. (The Finnish National Board on Research Integrity 2019.)

5 Results

5.1 Description of study participants

In **Phase I**, in observation part, participants were adolescent patients with psychosis (n = 6, three girls and three boys between 15 and 18 years of age) and health care professionals working in the study unit (n = 18, four males, fourteen females). The health care professionals were nurses, a physiotherapist and an occupational therapist. In idea generation part participants were health care professionals taking part in the seminar (n = 13, five males, eight females) and eight health care professionals working in the study unit (two males, six females). In prototyping part, participants were two adolescent patients (one girl and one boy).

In **Phase II**, participants were health care professionals (n = 33), patients (n = 57) and caregivers (n = 30). Twenty-four of the health care professionals (Paper II) were females and nine were males. Their mean age was 41 years and their mean working experience in mental health care was 14 years. Patients (Paper III) were divided to intervention (n = 33) and control groups (n = 24). In the intervention group, there were eighteen female and fifteen male participants and in the control group there were eighteen male and six female participants. The mean age was almost the same in both groups (42 vs. 41) and the mean age when they had first received mental health care was 24 years in both groups. Twenty-three of the caregivers (Paper IV) were female and five were males. Their mean age was 60. The caregivers were parents, siblings, children and spouses. The computer and internet skills and attitudes towards computers and internet of all participants in Phase II are presented in Table 6.

Table 6. Participants' computer and internet skills and attitudes towards the use of a computer and internet. Modified from Papers II–IV.

		Patients in intervention group (n = 33)	Patients in control group (n = 24)	Health care professionals (n = 33)	Caregivers (n = 29)
Computer / internet skills		%	%	%	%
	Very good	9	17	21	24
	Good	30	25	42	45
	Neutral	18	29	27	28
	Fairly poor	3	8	6	3
	Poor	39	21	3	0
Attitudes toward computers / internet					
	Very positive	24	33	39	41
	Positive	45	42	42	52
	Neutral	21	17	15	7
	Negative	9	8	3	0
	Very negative	0	0	0	0

5.2 Pre-design of the web-based psychoeducation interventions

5.2.1 Needs and expectations towards web-based psychoeducation

Users' needs and expectations for web-based psychoeducation were categorized to adolescent patients' and health care professionals' needs related to psychoeducation and expectations related to web-based psychoeducation. The adolescent patients thought that even though reading about the disorder was important, they needed to have a contact to an actual person which was, considered to be more important than the information. The adolescent patients needed information related to the disorder, its care and adolescence and life in general. Peer support was also important and adolescent patients felt that sharing their experiences and hearing others' stories helped them. Health care professionals' needs were related to information directed to adolescents with schizophrenia spectrum disorders and adolescents' daily living. Health care professionals also thought that it is their duty to support adolescent patients with information about their disorder and to reduce stigmatization with information that they are not alone with the disorder.

The adolescent patients expected that the content of the website would include information (e.g. related to disorder and information about patient associations), different kind of activating tasks (e.g. relaxation and self-tests), links to other reliable internet sites, a question-answer column to get contact to health care professionals, and a discussion forum to have peer support. The adolescent patients expected that the content of the website and the website in general would be reliable. The trustworthy and understandable information was important and with the question-answer column it would be possible to have reliable answers from health care professionals. Also, the adolescent patients expected that the website would be user-friendly and easy to use and the design would be professional with clear layout and without too many colors. The health care professionals expected that the website could help them to realize psychoeducation more systematically, improve its neutrality and to ensure its equality. They were worried that independent use of website could impact on the threshold of asking help from health care professionals. Another worry was that adolescent patients could feel that website was meant to replace health care professionals. The health care professionals expected that web-based psychoeducation could be helpful in their daily work when information related to disorder could be discussed neutrally with lower threshold when using the website.

5.2.2 Ideas for improvement of existing psychoeducation website

Before the modification, ideas for improvement of existing website were gathered from adolescent patients, health care professionals of the study unit and health care professionals taking part of the seminar. The ideas were related to the content and external aspects of the website (Table 7).

Table 7. Ideas for the existing psychoeducation website.

	Ideas related to content of the website	**Ideas related to external aspects of the website**
Adolescent patients	• Discussion forum • Information extension (anxiety, use of money, good manners)	• Correction of technical errors • Facelift of the design • Mobile application
Health care professionals in the study unit	• Information extension (school and education opportunities, spiritual wellbeing, different families) • Raise the meaning of involving the whole family in the rehabilitation process	• Refine origin of audio recorded stories and their narrators • Removement of word “severe”
Health care professionals taking part of the seminar	• Information extension (other mental disorders, regional services) • Site for professionals • Area for caregivers	• Question and answer -column • Facelift of the design • Correction of technical errors

The website was modified according to the ideas and an iterative design process with meetings with two adolescent patients. During the process, technical errors were corrected and content of the website was extended with the information adolescent patients proposed, a discussion forum and a question-answer column. The ideas for improvement of adolescent patients decreased after every meeting. The meetings lasted until the adolescent patients were satisfied with the content of the website and clarity of the interface. The design of the website was not changed and therefore the adolescent patients were not completely satisfied even though they thought it was good enough and stressed the importance of the content.

The learning platforms for web-based courses for health care professionals and caregivers were created to Moodle platform. The courses were accessed with personal username and password. The course for health care professionals was created with an aim to improve their skills to support patients in web-based psychoeducation. It included written information, articles and written tasks. The course consisted of orientation and four modules: 1) psychoeducation (including methods, effectiveness, and realization), 2) initialization of information technology in mental health work, 3) web-based psychoeducation in practice, and 4) practical training of web-based psychoeducation. The practical training was realized using the website with a patient.

The web-based psychoeducation course for caregivers was created with an aim to offer information and peer support for caregivers. The course consisted of orientation and six modules based on information themes on the website: 1) Information about the course and practical orientation, 2) Mental disorder, 3) Treatment, 4) Daily life, 5) Wellbeing, and 6) Patient and caregiver rights. The website was used as an information source and caregivers were guided to do their written tasks in the learning platform.

5.3 Results of testing of the web-based psychoeducation interventions

5.3.1 Feedback on the web-based psychoeducation interventions

Health care professionals, patients and caregivers gave feedback about content, layout and usability of the website (Table 8). Majority of health care professionals (86%) and patients (86%) and over half (59%) of caregivers rated content of the website to be ‘very good’ or ‘good’. Over half (69%, 65%, 53%) of the participants from all user groups rated also the layout to be ‘very good’ or ‘good’. Majority of health care professionals (76%) and patients (75%) rated usability of the website to be ‘very good’ or ‘good’. Less than half of caregivers (41%) found usability to be ‘very good’ or ‘good’ and over half of them rated it to be ‘not good or poor’.

The web-based psychoeducation sessions were evaluated by the patients and health care professionals. Both patients and health care professionals evaluated the global item ‘bad-good’ and three subscales (‘depth’, ‘smoothness’, and ‘positivity’) to be above midpoint 4.0 (range 1–7). The means ranged from 4.31 (SD 0.96) to 5.54 (SD 0.82). The mean of subscale (‘arousal’) was 3.47 (0.94) by patients and 3.33 (SD 0.58) by health care professionals. Further, the Cronbach alpha for subscale ‘arousal’ was found to be poor. Significant differences in evaluations between patients and health care professionals were found in global item ‘bad-good’ (*P* = 0.02) and subscale ‘depth’ (*P* = 0.04) when patients rated them higher than health care professionals and for subscale ‘positivity’ (*P* = 0.03) which was rated higher by health care professionals. The session evaluations are presented in more detail in Paper III (Table 4).

