Evaluations of chronic pain patients of the online aftercare program 'NaDien'

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Abstract

ACT-based online interventions are increasingly popular in treating health problems such as chronic pain due to their cost-effectiveness and promising results to reduce pain symptoms. Roessingh developed an ACT-based application 'NaDien' to support chronic patients' adherence to behavioral changes after completion of therapy. Guidance was shown to support patients in this process. So far, it has not been examined how guidance of a counselor next to using 'NaDien' is evaluated.

The goal of this qualitative research was to examine the user-evaluations of chronic pain patients with 'NaDien'. Nine patients were included, whereof six received guidance and three used the application independently. The participants were contacted by a psychologist and informed about the study. Semi-structured interviews were conducted via telephone, recorded and transcribed. The patients were asked questions about their experience with all six buttons of the application as well as their opinion about the received support at Roessingh to understand the application, the contact via email with a health care professional and the emails themselves.

The study revealed that the application is positively evaluated. The evaluations of the two groups differed not much from each other. Almost all functionalities affected the users' coping with pain, which underlined the effectiveness of the application. To enhance the usage of the application more personal guidance should be offered at Roessingh as well as during the period at home. Moreover, larger information boxes would be of added value as well as more personalized messages by the functionality "Coach". Mistakes such as spelling errors in the motivating messages should be avoided. Moreover, the program should work properly. For further research, it is recommended to execute pilot interviews and other researchers should be involved in analyzing the interviews to prevent bias.

<u>**Keywords:**</u> Chronic Pain – ACT-based Online Application – Mobile Application – Webbased Application – Guidance

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Introduction

Chronic pain is a severe condition affecting a major part of the world population. After being successfully treated, 30-60% of patients experience relapse in pain (Turk, & Rudy, 1991; Morley, 2008). eHealth-interventions offer help in reducing costs of face-to-face treatment and other health service costs and increase the user's control over the intervention such as when to use it (Griffiths et al., 2006). These online programs help patients to avoid relapse in ineffective coping with pain (Fledderus, Schreurs, Bohlmeijer, & Vollenbroek, 2015). In the current study, a similar eHealth application called 'NaDien' will be examined based on user evaluations of the program.

Chronic Pain: An Overview

Chronic pain is a very disabling and long-lasting condition for the patients (Johannes et al., 2010; Breivik et al., 2006) because 60% of chronic pain sufferers in Europe had lived with severe pain for more than 15 years. In today's society 20% of the global population experience chronic pain (Owens et al., 2016). In the Netherlands, 18% of 3197 respondents had chronic pain. All of them scored a 5 or more on a pain intensity scale from 1-10. Their mean age was 51.3 years and 60% of the Dutch sufferers were female (Breivik et al., 2006). Specific patient characteristics such as being middle-aged (older than 64 years old) and female described the at-risk group of developing chronic pain, were demonstrated by different studies (Johannes et al., 2010; Hardt et al., 2008).

Pain challenges the health system with high expenditures to finance medical treatments for patients as well as high absenteeism or low productivity of patients at work (Gaskin, & Richards, 2012). Mostly and in the current study, the term "chronic pain" is defined as having pain for more than 6 months (Johannes et al., 2010; IASP, 2016) because it endures the time tissue needs to heal completely (IASP, 2016). Lower back pain, osteoarthritis, rheumatoid arthritis and migraine headache were the most common pain conditions (Johannes et al., 2010).

Impact and Mechanisms of Chronic Pain

Chronic pain has severe consequences on almost every domain of the patient's life. Examples are its interference with daily activities such as sleep, sports, walking, doing household activities, maintaining an independent lifestyle, driving a car, social activities,

work-life, mood and general quality of life (Roth-Isigkeit et al., 2005; Breivik et al., 2006; Übelacker, Weisberg, Herman, Bailey, Pinkston-Camp, & Stein, 2015; Molton, & Terrill, 2014; Gaskin, & Richard, 2012).

