A web-based adolescent depression support system: Feedback and implications for the future

ABSTRACT

The aim is to describe feedback from the adolescents on their use of a web-based depression support system. Web-based support systems can serve as an alternative to conventional treatment or to complement the current services. Mixed methods were used to approach the topic from multiple perspectives. Feedback was collected from adolescents with symptoms of depression or anxiety. Adolescents (n = 46) responded to a questionnaire after participating on the support system, and 24 adolescents did not provide feedback. The data were analyzed with quantitative descriptive statistics and qualitative thematic analysis. Out of 45 adolescents, 93% agreed that the web-based support system was targeted at them, and 89% felt it was reliable and safe. It was perceived as a good channel for reflecting thoughts. However, some adolescents felt it was difficult to use or that using it did not help them. Ideas for development were also offered. Depis.Net provided the adolescents with a reliable way to ease their condition at home. Using feedback from the adolescents on the support system makes it possible to identify those who are able to use this kind of system in daily practice.

Key words: Adolescent, depression, feedback, web, mental disorders, support system

INTRODUCTION

Globally, depression among adolescents is one of the greatest causes of illness and disability that has long-term health implications on adolescents' lives (1). The World Health Organization has estimated that by 2020 depression will rank as the second leading cause of disability (2). The one-year prevalence of depression in the adolescent population is about 4–5% (3). About one-third

(30%) of people who die from suicide have a diagnosis of depression or other mood disorder (4). Suicide is the second leading cause of death among adolescents (5), and in the United States suicide accounts for 11% of deaths among this age group (16,400 deaths every year) (6). Furthermore, it affects males up to three times as often as it does females (7). Economically, depression is also a high-cost illness (8,9,10). In 2010, depression-related costs in the United States alone exceeded $210.5 billion (11). Depression also leads to lower production levels and earlier disability pensions (12). In Finland, 15–19% of 14 to 15-year-old adolescents have sought help for depression from health care professionals (13), and every day, five individuals under 30 retire on disability pension because of a mental disorder, usually depression (14).

Adolescent depression is often associated with emotional problems (15), such as experiencing the feeling of being different (16), having weak self-awareness (16), or having a sense of hopelessness (17). Functional impairment is also a sign of depression (18) and can involve problems such as getting along with family members, having difficulties with hobbies (19) or experiencing poorer functioning at school (20). However, over 50% of adolescents with depression never receive sufficient treatment (21). Some reasons for this include a reluctance to share thoughts about problems face to face with adults (22), a fear of stigma (23), and a perceived danger of losing friendships if real feelings are shared with friends (24). These problems identified have raised an urgent need to find out new ways how adolescents could receive professional support and share their concerns without fear.

Information technology has the potential to support adolescents in the care process and in mental health services (25) when it is safely carried out by protecting the confidentiality of adolescents, following guidelines and providing accurate information (26). Currently, 100% of Finnish adolescents in the age group of 16–24 reported having used the web during the past three months,

and 89% use it several times a day (27). A willingness to get support and information regarding mental health problems via the web has previously been expressed by adolescents (28,29). Different web- or computer-based programs have been designed and tested to support adolescents with depression (30,31,32,33,34,35,36). Studies have shown that working with web-based programs have reduced adolescents' depressed moods (33, 36, 37, 38). Adolescents who visited a web-based program were more likely to report that they experienced less depression symptoms and that their well-being was enhanced (39). Adolescents have also evaluated the programs as being helpful (31). Tools that facilitate coping skills (38, 44) were also found favorable by young people. Adolescents appreciate receiving responses from health care workers and getting feedback on their questions concerning individual problems without delay (29). The attitudes towards mental health treatment and counseling have also improved during the use of a web-based program (31). These results are encouraging, as technological solutions are planned to be included in mental health services for adolescents with depression (28,36,41,42).

To date, the results of the studies specifically focusing on adolescents' views of web-based programs are inconsistent, and adolescents' feedback has only been collected in a few studies. Havas et al. (29) found that among 12–19 years old Dutch adolescents (n = 106; 48% males) that more highly educated adolescents preferred plain websites with more information whereas adolescents with lower education level preferred colorful websites with less information (29). Merry et al. (43) conducted a study in New Zealand among adolescents (n = 187; 34% males). Regarding the length of the web sessions, 53% of those (n = 80) who completed and returned the satisfaction questionnaire, were satisfied with the length of sessions (20 to 40 minutes), while 44% would have preferred longer sessions. Further, 81% of the adolescents would recommend it to their friends (43). Horgan et al. (40) evaluated peer support among 18 to 24-year-old young people with depressed symptoms (N = 118, 64% males) and found that an opportunity to share problems with

peers helped them, while loneliness was the most difficult experience for the adolescents (40). Some studies have focused on the characteristics and methods of online treatment, such as anonymity (20, 40) or ability for self-testing (29). Shandley et al. (44) evaluated an online game purposed to support mental health among 16 to 25 years old (n = 266, 33% males). Out of them, 90% think the game was easy to use, and 88% would recommend it to friends (44). Stasiak et al. (36) assessed a computerized cognitive behavioral program among 13 to 18-year-old students (n = 34, 59% males). They favored computer-based intervention that could be used at school. They also named weaknesses in the program, such as technical problems, large amounts of reading materials, and the sense that the program and its presentation were more suited for younger adolescents (36).