Table 8. Feedback about content, layout and usability of the website from patients, health care professionals and caregivers.

	Patients N = 29	Health care professionals N = 28	Caregivers N = 17
Content of the website	%	%	%
Very good	17	11	12
Good	69	75	47
Not good or poor	14	14	41
Poor	0	0	0
Very poor	0	0	0
Layout of the website			
Very good	7	4	0
Good	62	61	53
Not good or poor	21	25	35
Poor	10	11	12
Very poor	0	0	0
Usability of the website in psychoeducation			
Very good	14	7	12
Good	62	68	29
Not good or poor	21	11	53
Poor	0	14	6
Very poor	0	0	0

All user groups gave their written feedback about the web-based intervention and / or course they attended (Papers II–IV). The feedback on web-based psychoeducation interventions is presented in Table 9.

Table 9. Patients', health care professionals' and caregivers' written feedback on the web-based psychoeducation interventions.

Patients' feedback on the web-based psychoeducation intervention
Positive feedback • Meaningful intervention • Comprehensive and good content **Constructive feedback** • Too difficult tasks if lack of computer skills • Some links did not work
Health care professionals' feedback on the web-based psychoeducation intervention
Positive feedback • Comprehensive information with good themes • Website gives structure for psychoeducation • Get new information about patients • Useful and easy to use with patients who are enthusiastic about the intervention, able to use the website and willing to find information independently **Constructive feedback** • Going through the website was useless • Hard to get patients interested in using it. • Some pages in the website include too much information • Too many links in the website and some of them did not work • Layout of the website is old fashioned • More tasks should be included
Caregivers' feedback on web-based psychoeducation course
Positive feedback • Interesting content with good information and tasks • Other caregivers' writings are valuable • Course was well structured **Constructive feedback** • No new information for long-time caregivers • Peer support was not found for all caregivers and others' stories were depressive to read • Did not replace face-to-face peer support and psychoeducation • Some technical errors on the course • Timing of the course and tight scheduling of the tasks • Information meeting in the beginning of the course could have been online

Further, health care professionals found advantages and disadvantages for the web-based course targeted for them (Paper II). For advantages health care professionals found that the web-based psychoeducation intervention was a modern method for psychoeducation and that the course supported their competence, discussions between them and patients, relations between them and patients, and structural nursing. For disadvantages health care professionals found factors concerning schedule and working time of the course, patients, and equipment and environment. Advantages and disadvantages are presented in more detail in Paper II (Tables 5 and 6).

5.3.2 Evaluations of the web-based psychoeducation interventions

The impact of web-based course on health care professionals' self-efficacy, self-esteem, and team climate was evaluated at three time points (baseline, eight weeks and six months). The evaluation revealed that health care professionals' self-efficacy improved between baseline (Mean 30.16, SD 3.31) and eight weeks (Mean 31.53, SD 2.83), and was even higher at six months (Mean 31.77, SD 3.35) measurement point. The difference between baseline and six months was statistically significant ($P = 0.02$). The effect size was 0.48. The evaluation of self-esteem and team climate did not reveal changes between the time points. The results are presented in more detail in Paper II (Table 4).

Feasibility of the web-based psychoeducation intervention was evaluated by patients' commitment to the study. Out of 213 eligible patients 150 refused to participate. The refusal rate was 69% in intervention group and 76% in control group. Out of 33 patients in intervention group, 11 (33%), and out of 24 patients in control group, 11 (46%) patients dropped out after the baseline. After the first follow-up, five patients from the intervention group and three patients from the control group dropped out. After both follow-ups there were 17 patients in the intervention group and 10 patients in the control group. Acceptability of the interventions was evaluated from patients' and caregivers' commitment to the interventions. Out of thirty-three patients, thirty-one (94%) attended all five web-based psychoeducation sessions, one patient attended to three sessions and one patient attended one session. Out of thirty caregivers, all thirty (100%) visited at least one main modules of the web-based psychoeducation course and twenty-five (83%) completed at least one main module on the course. Eighteen (60%) completed all five modules of the course. Most logged module was 'Orientation' with 3465 logins and least logged module was 'Daily life' with 1061 logins. Most visited module from main modules was 'Mental disorder' with 1758 logins. The results concerning to caregivers' acceptability are presented in more detail in Paper IV (Figures 2 and 3).

The preliminary impact of web-based psychoeducation intervention on patients was evaluated at three time points (base line, eight weeks and six months). The results were not statistically significant between patients in intervention group and control group. However, there were statistically significant changes in self-efficacy, helplessness and knowledge level of patients in intervention group. There were no statistically significant changes in the control group. Self-efficacy of patients in intervention group improved between baseline (Mean 26.12, SD 5.64), eight weeks (Mean 26.50, SD 7.20), and six months (Mean 29.24, SD 6.05). The improvement was statistically significant ($P = 0.003$) between base line and six months. The effect size was 0.53. Statistically significant ($P = 0.03$) change was also found between base line and six months in patients in intervention group when the subscale helplessness in illness cognition was evaluated. The scores decreased between baseline (Mean 2.26, SD 0.96), eight weeks (Mean 2.11, SD 0.72) and six months (Mean 1.85, SD 0.59). The effect size was 0.51. There were no statistically significant changes in other subscales in illness cognition. Further, change in knowledge level in patients in intervention group was statistically significant (*P* = 0.002) between baseline and six months. The scores increased between baseline (Mean 11.39, SD 4.65) eight weeks (Mean 12.50, SD 5.26) and six months (Mean 15.06, SD 5.26). The effect size was 0.74. There were no statistically significant changes in patients' self-esteem in intervention group or in control groups. The results are presented in more detail in Paper III (Multimedia Appendix 1).

During the web-based psychoeducation course, caregivers wrote about their lives with a person with schizophrenia spectrum disorder. Their experiences were divided to three main themes: the caregivers' own wellbeing, relationship with the person with schizophrenia spectrum disorders, and experience of health care services. The main themes, themes and subthemes are presented in Figure 2.