Chronic pain affects the patients' health by being a powerful predictor of developing a depression because of feeling helpless, being in destroyed personal relationships and not feeling accepted or misunderstood by others such as doctors, family and friends due to the pain (Breivik et al., 2006; Magni, Moreschi, Rigatt- Luchini, & Merskey, 1994). It also causes cognitive dysfunction, severe drug consumption (Pinsky, 1978) and other substance abuse to flee from the pain experience (Ilgen, Perron, Czyz, McCammon, & Trafton, 2010).

The patient is forced to adjust his life to his pain as well as steadily searching for methods of relief (Arends, Bode, Taal, & Van de Laar, 2013).

Background Processes of Chronic Pain

Although chronic pain can often not be explained by lesions to the body of the patient or other dysfunctions, physiological and psychological factors might explain the less functional behavior of the patient. Influences of physiological nature were osteoarthritis and rheumatoid arthritis, fractures of the spine, trauma, surgery, migraine and nerve damages (Breivik et al., 2006), musculoskeletal pain, headache, fibromyalgia, genetic conditions or surgeries that went wrong (Owens et al., 2016). Stress, depression, thinking of one's life as a failure and other negative thoughts, a bad mood, illness, anger, sadness, lack of sleep, nutrition and psychosocial problems trigger chronic pain to make it persist longer (Magni, Moreschi, Rgatti-Luchini, & Merskey, 1994; Jensen, Turner, Romano, Karoly, 1991; Roth-Isigkeit et al., 2005).

Other psychological models describe factors that maintain chronic pain over long periods of time: learning and reinforcement by the social environment to avoid activity causing fear of pain, paying attention to pain causing attempts to escape from it and neurological changes resulting in being overreactive to pain stimuli (Vlaeyen, & Linton, 2000; Flor, 2014; Eccleston, & Crombez, 1999; Melzack, & Wall, 1965).

One of the most interesting models, this research will focus upon is the "fear avoidance model", which explains that fear of pain and avoidance reinforce each other because avoidance happens before the feared situation is experienced, thus, letting the patient develop wrong beliefs about the feared situation such as activity. Avoidance causes the patient to encounter pain experiences more easily as well as worsened pain through negative

impacts on muscles and the cardiovascular system. Patients get caught up in increasing avoidance, pain and disability caused by fear of pain (Vlaeyen, & Linton, 2000).

The "cognitive coping model" assumes that people actively process information (Skinner, Wilson, & Turk, 2012) to form beliefs, attributions and motivation resulting in mood changes and behavior (Jensen, & Turk, 2014). It is believed that physiological processes, feelings, thoughts and behaviors are interrelated and if one changes e.g. due to pain the others change with it. The goal of this model is to teach patients to control one of the components such as thoughts to change their coping with pain (Skinner, Wilson, & Turk, 2012).

Previous studies reveal that chronic pain has severe consequences for the life of the patients. The only way to enhance their situation seems to help them cope effectively with pain because it results in more appreciation of life and relationships, gain deeper personal insights and be more open for experiences, satisfied and optimistic (Owens et al., 2016).

Acceptance and Commitment Therapy

The positivity and deeper insights in oneself described in literature defying the helplessness and negative outlook of some chronic pain patients lets us assume that the patients have the ability to deal effectively with their pain in an active way (Plews-Ogan, Owens, & May, 2013). This positive development can be sustained by non-pharmacological treatment methods. One of them is the Acceptance and Commitment Therapy (ACT) combining behavioral, cognitive behavioral and mindfulness-based therapies. Patients develop psychological flexibility through the practice of ACT. Psychological flexibility means that the patient accepts painful experiences and engages in values-based actions. They learn to stop trying to control pain through accepting negative experiences, freeing them to focus as well as act on personal values in life (Hayes et al., 2006). Thus, it means to learn to cope with pain without trying to change it and accept it as something that is always present. Therefore, reducing pain intensity is not the major goal of ACT. (McCracken, & Vowles, 2014; Veehof, Oskam, Schreurs, & Bohlmeijer, 2011). Instead, ACT supports positive changes in emotions and cognitions as well as learning to change and regulate behavior effectively which is reached through seeing oneself from a more objective point of view (McCracken, & Vowles, 2014).