The development of health services should be based on users' needs and experiences (45). To ensure client-centered treatment methods (46), which are both effective (47) and acceptable (48), feedback about interventions should be collected from adolescents (49), and their participation in developing future services for their age group should be guaranteed (50). *The Global standards to improve adolescent's health services* suggests that the experiences and expectations that adolescents have regarding the services provided to them should be taken into account (50). This would improve the quality of health services and, more specifically, improve treatment to better meet the needs of adolescents (49). Still today, adolescents' views are less frequently taken into account when mental health services are being developed (50,51). We have therefore gathered feedback regarding the Depis.Net web-based depression support system. Several programs have been developed in different countries, including the United States (30,31,37), Great Britain (52), Netherlands (29,38), Australia (32), and New Zealand (36), and implemented in school environment (32,36,52). Depis.Net is the intervention purposed for Finnish adolescents to answer cultural and linguistic needs (53). It is a targeted support system developed for adolescents with depressive symptoms, and it was implemented at adolescent psychiatric outpatient clinics in

specialized health care. Outpatient care organized in primary health care is recommended for the treatment of adolescent depression, but when these services are not sufficient and the adolescent's condition is severe, specialized health care services provided by a multidisciplinary team, including an adolescent psychiatrist, are needed (54). According to our knowledge, this is the first study in Finland where adolescents' feedback of a web-based support system for depression has been systematically collected. This study is based on a randomized controlled study on Depis.Net, ISRCTN80379583 (55), in which adolescents in the intervention group used the support system in addition to their standard care. This study is important as it adds insights about adolescents' views on a web-based depression support system. Findings can guide the development and improvement of web-based adolescent depression support systems, in order to make them more appealing, user-friendly and engaging for adolescents. The aim of this paper is to describe feedback from the adolescents on their use of the web-based depression support system. More specifically, the strengths, weaknesses and ideas for future modifications have been identified.

METHODS

Web-based support system

The web-based support system was used by adolescents using their own computers at their homes, in addition to their usual care over a 6-week period. The intervention consisted of 5 sessions, one for each week, lasting about 45 minute each: 1) well-being, 2) home and family, 3) rights and responsibilities, 4) depression, and 5) treatment of depression delivered through virtual educational technology, and links to websites. The content of the topics was developed based on interviews with social and health care professionals about the main concerns of adolescents (55). Before the specific topics were given, an introductory session was shared with the adolescents, which asked the adolescents what concern they wanted to work on during the use of the support system (e.g.

relationship problems, identity issues, or other well-being concerns) (24). After the introductory session, five specific topics were followed weekly. Each of them included self-reflective exercises, such as a mood diary, a sleeping diary, and a network map, which adolescents submitted to the support system. During the use of the support system, the research nurse, who was an expert in mental health care, monitored the diary texts and gave feedback for the adolescents. Weekly text message reminders were sent to the adolescents if they had not yet visited the support system. The nurses who were mainly responsible for coordinating the treatment process at the adolescent psychiatric outpatient clinic were aware of the use of the support system. They recommend its use by the adolescents, and offered support and discussion related to it.

The web-based support system, Depis.Net, was developed based on adolescents' needs, examples of existing web-based interventions, and in cooperation with mental health professionals and adolescents. The theoretical framework for the support system was the self-determination theory. The theory guided the developers of Depis.Net to take into account adolescents' personal needs of relatedness, competence and autonomy for enhancing their motivation and thus their well-being (56). The support system is targeted to adolescents with depressive symptoms. It is purposed to improve self-management skills and increase awareness of well-being and mental health. The protections of the adolescents' privacy and data was guaranteed through the use of special security measures with individual login information. Depis.Net has been certified by the Health On the Net (HON) code (https://www.hon.ch/), which verifies the reliability of health information provided online (57). More detailed information on the Depis.Net support system can be found in a previous publication (55).

Design of the study

A descriptive study with a mixed methods approach was used to capture the general concept of users' feedback on working with the web-based support system (58). The mixed method approach was selected in this study because we aimed to capture users' views of the web-based support system (58), as well as receive their feedback about it from multiple perspectives (59). We followed a mixed methods design by Plano Clarke et al. (60). We conducted both quantitative and qualitative data collections rather than emphasizing one method over the other. Analyses were conducted separately using descriptive statistics and thematic analysis. In reporting the results, statistics were exemplified through thematic writings (60). Differences and similarities arose, which confirms that results were strengthened and that it was less likely that an aspect was missed, which could have been the case if only one research methodology had been employed (61).

Setting

The study was carried out at six adolescent psychiatric outpatient clinics at two University Central Hospitals located in two different hospital districts in southern Finland. The specific hospital districts serve a total population of approximately two million inhabitants in their combined areas. Among 13–17-year-old adolescents, in 2014, there were 75.5 outpatients per 1000 capita treated in the area of the first hospital district, and 62.3 per 1000 capita in the other hospital district. Depression (F32, ICD-10) and anxiety (F41) were the most common main diagnoses in Finnish psychiatric specialized health care (62). The outpatient clinics offer treatment and an assessment of the mental status, which, through a psychiatric examination and family meetings, gathering information on family issues and life circumstances (63). According to the Finnish Current Care Guidelines (64), the treatment of depression primarily includes psychotherapy, while medication is used in more severe cases. Essential parts of the treatment are psychoeducation, strengthening of personal coping strategies, and providing psychosocial support.