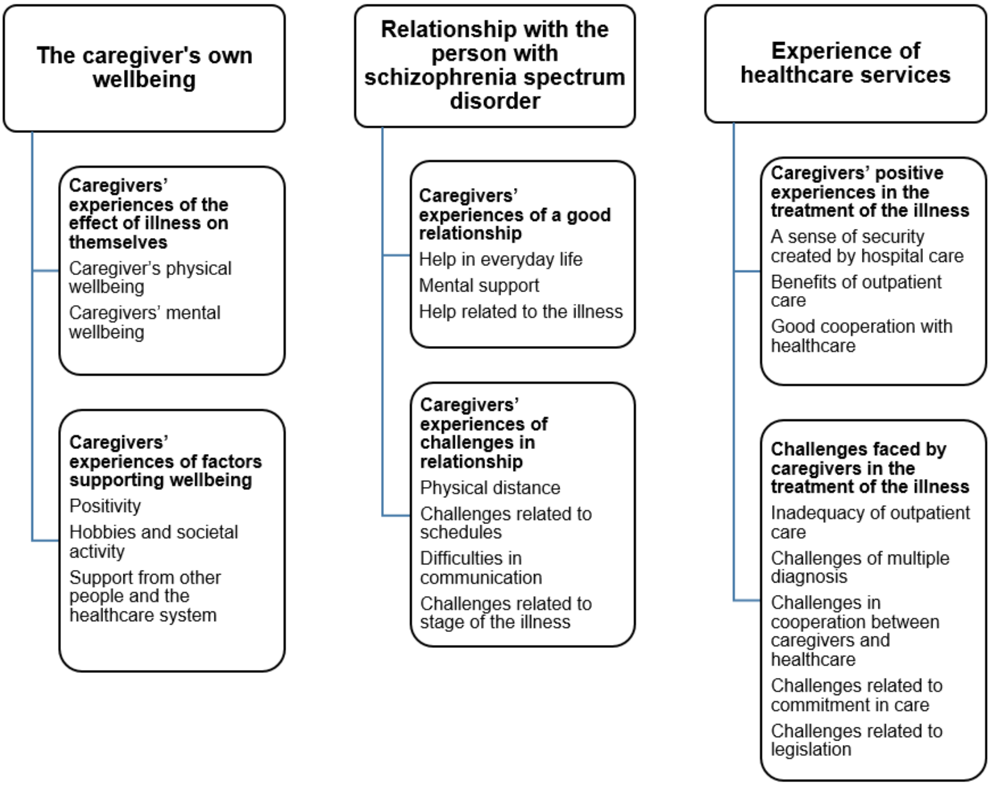

Figure 2. Caregivers' experiences of living with a person with schizophrenia spectrum disorder.

6 Discussion

6.1 Discussion of main results

6.1.1 Discussion about results in pre-design

In pre-design, the aim was to find out what needs and expectations patients and health care professionals have for psychoeducation and what ideas they offer to improve the existing website. The results were used to update and modify the website to suit also adolescent patients in addition to adult patients with schizophrenia spectrum disorder.

Previous studies have shown that health care professionals, patients and caregivers are worried that web-based psychoeducation would replace face-to-face support or decrease contacts with health care professionals (de Leeuw et al. 2012, Berry et al. 2017, Berry et al. 2019, Koivunen et al. 2007, Lobban et al. 2011, 2020b). These results were supported in this study as the adolescent patients and health care professionals raised that interaction between them is important for both of them. The adolescent patients described that they have a need for a real contact with health care professionals. Health care professionals were worried how using the website would impact on adolescent patients' threshold to ask help from health care professionals. Health care professionals were also worried how independent use of the website could impact on adolescent patients. However, adolescents and patients use internet actively (OSF 2019, Villagonzalo et al. 2019). When the use of internet would include using the website, the internet use might be more meaningful and patients could get trustworthy information about their disorder unlike if they search information from other sources in internet (Athanasopoulou et al. 2013).

The other needs were related to information and support as adolescent patients needed versatile information and peer support. Health care professionals needed information related to adolescents with schizophrenia spectrum disorders to be able to support them better with their disorder. Also, the expectations and ideas for improving the website included information and its expansion. These results support results of previous studies which have found that web-based psychoeducation programs should include information about schizophrenia spectrum disorders (Álvarez-Jiménez et al. 2012, Honary et al. 2018, Lobban et al. 2011, Sin 2013) and daily living (Berry et al. 2019). In this study, adolescent patients described that they need peer support and that the website should include discussion forum. Peer support seems to be a common need as other studies have also found that web-based psychoeducation programs should include possibility for it (Álvarez-Jiménez et al. 2012, Lobban et al. 2011, Sin 2013, Sin et al. 2019). With discussion forum patients can get in touch with other persons with schizophrenia spectrum disorders and share their experiences anonymously and without face-to-face contact. This might lower the threshold to talk with peers if social situations are difficult as the disorder impacts on patients' social skills (NICE 2014). Some patients are already using social media for peer support, for example loading videos on YouTube (Naslund et al. 2014). Monitored discussion forum could however, be more safe when persons could discuss with anonymity as comments and discussion related to schizophrenia can be stigmatizing in social media e.g. YouTube (Naslund et al. 2014, Athanasopoulou et al. 2016) and Twitter (Passerello et al. 2019, Athanasopoulou & Sakellari 2016). Adolescent patients proposed also that the website should be used with a mobile application. The use of mobile phones for internet has increased significantly in the past ten years (Statista 2020). In Finland, in year 2019, the most (84–98%) used device for internet among working aged (16–64 years old) people was mobile phone. 72–80% of people used internet with a laptop and 38–48% used internet with a desktop computer. (OSF 2019.) Worldwide, the forecast for the average daily use of internet in year 2020 is 38 minutes with desktop and 143 minutes with mobile phone per day (Statista 2019). Therefore, it is relevant to discuss if the website should have a mobile version to reach those who are not using a computer or a laptop.

In previous studies users have expressed that the information should be evidence-based (Sin 2013) and updated (Álvarez-Jiménez et al. 2012, Sin 2013). The results of this study support these findings when adolescent patients expressed their expectations related to quality of the information. Also, they expressed that with a question-answer column it could be possible to have trustworthy answers from professionals. The trustworthiness of the information must be seen crucial when using web-based programs as it is known that people can find a lot of low-quality and stigmatizing information about schizophrenia spectrum disorders from internet (Athanasopoulou et al. 2013, 2015, Naslund et al. 2014). People can also be suspicious about the trustworthiness of information in internet (Montagni et al. 2016). Therefore, there should be a plan how to maintain the updated information on the website.

The ideas from adolescent patients and health care professionals were used to modify the website. Due to the limited resources, the layout of the website was not modified even though the health care professionals and adolescent patients were not completely satisfied with it. The feedback from patients, health care professionals and caregivers in testing revealed that they were not either completely satisfied with the layout. The evolution of web-based programs is rapid (The Evolution of the Web 2020) and websites need to be renewed more often to fulfill the expectations of the users. One of the ideas from health care professionals was to include an area for caregivers on the website which has also been realized in some other web-based psychoeducation programs (Rotondi et al. 2010, de Leeuw et al. 2012). In a study of Sin et al. (2019), caregivers appreciated that the program focused only on themselves. In this study, instead of expanding the website for caregivers, a web-based psychoeducation course with learning platform was created and the website was used as an information source during the course.

6.1.2 Discussion about results in testing

In Phase II, feedback of the website was collected from patients, health care professionals and caregivers. The numeral and written feedback was mainly positive. Also in previous studies, most users of the programs have been satisfied (Baumel et al. 2016, de Leeuw et al. 2012, van der Krieke et al. 2012, McEnery et al. 2019b, Sin et al. 2014, Thomas et al. 2016, Glynn et al. 2010) and would recommend the program for others (Álvarez-Jiménez et al. 2013, Chan et al. 2016, Gottlieb et al. 2013, McEnery et al. 2019b, Thomas et al. 2016, van der Krieke et al. 2012, Sin et al. 2014, Sin et al. 2019). In a study of Kuosmanen et al. (2010), health care professionals were the most critical user group compared to nursing students and patients. In this study, the feedback from caregivers, especially how they rated usefulness, was weaker than feedback from other users. Caregivers were also the only user group who used the website by themselves without a face-to-face contact to others. Therefore, it is possible that missing face-to-face contact and possibility to reflect with other person impaired the experience compared to the health care professionals and patients.