Population and participants

Our study population consisted of Finnish-speaking 15 to 17-year-old adolescents who had been allocated to an intervention group in the Depis.Net randomized controlled study (55). In order to be recruited, adolescents were referred to an outpatient clinic based on symptoms of depression or anxiety (with or without a relevant diagnosis). The adolescents were excluded if they had psychotic depression, bipolar disorder, substance abuse, or primary eating disorder. They were also excluded if they were admitted to a psychiatric hospital ward at the same time or had previously scheduled a short-term visit in outpatient care (3 visits or less). Out of the 158 adolescents who gave informed consent, 75 were randomly allocated to the intervention group, where the Depis.Net support system was used for six weeks in addition to their usual care. Adolescents received a username and password for the program from a research nurse, and who also provided them with a short introduction on how to access Depis.Net. Adolescents in the control group followed treatment as usual, and later they had a possibility to access the Depis.Net support system. More detailed information about the development of Depis.Net is available in a previous publication (55). Five adolescents withdrew for personal reasons before starting the program, which left us with 70 adolescents. Finally, 46 adolescents in intervention group provided feedback (45 quantitative and 34 qualitative feedback). The participants did not remarkably differ from the non-participants (Table 1).

Instruments

To measure participants' feedback on the support system, an instrument was developed for this study based on the Quality Criteria of Public Online Services (65) and the Quality Criteria for Health Related Websites (66). The Quality Criteria of Public Online Services consists of 40 items assessing web-based services due to use, content, management, and production and benefits (65). The criteria have been used in the Finnish government's strategy for online services (65). The

Quality Criteria for Health Related Websites is an effort of the European Commission and consists of 14 items in assessing transparency and honesty, authority, privacy and data protection, updating of information, accountability and accessibility for the purpose of enhancing the validity of health related websites (66). It has been used to test a website promoting physical activity among patients with breast cancer (67) and website assessing cancer risk (68).

The original structure and items were modified by the research group to be usable for adolescents. The Quality Criteria checklists were chosen as a basic reference because, in Finland, they guide digital public online services that the public sector provides to citizens, companies and government departments (65,66). Our instrument consisted of 36 items describing five quality criteria of the web-based support system: 1) Content (4 items), 2) Structure (6 items), 3) Presentation (10 items), 4) Use (9 items), and 5) Information (7 items). Quality criteria were measured on a 5-point Likert scale (5 = totally agree, 4 = agree, 3 = neither agree nor disagree, 2 = disagree, 1 = totally disagree). The Cronbach's alpha varied from 0.73 to 0.91 (Content 0.73; Structure 0.86; Presentation 0.91; Use 0.85; and Quality 0.82), which represents at least an acceptable correlation between items. Further qualitative feedback regarding system's strengths, weaknesses, and ideas for the future, was gathered with a questionnaire consisting of eight open-ended questions (Figure 1).

Figure 1.

Data collection

The data were collected between 2008 and 2010. Both a 36-item structured questionnaire and a questionnaire with eight open-ended questions were used. To ensure flexibility, the adolescents could provide their feedback in three ways: in a face-to-face interview, by posting it after completing the questionnaire or via an electronic survey. For the first feedback option, after the six

weeks of using the support system, the adolescents had the opportunity to meet the research nurse at the outpatient clinic where she would interview the adolescent based on the questionnaire. The adolescents could also provide their feedback at home via an electronic survey questionnaire during the last session of the program. If adolescents missed these two feedback options, they would receive the questionnaires in paper format at the time of the first follow-up measurement and return them by post. Out of 70 adolescents who started to use the Depis.Net support system, 46 (66%) provided feedback on it after the 6-week working period, and 24 (34%) did not use the possibility to give feedback. Out of them, a few adolescents (n = 7) returned feedback in paper format, and more than half (n = 39) used the electronic survey. This study is based on the data from the quantitative feedback questionnaires as well as 24 pages of qualitative written text.

Data analysis

The data analysis was conducted using quantitative and qualitative methods (60). First, the quantitative data (Likert scale feedback) were analyzed using descriptive statistics (frequencies, percentages). Data were analyzed using SPSS statistics 22 software (69).

Qualitative data (open-ended feedback) were analyzed using thematic analysis for explaining the writings of adolescents (70,71). A deductive approach was used for extracting a detailed description of the data based on the existing classifications in the structured questionnaire (72). A consensus of thematic analysis was confirmed by using two researchers to conduct analyses. In cases of disagreement, the issue was resolved with a third author (M.V.) (73). Further, mixed methods were used to have a possibility to compare the core message from qualitative results to quantitative results (73) to validate the results (59). The thematic analysis was conducted using Braun and Clarke's (72) phases of analysis. First, the data was printed out and read by the authors several times so that they could familiarize themselves with it. Second, the adolescents' expressions used in the feedback they

gave on the web-based support system were codified. The 36 items in the structured questionnaire guided the deductive forming of the codes. From the text, expressions such as *"Smileys were nice"* or *"Instructions were quite clear"* were searched for. Third, themes were formed based on five quality criteria. The codes were then added to a word document and, still collated under five themes (Content, Structure, Presentation, Use, and Information). Fourth, the codes were divided into three parts: strengths, weaknesses and ideas for modifications of the support system.

The written report was produced for combining the results of the Likert scale questionnaire and the main ideas of the qualitative writings. Following the weaving approach, the quantitative and qualitative results were integrated in the reporting phase and narratively described under the five themes (74). The results were merged to gain an exhaustive understanding of the topic, and quantitative descriptions were visualized through examples from the qualitative writings (60), bringing out differences and similarities in the data (61).

Ethical issues

An ethical evaluation (R08075H) was conducted by the Ethical Committee of the University Hospital, and the approval for the study was granted by the administrators of the two hospital districts. Throughout this study, the principles of medical research and legislation were respected, and the safety and well-being of the participants was prioritized (75). The research nurse and clinic staff provided the adolescents with information on the process of the study both verbally and via an information letter. The research nurse requested informed consent was requested in writing before participation (76). If any alarming signs related to a participant's mental state occurred during the use of the support system, the research nurse informed the clinic staff about it. The adolescents were able to withdraw from the study at any stage and without having to give a reason. According the Personal Data Act (77), confidentiality was guaranteed, and anonymity of adolescents was

respected by using unidentifiable ID codes. Guidelines for good scientific practice were followed (78).

RESULTS

Participant characteristics

Out of 46 participants, a large majority (74%) were female (Table 1). The respondents' mean age was 16 years (range 15–17 years). Majority of them (41%) were in comprehensive school, for children from 7 to 15 years old, or in high school (40%). Further, some of them (17%) were in vocational school and a few (2%) were enrolled in other types of education, such as optional 10th grade. Among those who did not provide feedback (n = 24), a large majority were female (88%) and they were in high school (50%) or in comprehensive school (46%). The mean age of non-participants was 16 years. The characteristics of the participants and nonparticipants are presented in more detail in Table 1.

Table 1.

Feedback regarding strengths and weaknesses of the web-based support system

The strengths and weaknesses of the web-based support system were based on the 36-item structured descriptive questionnaire and the qualitative writings of the adolescents. The results are integrated, and the quantitative results (n = 45) are visualized by examples from qualitative writings (n = 34). To visualize the skew distribution, the frequencies and median (interquartile range IQR) are presented by item in Table 2.

Content's strengths and weaknesses

As for the content, the adolescents agreed that the support system was targeted for adolescents (n = 42; 93% totally agreed or agreed, median 4.0, IQR 4.0-5.0) and that the objectives of the support system were given (n = 40; 89%; median 4.0, IQR 4.0-5.0) (Table 2). They also appreciated that there was a possibility to give feedback (n = 36; 80%; median 5.0, IQR 4.0-5.0). The adolescents provided some examples of strengths of the content. They were pleased with the existence of smiley faces and the cursing hedgehog cartoon strips included in the support system. They thought that these graphics helped them to understand and express themselves. The participants were also of the opinion that the content was useful for adolescents.

A smiley face helps you to understand what somebody means (ID 21).

It was good how it was possible to learn about and memorize different issues (ID 287).

In contrast, some adolescents (n = 7 totally disagreed or disagreed; median 4.0, IQR 3.0-5.0) were less pleased with the way the pictures helped them understand the content (Table 2). Some adolescents also wrote that the target group of users was not fully understood. They felt that the program was too easy for them or even childish and intended for younger people. Moreover, they did not always know what they were expected to do there.

I was unsatisfied that some issues were so simple (ID 398).

It is difficult to know what they want me to write (ID 22).

Structure's strengths and weaknesses

Related to the structure, the vast majority of the adolescents agreed that the instructions in the support system were sufficient (n = 38; 84% totally agreed or agreed; median 4.0, IQR 4.0-5.0). Further, the system was seemed to be easy to use (n = 35; 78%; median 4.0, IQR 4.0-5.0) (Table 2). They provided some examples of strengths of the structure. For example, the structure of the support system enabled easy usage without any specific difficulties. Clear instructions and themes

supported their usage of the support system. The structure enabled a self-reliant way to work and adolescents appreciated it.

The user interface was easy and pleasant (ID 100).

The themes in the program were good, even if it was difficult to come up with what to write (ID 26).

I think self-reliant work is a good idea, because the youth have the possibility to reflect all kind of things themselves (ID 5).

Contrastingly, some adolescents did not agree that the instructions were clear (n = 5 totally disagreed or disagreed) or that the support system was easy to use (n = 3). Furthermore, while two-thirds (n = 31; 69%; median 4.0, IQR 3.0-5.0) agreed that it was easy to move from one web page to another, two adolescents (n = 2) disagreed with this or thought that moving between the pages could not be done quickly (n =3) (Table 2). The support system was also experienced as difficult, challenging or as an obligatory program. Further, they wrote that the structure of the support system was scholastic, including too many rules with ready-made themes. The structure of the instructions was also described as unclear.

I didn't consider self-reliant working as pleasant, because usually I'm not such an active talker on the net (ID 436).

I didn't exactly understand everything (ID 174).

Some exercises were a little complex (ID 116).

I was unsatisfied that the site was like a school book (ID 287).

Presentation's strengths and weaknesses

In regard to the presentation of the support system, most adolescents agreed that the way the topics were expressed was understandable (n = 39; 87% totally agreed and agreed; median 4.0, IQR 4.0-

5.0) and that it suited the target population (n = 37; 82%; median 5.0, IQR 4.0-5.0) (Table 2). Only a few written examples relating to strengths of the presentation were given.

… the appearance of the website is quite nice (ID 2).

On the other hand, some adolescents did not agree that the layout of the support system was good (n = 6 totally disagreed or disagreed; median 4.0, IQR 3.0-5.0), or they thought that it was not pleasant to use (n = 5) (Table 2). In their opinion, the system was unclear and difficult to follow. Some also criticized incompatible colors or pictures presenting people who were too happy. They commented that such pictures are not suitable for people with depression.

The website is quite unclear (ID 174).

Those youth in the pictures reminded me of school fellows whom I really don't like (ID 5).