In written feedback, all user groups gave positive feedback about the content of the website and patients felt that the intervention was meaningful and the information helped them to understand their situation. This is in line with earlier studies' results. Patients have found that the programs help them in their situations (McEnery et al. 2019b, Thomas et al. 2016) and that the programs are supportive and meaningful for them (van der Krieke et al. 2012). However, in this study, some critical feedback was also expressed. Health care professionals described that there were too many links and that there is a need to include more tasks to support patients' illness cognition. For patients, some of the tasks were too difficult if they had lack in their computer skills. Previous studies have shown that users appreciate if the program is simple and easy to use (Lobban et al. 2011, Honary et al. 2018). Also, based on the adolescent patients in pre-design, the layout of the website should be clear. Therefore, there is a need to discuss what is the right amount of links and tasks, and how the tasks could be modified to be easier to complete. The modification of the website was realized with adolescent patients and health care professionals. In spite of that, adult patients', health care professionals' or caregivers' feedback did not include any comments about useless content for adult patients.

During the iterative process, technical errors were corrected. However, health care professionals and patients found some links that did not work. Updates on the website are important to keep the website trustworthy and usable which requires regular checking of the links as their content might disappear after a short time. Further, even though over half of users in all groups rated the layout of the website to be at least good, health care professionals expressed in their written feedback that the layout was old fashioned. This was an improvement idea that was not fulfilled in pre-design phase. It is already known that the look of the program may affect on users' impressions about reliability of the program (Honary et al. 2018). Therefore, even though the content is important, it is important to pay attention to the outlook of the website.

Health care professionals pointed out that web-based psychoeducation was challenging if the patient was not willing to participate. Therefore, it might be good to discuss when web-based psychoeducation is the right option for psychoeducation which, however, should be included to patients' treatment (Current Care Guidelines 2020). If the patient is suspicious about internet (NICE 2014), it might be better to use for example leaflets. If the patient is willing to have web-based psychoeducation but lacks computer skills, he or she will need more support from health care professionals. This requires more resources and health care professionals' willingness to support the patient. However, it could still be useful for those patients who are motivated. Also, it could be an opportunity to practice to use computer and internet. Those skills are needed in our everyday lives and having the skills could help patients to cope more independently.

Caregivers expressed in their feedback that the web-based psychoeducation course did not give new information for those who had a long experience as a caregiver. Bangerter et al. (2019) found in their study that 65% of caregivers had used internet when they recently had searched health information. In the past 12 months, 74% of caregivers had used internet to search health or medical information for themselves and 71% had used internet when searching information for someone else. Further, Lobban et al. (2011), found in their study that the timing of the intervention was crucial for its success. Based on their findings, it was important that the caregivers get information early enough to understand the situation. So, many caregivers search information themselves and therefore the course might not bring any new information for those caregivers who have a long experience. Therefore, it might be relevant to discuss if the main target group for future users should be caregivers with a short experience as a caregiver of a patient with schizophrenia spectrum disorder. The timing seems to be important for the most useful use of the course.

As experiences from previous studies (Kannisto et al. 2017, Kanuch et al. 2016), have shown, recruitment of the patients with schizophrenia spectrum disorders can be challenging. The recruitment of patients in this study, revealed that their commitment on the study was low when refusal rates were high in both groups. However, refusal in this study might not be related to web-based psychoeducation as patients with schizophrenia spectrum disorders have refused from studies that are related to other subjects also (Kannisto et al. 2017, Kanuch et al. 2016, Abbot et al. 2005, Terp et al. 2018). Also the dropout rates were high in both groups. High amount of dropouts have also been found for example in a study of Kannisto et al. (2017). However, the acceptability of the web-based psychoeducation intervention was good when 31 from 33 patients completed all five sessions. This supports earlier findings about patients' adherence to web-based interventions. Killikelly et al. (2017) found in their review that the adherence to web-based interventions of persons with psychosis ranged from 28% to 100% and the mean was 83%. They also found that adherence was higher if patients were involved when developing the intervention, if social support was in higher level, and if the duration of the intervention was short. In this study, patients were supported by health care professionals and the duration of the intervention was quite short with five sessions. Those might have been the reasons to support adherence also in this study.

Caregivers' commitment to the study was not able to be evaluated as the number of eligible participants was not known. Their number of completed modules and logins to the learning platform decreased during the course which was also found in a study of Rotondi et al. (2005) where caregivers of persons with schizophrenia spectrum disorders used web-based psychoeducation program also by themselves. Caregivers might lack strength to continue the course (Shamsaei et al. 2015, Yu et al. 2017). It is also possible that their interest decreased if they did not get any new information as caregivers with long experience expressed in their feedback. However, it would be important to discuss if extra support would be needed or if the support should be realized differently during the course.

The results of this study show that self-efficacy of health care professionals increased during and after the web-based course where they learned about psychoeducation and how to realize web-based psychoeducation. The change between baseline and six month was statistically significant. This result is in line with earlier studies with results that education effects on health care professionals' self-efficacy (Soudagar et al. 2013, Winslow et al. 2014). It seems that health care professionals who have higher educational level have also higher self-efficacy than their colleagues who have lower educational level (Soudagar et al. 2013, Winslow et al. 2014). Earlier studies have also found that, similar to this study, short continuing education has impact on health care professionals' self-efficacy (Barta et al. 2005, Nørgaard et al. 2012).

In addition to self-efficacy, it was hypothesized that the course could have effects on health care professionals' self-esteem and team climate but any changes were not found. Earlier study (van Eckert et al. 2012) found that nurses who had academic education had higher self-efficacy than nurses without academic education. It is possible that rise of self-esteem needs longer education than this kind of short continuing education. Previous studies have shown that close cooperation and reflection with other students might have a positive impact on team climate (Koohestani et al. 2016), and sense of belonging can be increased with teamwork (Mohamed et al. 2014). It is possible that the health care professionals did not cooperate closely with each other during the course and therefore, the impact in team climate was not shown.

No statistically significant differences between intervention and control groups were found in patients' self-efficacy, self-esteem, illness cognition and knowledge level during the follow-up. It is possible that due to the small sample size, the statistical power was too low and therefore differences between the groups did not reveal (Polit & Beck 2017). However, patients' self-efficacy and knowledge level improved in the intervention group between base line and six months. It is possible that during the six months follow-up time mental state of the patients improved and therefore, their self-efficacy was also improved as it is known that increased level of self-efficacy is related to increased level of mental health (Rabani Bavojdan et al. 2011). The results related to knowledge level support findings of Rotondi et al. (2010) who also found that web-based psychoeducation improved knowledge level of patients with schizophrenia spectrum disorders. In addition, subscale helplessness decreased significantly in intervention group between base line and six months.