Use's strengths and weaknesses

Regarding the use of the support system, the point that the adolescents agreed the most on was that it was possible to use at home (n = 42; 95% totally agreed or agreed; median 5.0, IQR 5.0-5.0). They agreed that the system is reliable (n = 40; 89%; median 5.0, IQR 4.0-5.0) and safe (n = 40; 89%; median 5.0, IQR 4.0-5.0) (Table 2). The adolescents gave some examples of strengths of the use. They appreciated the possibility to work at their own pace. They wrote about how they got help, and how working in the support system was calming. It was possible to release feelings via the support system, and it furthered new kinds of pondering. The adolescents also thought the support system offered an alternative for conventional treatments. They also appreciated the feedback and comments offered by the research nurse related to their own writings on the support system. Furthermore, as part of the support system, participants got text-message reminders every week, and those were experienced as useful.

I was able to think in peace of what to write (ID 67).

I was satisfied with questions that opened a way to deeper soul-searching, and I better recognized the starting point of my problems (ID 287).

For a change, I saw some of my good features (ID 306).

Depis.Net really is a better way for many youth to deal with their issues than to visit some therapist (ID 220).

It was nice to write about my own feelings and thoughts and get some feedback on them. (ID 79).

I believe that to take a stand on a certain matter was really important. You may understand. There are some matters you don't have the courage to say aloud (ID 100).

Text messages helped me to remember this and didn't irritate me (ID 21).

Moreover, the adolescents mostly disagreed that there should be a possibility to use the support system at friend's home (n = 13; 29% totally disagreed or disagreed; median 3.0, IQR 2.0-5.0). Some of them (n = 9; 21%; median 3.0, IQR 3.0-4.0) disagreed that they intended to use the support system in the future (Table 2). Some additional examples were given regarding perceived weaknesses of the system, and some adolescents thought that using the support system was not helpful to them − they were not interested in using this kind of support system. Sometimes, they felt too busy to use it or they just forgot. They also felt bad if they did not get feedback from the research nurse or if it was given late. Sometimes, participants felt that starting to use the support system was hard and tiring, and their poor condition weakened their willingness to use the system. Concern about confidentiality bothered some adolescents, and they were worried that someone would find out about the thoughts they had expressed there. In addition, problems with web connections, not having a computer, or other technical problems hindered working.

I couldn't do the last parts of the program, because I suffered from the worse phase of my situation and nothing actually interested me (ID 287).

I have poor experiences of someone reading my diary (ID 22).

It really irritated me that I lost the paper where I had the username and password (ID 32).

It irritated me that I didn't get answers to everything I had asked (ID 100).

I was told that I would get feedback, but I didn't. (ID322).

Information's strengths and weaknesses

The adolescents appreciated the reliable information offered on the support system (n = 41; 91%; median 5.0, IQR 4.0-5.0) totally agreed or agreed). The also strongly agreed that the information was effective (n = 39; 87%; median 5.0, IQR 4.0-5.0) (Table 2). The adolescents gave some examples regarding the strengths of the information. They thought that reading the information from the support system helped them. The information was described as new, accurate, and also practical. The adolescents appreciated the exercises in the support system where they had the possibility to write about their thoughts. They found that answering the questions or illustrating their future was helpful to them. The mood diary and sleeping diary were mentioned as being especially good.

The knowledge pages offered a lot of general information, i.e. about depression, and also a lot of specific information. I was satisfied with the facts that I found from there, (because they were things) that I have already thought or sought answers for (ID 287).

And when I wrote in the mood diary, even my own thoughts became clearer (ID 32).

On the other hand, some adolescents were not in agreement about the information on the support system; some of them did not agree that the information was accurate (n = 6 totally disagreed or disagreed; median 4.0, IQR 3.0-5.0) or that the support system was clear in its entirety (n = 4; median 4.0, IQR 3.0-5.0) (Table 2). Some examples were given regarding weaknesses in the quality. The information was thought to be already well-known and some sites were described to be too basic. The learning tasks were at times challenging to the adolescents and demanded time and

concentration, which resulted in the tasks being left unfinished. Some reported that expressing one's own feelings in writing is not always easy.

We have gone over the same things at school before (ID 475).

It's difficult to write about a subject that is not acute just at the moment (ID 83).

Table 2.

Ideas for future implications and suggested system modifications

Out of the 43 respondents, over one-third (38%) reported that they would use the Depis.Net system again, while 21% of adolescents had no intention of using the system again. Still, 67% of the adolescents could recommend the use of the support system to friends. For the future, the adolescents suggested some ideas for modifications of the Depis.Net support system. They were willing to have more interaction with professionals, such as research nurses, within the support system. They considered feedback from the health care professionals to be important. They also thought that feedback should be given immediately, when the adolescents have written about their poor feelings.

Just a short comment may be important to a depressed person. They would get a feeling of being noticed. (ID 100).

The adolescents expressed the willingness to engage more with peer-communication within the support system. They suggested the possibility to read and comment on other adolescents' posts. They even thought that there could be an open section in the support system that all users could read.

It would be interesting to read other adolescents' writings – there could be more of a sense of community and networking (ID 22).

It would be great if adolescents on Depis.Net could have a possibility to comment on each other's updates (ID 357).

According to the presentation of the support system, the adolescents wished for a clear and advanced presentation with more colors. They also suggested that the graphics' quality could be improved.

There should rather be some cartoon animals or normal people among the pictures (ID 5).

I would develop the coloring by using two well-matching colors. One should not mix whatever colors that were now used in the introduction section on the Moodle sites (ID 2).

The adolescents would like to extend the information of the support system by adding more links and more detailed information about depression treatment. Concrete examples of how to cope with or get rid of depression or anxiety were also suggested. Further, it was suggested that users could write their own descriptions about their lives, for example, about their concerns or attitudes, and that other users would have the possibility to comment on their writings. Some adolescents also wanted more learning tasks and questionnaires to be included in the system, and they thought that they could write more about what is bothering them.

There could be more questions about the youth, about bad feelings, anxiety and depression. And besides the questions, how she/he can get help (ID 438).

DISCUSSION

Principal findings

According to our knowledge, this is the first Finnish study aiming to describe the feedback from adolescents on a web-based depression support system in clinical practice. Our study showed that

the majority of the adolescents were pleased with the Depis.Net support system, especially with its' content and quality. It is important to produce mental health services that consider adolescents' personal views, needs and behaviors (79) and that are high-quality from the adolescents' perspective (48). This study helps remedy the fact that adolescents' views are still not heard often enough (50,51), and enables service development based on the experiences of adolescents using the web-based support system (45). Adolescents' experiences of services may provide knowledge for overcoming the obstacles in current mental health services (22,23,24). It is suggested that adolescents engage in treatment when their needs regarding services are taken into account (80).

Discussion in light of the literature

The positive experiences of the adolescents in our study are in line with the experiences of adolescents with depression as they get help by using a web-based intervention (31). There has also been a need for this kind of support system. Adolescents have expressed a need for websites specifically aimed at them where they can find information and take self-tests (29). In our study, the adolescents described that they received support by getting information or answers to their questions through the web-based support system, and that they appreciated the possibility to reflect on their thoughts in the different exercises. This is in line with previous findings that adolescents need to have access to information and be able to take self-tests on websites (29) and that they favor tools that facilitate their coping skills (44). The system is also more likely to be beneficial if adolescents can trust the content of the support system and feel safe when using it. When the users have confidence in the support system, they may be more likely to engage in it, especially in the reflection of thoughts and in finding understanding and reasoning in their situation (81).

The adolescents in our study stressed the value of interaction with experts and prompt answers to their questions regarding problematic issues. They may be interested in having more possibilities to interact with peers and professionals via a web-based support system. This would provide adolescents with a network in which they could share experiences, reflect difficult life situations, and get support from health care professionals. In line with previous studies, this study found that getting support from professionals (29) and peers (40) is important to adolescents when using a web-based intervention.

Also previously, peer support has been found to help adolescents with depressive symptoms (40) and has been shown to increase feelings of hope (82). Although, one benefit of the web-based support system is to save time of a therapist (83), it is essential that the human contact is always guaranteed. Therefore, adolescents' self-directed working did not and should not play too dominant role in health services. As adolescents appreciated the feedback and comments offered by the research nurse related to their own writings, the therapist support during the use of web-based support systems should be clearly defined and evaluated in the future. The therapist support is previously found to be provided in different ways, such as by text messages or face-to-face meetings, or by taking different durations that may have an effect to intervention impact (84).

Further, some adolescents experienced it helpful that they had the opportunity to express their thoughts on the Depis.Net system. They also appraised the information they received from the support system as reliable (91%) and effective (87%), and further, described it as useful and practical. Contrary to a previous study (36), where a large amount of text has been seen as a weakness of a computerized program, some adolescents in our study hoped to have even more detailed information with more concrete examples. This finding is in line with service users'

expectations that treatment provides practical support, counselling and coping tools for them (81). Therefore, in order for adolescents to experience that the system is beneficial for them, they need to have up-to-date and supportive feedback on their daily improvement in a variety of ways.

A minority of the adolescents did not find using the Depis.Net support system to be helpful. However, some obstacles were mentioned. They experienced difficulties with instructions, and as described in a previous study, technical challenges (36). We can also assume that those adolescents with a poorer mental state may have concentration problems, especially with computer use, which is supported in previous studies where problems in functional impairment were found to be connected to depression (18,19,20). In addition, emotional problems (15,16,17), tiredness, business or having a poor mental condition may affect an individual's willingness to work with the support system. One benefit of support systems is that they can be intended for a large group of users. The severity of psychological symptoms is found to be a reason for increased withdrawal from web-based support systems, whereas in contrast, the motivation through treatment can decrease when symptoms are not severe (85). Therefore, more research is needed on what factors cause unwillingness to use the systems, such as difficulty in using them or if users, e.g. adolescents in this study, feel that the use does not help them. Notwithstanding, one benefit of this study is that the voices of the adolescents were heard, and their systematic feedback regarding the web-based support system was collected and analyzed using a variety of means.

Previous studies have shown that adolescents do not want to share their problems and real feelings with their friends due to stigma related to mental health problems (23) or a perceived risk of ending friendships (24). As seen in other studies, we found the need for confidentiality and privacy regarding highly sensitive issues (26,29,40). In our study, the adolescents expressed thoughts and feelings via a support system, yet they were still worried that somebody might find out about their

personal writings. Therefore, as anonymity on the web is important for adolescents (29,40), a balance between openness and confidentiality should be guaranteed and highlighted.