Caregivers told about their experiences of being a caregiver for a person with schizophrenia spectrum disorders in their writings. As found in many previous studies (Lerner et al. 2018, Hegde et al. 2019, Wan & Wong 2019, Sharma et al. 2018), caregivers had difficulties with their own physical and mental wellbeing. To overcome the difficulties, caregivers had versatile methods to support their wellbeing and they got support from other people in their lives. This is a good result as previously it has been found that caregivers lack social support (Chen et al. 2019). Caregivers told also about their good and challenging relationships with the patients. Caregivers were flexible in their interaction, social relationships and daily activities based on the mental status of the patient. Based on caregivers, their interaction with health care professionals was challenging. Caregivers described how they had faced difficulties if their opinion differed about the need of involuntary treatment. In a previous study, caregivers have described that they face feelings of frustration with a delay of getting help (Jankovic et al. 2011). However, health care professionals must follow the legislation which guides strictly when involuntary treatment is needed (Mental Health Act 1116/1990). The legislation might be too strict for the caregivers when they are worried about the patient but his / her mental status is not fulfilling the criteria for involuntary treatment. When the patient is admitted to hospital, caregivers were relieved when the patient was getting help and was safe in hospital. However, they were frustrated when they did not get information about the patient and felt that they were ignored when health care professionals were not interested about the information they got. Due to Finnish legislation (Act on the Status and Rights of Patients. 785/1992), information about patients is confidential and health care professionals are not allowed to tell anything to caregivers or anybody else without a consent from the patient. However, it is not forbidden to receive information from caregivers. Therefore, it could be relieving for caregivers if health care professionals would listen to what information they have about the patient. Based on earlier studies, caregivers have contradictory feelings when the person is admitted to hospital, and difficulties when they don’t get information about the patient (Jankovic et al. 2011, Stuart et al. 2020). As found in this study, review of Stuart et al. (2020) found that caregivers need a relationship with health care professionals and involvement in care. Therefore, it would be important to support caregivers and involve them to the care as much as it is possible within the legislation.

6.2 Validity and reliability of the study

Overall, using qualitative and quantitative methods can improve the quality of the study when mixed methods utilize the strengths of both approaches (Fetters et al. 2013). However, the assessment of quality is complex when collecting, analyzing and mixing different data set (Tashakkori & Tedlie 2008). In mixed methods studies, validity of both qualitative and quantitative methods should be established (Creswell 2014). Therefore, the validity and reliability are discussed related to the research process and methods used in this study. In qualitative studies, validity and reliability are referring on trustworthiness of the data and results. Trustworthiness includes credibility, dependability, confirmability, transferability and authenticity (Kyngäs et al. 2020). Credibility is essential factor of trustworthiness. It refers on confidence of how well the results represent the information in data and original views of participants. Dependability refers on how stable the results are over time. Confirmability refers on objectivity of the researcher and the degree of how other researchers would confirm the results. Transferability refers on the degree of how well the results can be transferred to other setting. (Korstjens & Moser 2018.) In quantitative studies, validity refers to extent of accuracy of the results and how well the instruments measure what they are meant to measure. Reliability refers to the degree of consistency or dependability of the method or instrument used for measurement. (Heale & Twycross 2015.)

The credibility of this study was supported by data triangulation, investigator triangulation, and method triangulation (Korstjens & Moser 2018). In Phase I, the data triangulation and method triangulation were realized when the data was collected from two different settings and from three different participant groups with audio recorded interviews, iterative interviews with written notes, educational sessions with written notes, and with a structured questionnaire with open-ended questions. The written notes might have been a limitation for credibility as the educational sessions with health care professionals were not recorded. However, in addition to researchers' own notes, they got health care professionals' memos after the sessions. The interviews of adolescent patients were planned to realize with focus groups which have been found to be an effective method to collect information in qualitative studies (Jayasekara 2012). However, instead of focus groups one interview with two adolescent patients and five individual interviews were realized because of adolescent patients' reluctant to take part in interviews with others. In Phase II, the data triangulation and method triangulation were realized when the qualitative data was collected from two different settings and from three different participant groups with questionnaires with open-ended questions, and from writings. Investigator triangulation was realized in Phase I when two researchers realized the interviews and educational sessions. Another of them (A.L.) realized the analysis and the other researcher agreed with the results when writing the article together. In Phase II, two researchers conducted inductive content analysis (Paper II) and thematic analysis (Paper IV). In addition to triangulation, prolonged engagement (Korstjens & Moser 2018) was realized in Phase I when the researcher was working in the study ward in some parts of the study process. The researcher was therefore familiar with the adolescent patients and health care professionals with long-lasting engagement in that setting. This might have been also a limitation if it has influenced the answers of the participants even though they had been informed about researcher's role as a researcher. Prolonged engagement was also realized in Phase I and II when researchers took time to get to know the data during the analysing process. Member check (Korstjens & Moser 2018) was used in Phase I when adolescent patients got to know what kind of modifications had been done based on their ideas.

To support dependability, research steps with contexts and settings were described (Korstjens & Moser 2018) following reporting criteria (Tong et al. 2007, O'Cathain et al. 2008). In addition, in Phase II, intervention for patients and courses for health care professionals were described with details of their contents and arrangements. Another strategy to confirm dependability was to choose suitable analysing methods (Korstjens & Moser 2018). Analysing processes were conducted following the guidance for inductive content analysis (Graneheim & Lundman 2004) and thematic analysis (Braun & Clarke 2006).

To support confirmability, the objectivity of results were confirmed by paying attention to researcher's neutrality during the research process (Korstjens & Moser 2018). This was important especially in the Phase I where the setting in adolescents' psychiatric ward was researcher's working place. During the analysing processes, the researcher tried to be neutral with the data and to recognize possible personal views to avoid bias in the results (Korstjens & Moser 2018). The objectivity was supported also when two researchers took part on interviews and educational sessions in Phase I and made the analysis together in Phase II.

To support transferability, the contexts of the study, characteristics of participants, data collections and analyzing processes were described (Korstjens & Moser 2018). The number of participants was small, especially number of adolescent patients. In Phase I, purposive sampling was used to ensure that the participants have knowledge about the subject for relevant data (Polit & Beck 2017). The results in Phase I and Phase II were in line with the results from previous studies. In Phase II, caregivers were recruited via local family associations. The associations offer support and information for caregivers. Therefore, it is possible that the caregivers were more familiar with the disorder than caregivers who are not members of family associations. This might have affected to results of how caregivers thought that the web-based psychoeducation course did not offer any new information for those caregivers who had been caregivers for a long time. In addition, this might be a reason why caregivers had versatile methods to take care about their own wellbeing.

Quantitative methods with different instruments were used in Phase II to gather data from health care professionals, patients and caregivers. Internal consistency of an instrument reflects to the extent of how accurately the instrument's items are measuring the same feature (Polit & Beck 2017). Internal consistency can be measured with Cronbach's alpha which should be over 0.70 to refer that the instruments internal consistency is acceptable (Taber 2017). In this study, Cronbach's alphas were calculated to test reliability of the instruments. The Cronbach's alphas are presented in Table 10. The range of alphas is presented from those instruments which patients filled in base line, eight weeks and six months. For health care professionals, the Cronbach's alpha was measured only in base line. The internal consistency of subscale Arousal in Session Evaluation Questionnaire was low in both health care professionals (0.34) and patients (0.39) answers. This points that items in that subscale are heterogeneous and results are not reliable. Same problems have been found when measuring Cronbach's alpha from Dutch version of the instrument (Hafkenscheid 2008).

Table 10. Cronbach's alphas of instruments used with health care professionals and patients.

Instrument	Health care professionals	Patients
Session Evaluation Questionnaire		
Depth	0.81	0.67
Smoothness	0.75	0.73
Positivity	0.84	0.73
Arousal	0.34	0.39
The General Self-Efficacy Scale	0.82	0.92–0.96
The Rosenberg Self-Esteem Scale	0.86	0.83–0.90
The Illness Cognition Questionnaire		
Helplessness		0.77–0.97
Acceptance		0.74–0.91
Perceived benefits		0.61–0.91
Knowledge about Schizophrenia Questionnaire		0.71–0.81
Team Climate Inventory		
Participative safety	0.91	
Support for innovation	0.89	
Vision	0.95	
Task orientation	0.92	

Session Evaluation Questionnaire, Illness cognition questionnaire and Knowledge about Schizophrenia Questionnaire were translated to Finnish from their official English versions. To confirm the validity of the instruments, the translations were made with a back-translation method (Sperber 2004) with a professional translator who was not a member of the research team and the original developers of the instruments. In the translation process, the researcher translated first the original instruments in Finnish and showed it to another researcher who gave some suggestions and revised the translation. When the researchers were pleased with the translation, the professional translator translated the instruments back in English. After that, the back-translated English versions were sent via email to the developers who gave their feedback to find out if the translated version was close enough to the original version. Some revisions were made based on the feedbacks. Knowledge about Schizophrenia Questionnaire included one question which needed a cultural modification to follow the Finnish health care system and legislation about involuntary treatment.

Validity of quantitative research can be discussed with different aspects of validity. Statistical power is one matter when estimating statistical conclusion validity (Polit & Beck 2017). Power analysis was not made before starting the research process because the aim was to collect only preliminary data. Because of the small sample sizes, it is possible that statistical power was too low to show effects in health care professionals and / or patients. When comparing results between intervention and control group, the difference was not statistically significant. This might be due to low power. To confirm the reliability of the results, Cohen *d* was measured between base line and six months when analyzing quantitative data from instruments used with health care professionals and patients. It was used to find out effect size of the measurements.

Internal validity refers to the extent which the intervention is truly the influencer during the research and its measurements (Polit & Beck 2017). When studying effects in patients, the internal validity was supported by quasi-experimental design where patients in intervention group and patients in control groups were in different wards. This was used to avoid information flow between patients in different groups (Keogh-Brown et al. 2007) as it could have affected the results (Harris et al. 2006). Randomization could have been done in cluster level but instead of that, wards were decided in advance to find equivalent control ward for each intervention ward. The research was conducted without a control group when studying effects in health care professionals. The original plan included a control group of health care professionals in the same wards where patients in control group were treated. However, the degree of withdrawal in intended control group was so high that only data from intervention group was used. When assessing the effects in patients, it is possible that their mental state and wellbeing was increasing as the follow-up period was six months. Therefore, it is possible that some of the changes are due to improvement in their overall wellbeing. When measuring the caregivers' engagement on the web-based psychoeducation course, their log information were collected. The most visited part of the course was orientation. The reason for that might be that everything was new and caregivers wanted to get them familiar with the learning platform rather than it was the most interesting part of the course.

External validity refers to generalization of the results in other settings and people (Polit & Beck 2017). External validity was supported with exclusion and inclusion criteria with every participant. The recruitment was conducted by health care professionals when recruiting patients and caregivers. Therefore, it is not possible to be totally sure how the criteria were interpreted in those recruitments. To support the recruitment and research process, the researcher visited the study wards regularly and talked with the health care professionals and patients about practical issues of the study. However, some patients were not asked to participate. The measurements of patients and health care professionals were done in one hospital with quite small sample sizes which do not support the generalizability. The sample of caregivers was recruited via local family associations. Caregivers who are members of family associations, might know how and where they can have support and to have more knowledge about the schizophrenia spectrum disorders. Also, the caregivers described in their written feedback that the web-based psychoeducation course did not give new information for those caregivers who had a long experience of being a caregiver. Therefore, it is possible that the number of logins and completed modules decreased because they already had the knowledge. This might lower the level of generalizability compared to caregivers who are not members of family associations.

6.3 Implications of the study

Clinical practice

This study provides information about what kind of needs and expectations adolescent patients with schizophrenia spectrum disorders have for web-based psychoeducation. These results can be used in clinical practice to provide best possible care for those patients. Patients' needs are mostly related to content of the website i.e. information related to their disorder. The information should be trustworthy and updated. The knowledge can partly be used when realizing psychoeducation with written material or with other internet sources.

The results may encourage health care professionals to use web-based sources when treating patients with serious mental disorders with complicated symptoms. Some of the patients might need support to be able to use a website if they have lack of computer skills. However, it could be important for a patient to have the opportunity to participate web-based psychoeducation intervention if he or she is willing and motivated to use it. This way it is possible to include new possible way to offer psychoeducation.

The caregivers of patients with schizophrenia spectrum disorders have many ways to improve their own wellbeing. Despite this, they need support from health care professionals and opportunities to be involved in care. Because of legislation, it is not possible to give information to caregivers if the patient has denied it. Caregivers appreciate if they still have the opportunity to tell their information about the patient to be sure that health care professionals have the necessary information about the patient. Therefore, it would be important to listen caregivers and involve them to care as much as it is possible within the legislation.

Health care administration

Health care professionals and wards need resources to be able to offer web-based psychoeducation. Lack of computers and peaceful rooms were a disadvantage when health care professionals were realizing the intervention with the patients. Nurse administrators and nurse managers are in crucial role when deciding how to ensure that the wards have materials (e.g. computers) to realize psychoeducation and how to arrange wards' daily agenda with possibility to offer web-based psychoeducation for patients without interruptions. Psychoeducation should be part of patients' treatment and therefore, there should be possibility to realize it anyway. Continuing education of health care professionals is important when ensuring that they maintain their skills. Studying beside the demanding work might be laborious. Therefore, it would be important that health care professionals have a possibility to do at least part of the studies on their working time.

Nursing science

This study provides knowledge about needs and experiences of patients, health care professionals and caregivers for psychoeducation website. The study also provides that there is a need to pay attention to recruitment process and monitoring follow-up period when researching patients with schizophrenia spectrum disorders and health care professionals. User-centered design was a sufficient framework for this study. It guided the process where users of the interventions were involved. Mixing the qualitative and quantitative methods, it was possible to gather a rich data. These results encourage to involve all user groups when developing and studying interventions and to use different kind of methods for data collection.

Nursing education

The knowledge about use of web-based interventions is important for nursing students who are starting their career. It is likely that the use of web-based programs and interventions will increase significantly during their career. This means that health care professionals will need skills to use web-based programs in the future. In these days, web-based programs, learning platforms and materials are widely used in nursing education. Therefore, students are already used to use different kind of web-based devices. They have a possibility to start their career with web-based interventions as a part of their daily work. The increase of web-based interventions means that also those health care professionals who are not used to use web-based programs will need those skills in the future. Therefore, there will be a need to educate health care professionals in their technology skills. The educations in health care professionals' working places must be planned well to avoid scheduling problems.