Limitations

This study has limitations to take into consideration. First, we may ask whether the structured instrument modified by the research group captured adolescents' thoughts and impressions in the best possible way. However, using both quantitative and qualitative methods can be seen as a strength of this study and as validating the results (59). Second, our sample size was small, while both genders where not equally represented. The majority of the participants were girls, and that may cause concern for a gender bias towards 'girlish' attitudes. On the other hand, the health statistics of the National Institute for Health and Welfare reports that 79% of adolescents with depression between the ages of 13 and 17 (F32, ICD-10 (86) are girls (87). However, high suicide rates among boys should be taken into consideration in future research on depression. Regarding information technology use, levels of activity are similar between boys and girls, although boys more actively search for information on the internet and play online games, and girls more often participate in social media (88). Considering this, the boys and girls may have had different needs from the web-based support system, and that may explain some of the feedback given in this study.

Third, we are appraising and analyzing feedback on our own product. There is a risk of interpreting the data based on our preconceptions (72), which could influence the meanings we saw in the text (89). According to the analysis process, we tried to take this into account by working systematically, following the guidelines of thematic data analysis (72).

Fourth, one-third of the adolescents in our study never provided feedback on the support system. Compared to other studies, the number of adolescents who did not give feedback in our study is in

line with the average drop-out rate in web-based interventions (31%) (84). Due to this, there were not enough participants to make any generalizations. These numbers may simply show that all adolescents are not willing to share their views and opinions. Also, the adolescents' different situations and varying needs should be taken into account when planning the support.

Although web-based interventions are seen as an effective approach in mental health services (90), one potential danger is that digital technology is investing and developing programs that are only used by active adolescents who would be able to use any other type of treatment. It is also important to remember that the use may be dependent on an individual's mental condition or life circumstances (91). A patient's financial situation or fear of coercion are just a couple of factors that may affect their willingness to choose web-based intervention (92). In our study, the participants may represent a group that are willing to use information technology, which may bias our sample towards positive experiences. Adolescents from different backgrounds, i.e. various levels of education, may also have different needs from websites (29). The results of this study support recognizing individual needs and developing alternative solutions on websites. The results also show the variation of adolescents' experiences on the use of this web-based support system. Although most adolescents gave positive feedback, some did not find the support system as beneficial. More research is therefore needed from both the user's and non-user's perspectives to determine if this true or not.

Fifth, the data were collected several years ago, so the question of relevancy must be raised. However, the existing literature still lacks studies like this of a specific population. Our study fills a gap in research on feedback from adolescents with depressive symptoms. In recent years, the development of information and communication technology has made the delivery of programs more likely to happen through a mobile device (93). We see future potential of web-based support

systems to follow this development and be available through mobile applications. Although technology systems have advanced, support systems like Depis.Net are not used full-weight, and feedback is essential. Although the internet has dramatically changed societies (94), and provides great opportunities, the digital world may be associated with some risks to mental health (95). This, in turn, limits our understanding of its potential use for mental health promotion and prevention (95). Despite the development of many technical applications, traditional methods are still effective and usable. For example, a systematic review by Mehta et al. (96) explored the evidence of effective interventions to reduce mental health stigma and discrimination, and found that interventions included in their review targeting university students (13 in total) used traditional methods, such as lectures, videos, and information. Therefore, a variety of interventions and methods should be available for users, to be selected based on their own interests, willingness and capabilities.

Conclusions and implications

Web-based support systems may complement current outpatient treatment for adolescents with depression. This study shows that the adolescents are able and willing to use support systems like Depis.Net. However, it is important that an individual's mental state and specific needs are taken into account when considering the use of a web-based support system as a part of their treatment. Web-based support systems may not be the best way to support the well-being of all adolescents. Although most of the adolescents in this study experienced the support system as helpful and useful, there were some who were not willing to use it or had difficulties in using it. So, alternative treatments based on individual needs should be available.

Future research is needed on how adolescents' actual participation in developing services (49,50,51) is linked with treatment outcomes and patients' willingness to use web-based programs. Research is

also needed about how to support adolescents who are not willing to use web-based programs, and how mental condition or internet use features affect the support system use. Future research is also needed to explore the interaction of adolescents with peers and professionals on web-based support systems. Human contact may have some effect on one's willingness to use the web-based support systems, or an impact on their mental state.

Declaration of interests

The authors declare that they have no competing interests.

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Contribution

K.A. contributed to the design of the study, data analysis and writing the manuscript. M.A. worked as a researcher in the Depis.Net project, contributed to the conception of the study, design of the study, data collection, data analysis, and writing the manuscript. M.V. worked as a leader of the project, contributed to planning and organizing the Depis.Net RCT study, the conception of the study, writing the manuscript and supervised the study.

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Table 1. Characteristics of the participants and nonparticipants of the feedback survey.

Characteristics		Participants (n = 46) N (%)	Non-participants (n = 24) N (%)
Age (years)	15	15 (32)	7 (29)
	16	16 (38)	10 (42)
	17	15 (30)	7 (29)
Gender	Male	12 (26)	3 (12)
	Female	34 (74)	21 (88)
Education	Comprehensive school	19 (41)	11 (46)
	High school	18 (40)	12 (50)
	Vocational school	8 (17)	0 (0)
	Other (10^{th} grade, after primary school, optional for adolescents)	1 (2)	0 (0)
N/A		0 (0)	1 (4)

Table 2. Adolescents' feedback on the quality criteria of the Depis.Net support system.