Future research

A future study with larger sample size is needed to study possible impacts and differences of web-based psychoeducation on patients' self-efficacy, knowledge level, illness cognition and self-esteem in intervention group compared to their controls. A study with larger sample size and control group will be needed to find out possible impacts of web-based education on health care professionals' self-efficacy. More information is needed on how health care professionals feel using the web-based psychoeducation for a longer time as part of their work. More research is needed to find out if web-based courses should be targeted only for those participants who are used to use web-based programs, or should the focus be with technical support on those people who have lower digital skills. Also, future study is needed to ensure intervention's usefulness in care of adolescent patients.

7 Conclusions

Even though the main feedback on the website was positive, there is still a need to continue the iterative process. The content of the website seems to be mainly sufficient and meets users' needs and expectations. However, there are still some aspects that needs to be noticed. The nonfunctional links must be corrected and there is a need to discuss if all links are necessary. Also, there is a need to add tasks for patients and to discuss if the tasks should be modified or instructions could be added to meet the needs of those patients who described that the tasks were too difficult for them. The importance of accessibility of the websites have been seen in Europe and the public sector's websites and mobile applications need to be accessible for all people (European Commission 2016). It is important that we pay attention on accessibility especially when we know that the user group might have lower computer skills. The technology of websites has evolved rapidly (The Evolution of the Web 2020). Therefore, the layout might seem old fashioned if the user is a frequent internet user and knows the trends of the websites. The evolution of websites sets challenges and the website needs to be modified and updated regularly. The website was modified from adolescent patients' point of view to suit also their care. The evaluation with adult patients, health care professionals and caregivers did not reveal any useless content for adult patients. Therefore, we can assume that the modifications were successful. However, more accurate evaluation is needed to ensure its usefulness in adolescent patients care.

Based on the results of this study, web-based course related to web-based psychoeducation supports health care professionals' self-efficacy. Planning of a course and its schedule is important to avoid challenges for example with health care professionals' shift work and vacations. One part of the course was practical training with a patient. Recruitment of the patients was challenging and therefore some health care professionals needed to wait until they were able to finish the course. Therefore, schedule of the course needs even more planning when patients with schizophrenia spectrum disorders are involved with the course realization. However, health care professionals found that during the practical training they got to know the patient better and it improved their relationship.

The refusal rate among patients was high. However, based on the patients' acceptability of the web-based psychoeducation intervention and their ratings about the sessions, it seems like web-based psychoeducation is a good and sufficient option to realize psychoeducation when the content fulfills patients' needs and patient is motivated to participate web-based psychoeducation intervention. In addition to patients, web-based psychoeducation seems to be sufficient for caregivers. Therefore, it would be important if mental health services could offer possibility for web-based realization for psychoeducation. The timing of the web-based psychoeducation should be discussed. It seems that at least caregivers would benefit the most if they could participate the intervention when the diagnosis is still quite new and they have a need to find out knowledge about the disorder and its care. However, planning of the interventions is important to ensure their good end result. In addition, web-based psychoeducation might have impacts especially on patients' self-efficacy and knowledge level but there is a need for future study with sufficient statistical power to get more relevant results. The future study needs to pay attention on recruitment and monitoring of the patients to motivate them to participate and to decrease dropout rates.

Caregivers have versatile ways to maintain their own wellbeing and they get support from people around them. However, they still need support and co-operation with health care professionals. Caregivers prefer dialogue between them and health care professionals. Even if the patient has denied telling any information to the caregiver, caregivers hope that their words could still be heard. Therefore, it would be important to pay attention on how caregivers could be involved to the care and co-operation.

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Appendices

Appendix 1. Search strategies for the literature review.

Database	**Search terms**	**Result**
Pubmed (Medline) English Journal Articles 2010–2020	("schizophrenia spectrum and other psychotic disorders"[MeSH Terms] OR "schizophrenia"[Title/Abstract] OR "psychosis"[Title/Abstract] OR "severe mental health"[Title/Abstract]) AND ("internet"[MeSH Terms] OR "online"[Title/Abstract] OR "internet"[Title/Abstract] OR "web*"[Title/Abstract] OR "ehealth"[Title/Abstract] OR "computer"[Title/Abstract] OR "mobile applications"[MeSH Terms] OR mobile[Title/Abstract] OR smartphone[Title/Abstract]) AND ("Patient Education as Topic"[Mesh] OR "patient education"[Title/Abstract] OR "psychoeducation*"[Title/Abstract] OR "education*"[Title/Abstract] OR "self-management"[Title/Abstract])	216
CINAHL Peer reviewed English 2010–2020	((MH "Schizophrenia+") OR (MH "Schizoaffective Disorder") OR TI "schizophrenia" OR AB "schizophrenia OR TI "psychosis OR AB "psychosis" OR TI "severe mental" OR AB "severe mental") AND (MH "Data Communications+" OR TI "online" OR AB "online" OR TI "web" OR AB "web" OR TI "internet" OR AB "internet" OR TI "ehealth" OR AB "ehealth" OR TI "computer" OR AB "computer" OR (MH "Mobile Applications") OR (MH "Smartphone") TI "mobile" OR AB "smartphone") AND (MH "patient education" OR TI "patient education" OR AB "patient education" OR TI "psychoeducation*" OR AB "psychoeducation*" OR TI "education*" OR AB "education*" OR TI "self-management" OR AB "self-management")	124
Web of Science 2010–2020 English Article Review	TS=(schizophrenia OR psychosis) AND TS=("patient education" OR psychoeducation* OR education* OR supportive OR "self-management") AND TS=(internet OR online OR computer OR ehealth OR web OR mobile OR smartphone)	344
Total		684

Appendix 2. Details of the previous studies related to web-based educational interventions for persons with SSD.

Authors, year	**Year**	**Country**	**Participants**	**Research method**
Alvarez-Jimenez et al.	2013	Australia	Patients (n = 20)	A pilot study
Anttila et al.	2008	Finland	Health care professionals (n = 89)	A qualitative study
Anttila et al.	2012	Finland	Patients with SSD (n = 93) Health care professionals (n = 83)	A mixed methods study
Arnold et al.	2019	Australia	Patients (n = 98)	A randomised controlled trial
Baumel et al.	2016	USA	Patients (n = 200)	A single-group study
Berry et al.	2017	UK	Health care professionals (n = 20)	A qualitative study
Berry et al.	2019	UK	Patients (n = 18)	A qualitative study
Chan et al.	2016	Hong Kong	Caregivers (n = 809) In usability testing: caregivers (n = 10)	A mixed-methods study
de Leeuw et	al. 2012	Netherlands	Participants in focus groups: Patients (n = 19), Caregivers (n = 12) Nurses (n = 15) Social psychiatric nurses (n = 3) Psychologists (n = 3) Social workers (n = 4) Psychiatrists (n = 3) Managers (n = 3)	A qualitative study
Glynn et al.	2010	USA	Caregivers intervention group (n = 26) comparison group (n =10)	A quasi-experimental trial
Gottlieb et al.	2013	USA	Patients (n = 21)	A pilot study
Honary et al.	2018	UK	Caregivers (n = 24)	A qualitative study
Koivunen et al.	2007	Finland	Health care professionals (n = 76)	An explorative descriptive multiphase study

Authors, year	**Year**	**Country**	**Participants**	**Research method**
Kuosmanen et al.	2010	Finland	Patients (n = 21) Students (n = 20) Health care professionals (n = 35)	An explorative descriptive design
Lederman et al.	2014	Australia	Patients (n = 20) Health care professionals (n = 3)	A mixed-methods study
Lobban et al.	2011	UK	Caregivers (n = 23)	A qualitative study
Lobban et al.	2020a	UK	Caregivers (n = 800)	A randomised controlled trial
Lobban et al.	2020b	UK	Health care professionals (n = 281) Caregivers (n = 159)	A mixed-methods study
McEnery et al.	2019a	UK	Patients (n = 16)	A mixed methods development study
McEnery et al.	2019b	UK	Patients (n = 10)	A single-group pilot study
Rotondi et al.	2005	USA	Patients (n = 30) Caregivers (n = 24)	A randomised controlled trial
Rotondi et al.	2007	USA	Patients (n = 98)	A Mixed methods development study
Rotondi et al.	2010	USA	Patients (n = 31) Caregivers (n = 24)	A randomised controlled trial
Sin	2013	UK	Caregivers (n = 144)	A qualitative study
Sin et al.	2014	UK	Caregivers (n = 20)	A non-randomised usability study
Sin et al.	2019a	UK	Caregivers (n = 23)	A mixed methods study
Sin et al.	2019b	UK	eLearning experts (n=14) Caregivers (n = 24)	A coproduced design and build study
Thomas et al.	2016	Australia	Patients (n = 10)	A single-group study
van der Krieke et al.	2012	Netherlands	Patients in the intervention group (n=124) Patients in the control group (n=126)	A mixed methods study

Appendix 3. Details of the previous web-based educational interventions for persons with SSD.

Name of the program, Authors of the studies related	**Target group of the program**	**Aim of the program**	**Content of the program**
HORYZONS Alvarez-Jimenez et al. 2013 Lederman et al. 2014	Persons with first episode of psychosis	To improve long-term recovery of patients with first episode psychosis.	Interactive psychosocial interventions with mandatory (e.g. psychoeducation) and optional (e.g. relapse) modules, peer-to-peer online social networking with a newsfeed where patients and moderators can post messages.
MentalNet Koivunen et al. 2007 Välimäki et al. 2008 Anttila et al. 2008 Anttila et al. 2012 Kuosmanen et al. 2010	Persons with schizophrenia spectrum disorders Caregivers Health care professionals	To support self-management of persons with SSD.	Information about SSDs, treatment, social support, and patients' rights with text, audio stories, figures and photos, a discussion forum, chat room, a room for diary, and a question and answer column.
Self-Management and Recovery Technology, The SMART website Arnold et al. 2019 Thomas et al. 2016	Persons with psychosis	To promote recovery of persons with psychosis.	Six modules with different topics (e.g. recovery, managing stress) with videos of peers telling about their experiences related to the topics, exercises, self-management tools (e.g. charts for sleep and stress), a moderated discussion forum, opportunity to comment publicly, and opportunity to interact with other users of the website.
Interactive internet-based self-help psychoeducation program, iPEP Chan et al. 2016	Caregivers of persons with first episode of psychosis	To offer up-to-date information for caregivers of persons with first episode of psychosis.	Information about psychosis, its treatment and recovery, tips for caring the persons with psychosis, information for caregivers' self-support, and information about community resources.
Personal Control in Rehabilitation (PCR) de Leeuw et al. 2012	Persons with schizophrenia spectrum disorders Caregivers Health care professionals	To support patients optimal self-management and to offer information about patient to caregivers and health care professionals.	An open portal and three secured personalized portals for patients with schizophrenia, their caregivers and their health care professionals.

Name of the program, Authors of the studies related	**Target group of the program**	**Aim of the program**	**Content of the program**
The Online Relative Support Program website Glynn et al. 2010	Caregivers of persons with schizophrenia	To provide psychoeducation to caregivers of persons with schizophrenia.	A discussion forum, links to information related to serious mental illness and resources, educational written and video presentations, and a chat.
"Coping with Voices." Gottlieb et al. 2013	Persons with psychosis	To reduce the severity, distress, and dysfunctions which are caused by hallucinations.	Self-assessment of experience about auditory hallucinations, "daily voices log" where persons tell about their auditory hallucinations every week, videos, games, and exercises.
REACT Honary et al. 2018 Lobban et al. 2011 Lobban et al. 2020a Lobban et al. 2020b	Caregivers of persons with psychosis or bipolar disorder.	To offer support and information for caregivers of persons with psychosis or bipolar disorder.	12 psychoeducational modules (e.g. "What is psychosis?" and "Managing "positive" symptoms") including written information, videos, and self-reflection tasks, a forum for peer support and messaging service, information about organizations supporting persons with psychosis and bipolar disorder and their relatives, information about the team that was delivering the content of the program, and a personal place where users of the program can save links for information they want to use later.
EMBRACE McEnery et al. 2019a McEnery et al. 2019b	Young persons with first episode of psychosis	To treat social anxiety of young persons with first-episode psychosis.	12 independent modules. Each module has its own topic and include psychoeducational description to outline the topic, a comic related to the topic, behavioral experiments related to the topic to increase skills in real world, and a discussion forum.
SOAR website Rotondi et al. 2005 Rotondi et al. 2007 Rotondi et al. 2010	Persons with schizophrenia and their caregivers.	To provide family psychoeducation for persons with schizophrenia and their caregivers.	Three therapy groups (one for persons with schizophrenia, one for caregivers, and one for all intervention participants) guided by mental health professionals, an ability to ask questions from professionals, a library for previously asked questions and their answers, educational reading material, and a module for news or activities in community relevant for website users.

Name of the program, Authors of the studies related	**Target group of the program**	**Aim of the program**	**Content of the program**
E Sibling Project Sin 2013 Sin et al. 2014	Siblings of persons with psychosis.	To address the needs of siblings of persons with psychosis.	Information on psychosis, interactive exercises to promote siblings’ coping and well-being strategies, siblings’ blogs and discussion forum for peer-support, forum for questions for experts, forum for previous questions and answers, and links to further resources.
Carers fOr People with Psychosis e-suppor, COPe-support Sin et al. 2019 Sin et al. 2019b	Caregivers of persons with psychosis.	To provide psychoeducation and peer-support for caregivers of persons with psychosis.	Information about psychosis and caring issues related to it, a forum for caregivers’ questions to experts, a blog section and discussion forum for caregivers to share their experiences with peers, and a further resources with links to other relevant sources.
WEGWEIS van der Krieke et al. 2012	Persons with psychotic disorders	To support persons with schizophrenia to get an overview of the needs of their care and treatment abilities in their mental health care organization.	A home page where the procedure of the webpage is introduced and three webpages. First webpage includes a questionnaire about care needs. The second webpage informs the person about treatment module possibilities based on the outcomes of the questionnaire person filled in the first webpage. Users of the webpage have also an ability to view all available treatment modules.

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