Item	N	Totally agree n (%)	Agree n (%)	Neither agree or disagree n (%)	Dis-agree n (%)	Totally disagree n (%)	Median (IQR)[1]
Content							
Targeted for adolescents	45	22 (49)	20 (44)	3 (7)	0 (0)	0 (0)	4.0 (4.0-5.0)
The objectives have been described	45	18 (40)	22 (49)	4 (9)	1 (2)	0 (0)	4.0 (4.0-5.0)
There is the possibility to provide feedback	45	29 (64)	7 (16)	8 (18)	1 (2)	0 (0)	5.0 (4.0-5.0)
Pictures make the content easier to understand	44	13 (30)	15 (34)	9 (20)	4 (9)	3 (7)	4.0 (3.0-5.0)
Structure							
Easy to use	45	14 (31)	21 (47)	7 (15)	3 (7)	0 (0)	4.0 (4.0-5.0)
Instructions are sufficient	45	14 (31)	24 (53)	4 (9)	2 (5)	1 (2)	4.0 (4.0-5.0)
Instructions are clear	45	16 (36)	18 (40)	6 (13)	4 (9)	1 (2)	4.0 (3.5-5.0)
The home page makes it easy to move from one page to another	45	15 (33)	19 (42)	9 (20)	2 (4)	0 (0)	4.0 (3.5-5.0)
It is easy to move between the pages	45	13 (29)	18 (40)	12 (27)	2 (5)	0 (0)	4.0 (3.0-5.0)
It is quick to move between the pages	45	13 (29)	21 (47)	8 (17)	3 (7)	0 (0)	4.0 (3.5-5.0)
Presentation							
Pleasant to use	44	19 (44)	15 (34)	5 (11)	5 (11)	0 (0)	4.0 (4.0-5.0)
Shows to be simple	45	15 (33)	22 (49)	5 (11)	3 (7)	0 (0)	4.0 (4.0-5.0)
Shows to be clear	45	18 (40)	17 (38)	6 (13)	4 (9)	0 (0)	4.0 (4.0-5.0)
Shows to be consistent	45	18 (40)	14 (31)	9 (20)	4 (9)	0 (0)	4.0 (3.0-5.0)
Text type is easy to read	45	21 (47)	14 (31)	10 (22)	0 (0)	0 (0)	4.0 (4.0-5.0)
Layout is good	45	15 (33)	15 (33)	9 (20)	6 (14)	0 (0)	4.0 (3.0-5.0)

Fit for the target population	45	23 (51)	14 (31)	7 (16)	1 (2)	0 (0)	5.0 (4.0-5.0)
Most important items are highlighted	45	14 (31)	22 (49)	7 (16)	2 (4)	0 (0)	4.0 (4.0-5.0)
Things are expressed in a familiar way	45	16 (36)	19 (42)	8 (18)	1 (2)	1 (2)	4.0 (4.0-5.0)
Things are expressed understandably	45	20 (45)	19 (42)	4 (9)	1 (2)	1 (2)	4.0 (4.0-5.0)
Use							
Program is important	45	13 (29)	18 (40)	10 (22)	3 (7)	1 (2)	4.0 (3.0-5.0)
Use is safe	45	29 (64)	11 (25)	5 (11)	0 (0)	0 (0)	5.0 (4.0-5.0)
Use is reliable	45	28 (62)	12 (27)	5 (11)	0 (0)	0 (0)	5.0 (4.0-5.0)
Possible to use at home	44	37 (84)	5 (11)	2 (5)	0 (0)	0 (0)	5.0 (5.0-5.0)
Possible to use at the library	44	14 (32)	11 (25)	14 (32)	5 (11)	0 (0)	4.0 (3.0-5.0)
Possible to use at a friend's home	45	14 (31)	6 (13)	12 (27)	11 (25)	2 (4)	3.0 (2.0-5.0)
Willing to use sites like this in the future	44	12 (27)	10 (23)	16 (36)	2 (5)	4 (9)	3.5 (3.0-5.0)
Can be recommended to friends	45	14 (31)	16 (36)	9 (20)	4 (9)	2 (4)	4.0 (3.0-5.0)
Intention to use in future	43	5 (12)	11 (26)	18 (41)	5 (12)	4 (9)	3.0 (3.0-4.0)
Information							
Information is reliable	45	28 (62)	13 (29)	4 (9)	0 (0)	0 (0)	5.0 (4.0-5.0)
Information is effective	45	32 (71)	7 (16)	6 (13)	0 (0)	0 (0)	5.0 (4.0-5.0)
Information is accurate	45	12 (27)	13 (29)	14 (31)	5 (11)	1 (2)	4.0 (3.0-5.0)
Links are useful	44	7 (15)	21 (47)	15 (34)	1 (2)	1 (2)	4.0 (3.0-4.0)
Structures are consistent	45	16 (36)	18 (40)	11 (24)	0 (0)	0 (0)	4.0 (3.5-5.0)
Overall structure is clear	45	16 (36)	16 (36)	9 (19)	3 (7)	1 (2)	4.0 (3.0-5.0)
One page includes one topic	45	19 (42)	19 (42)	6 (14)	1 (2)	0 (0)	4.0 (4.0-5.0)

[1] 5 = totally agree, 4 = agree, 3 = neither agree or disagree, 2 = disagree, 1 = totally disagree

Figure 1. Open-ended questions about adolescents' experiences using the web-based support system.

1. What do you like about working with the Depis.Net web-based support system? What were you satisfied or unsatisfied with?

2. How would you develop the support system further?

3. What was the most useful to you?

4. Did you find any difficulties in using the Depis.Net support system?

5. How did you feel about working self-reliantly?

6. What is your opinion about the information sites on Depis.Net? What were you satisfied or unsatisfied with?

7. Which link was the most useful to you?

8. What do you think about the exercises on Moodle? What were you satisfied or unsatisfied with?