The following six core processes form the foundation of ACT: acceptance, cognitive defusion, being present, self-as-context, values and committed action. Acceptance means to

not struggle with pain but to accept it through experiencing internal sensations without judgement (Hayes et al., 2006). For chronic pain it means to accept the pain and not to desperately try to reduce it reducing pain interference with daily life (Veehof, Trompetter, Bohlmeijer, & Schreurs, 2016).

Cognitive defusion stands for the same nonjudgemental experience of thoughts over oneself, which reduces the threat of negative ones. Hereby, the person learns to be less sensible to negative thoughts, which is attained through changing the way how the person relates to them such as saving them aloud frequently until they lose their impact on the person. Self-as-context depicts the process of not attaching to one's experiences or thoughts. Seeing oneself more from a third-person perspective, reflecting on oneself, and being in the present moment helps to formulate clear and individualizes life values. Committed actions stands for setting concrete goals based on these clear values. These actions are established through defining short-, medium- and long-term goals. The goals teach the patient to change his behavior by staying committed to actions based on his values through identifying and overcoming inner barriers that naturally occur in behavior change. The patient learns to live based on his values and not based on barriers build by pain (Hayes et al., 2006). The committed actions are formulated in ACT to motivate the patient to stick to changed and more effective reactions to chronic pain (McCracken, & Vowles, 2014). The processes of acceptance, contact with the present moment, committed actions, self-as-context and cognitive defusion are integrated in psychological flexibility and counteract negative effects of chronic pain on the patient (Haves et al., 2006; McCracken, & Velleman, 2009). This flexibility accounts for enhanced general health and wellbeing in chronic pain patients such as better physical, emotional and social functioning with less suffering and physicians visits due to pain (McCracken, & Velleman, 2009).

Mindfulness is a process included in the Acceptance and Commitment Therapy (ACT). It is defined as an awareness of the present moment reached through concentration (Kabat-Zinn, 1982; Lichtenstein, 2016). Kabat-Zinn (1990) defines mindfulness as intentional awareness in an objective way, which allows for deep relaxation reducing stress, pressure, pain as well as acceptance of oneself (Shapiro, Carlson, Astin, & Freedman, 2006). It is a way to observe inner and outer experiences such as emotions, physical symptoms or thoughts to reduce their impact on the person through breaking automatic reaction patterns, which helps to gain better control over own actions and reactions to experiences (McCracken, Gaunlett-Gilbert, & Vowles, 2007; Frewen, Evans, Maraj, Dozois, & Patridge, 2008). This

openness, also called nonjudgement (Lichtenstein, 2016), helps to think about useful and effective ways of coping with e.g. pain (Shapiro, Carlson, Astin, & Freedman, 2006) without trying to avoid it (Baer et al., 2004).

Research on ACT expanded during the last years. It demonstrated that the therapy is effective for the treatment of anxiety, depression, quality of life, and pain interference, which allows patients to go on with the daily life even though pain is experienced. This supports the impression that patients learned to integrate ACT effectively in their daily lives and that accepting pain and negative sensations contributes to a more positive development of chronic pain patients (Veehof, Trompetter, Bohlmeijer, & Schreurs, 2016). In the long run, three years after the completion of ACT, chronic pain patients experienced positive developments in: depression, pain-related anxiety as well as physical and psychosocial disability. This enhanced emotional and physical health (Vowles, McCracken, & O'Brien, 2011). It can be seen that ACT includes a focus on cognitive behavioral and pure behavioral therapy since it teaches the chronic pain patient to examine and change inner psychological events such as emotions, thoughts and perceptions as well as his or her reaction to them. The focus on thoughts, feelings and behavior is executed because CBT assumes that wrongful cognitions lead to maladaptive behavior, which have both to be changed to result in effective strategies to live with pain (Hayes et al., 2006).

In conclusion, it becomes evident that Acceptance and Commitment Therapy includes effective aspects of different therapies in order to offer a broad range of strategies for chronic pain patients to learn to live with their pain experience.

E-health and the application 'NaDien'

In general, web-based eHealth interventions represent new treatment options, which are of importance for health professionals nowadays to make healthcare accessible for everyone everywhere.

The interventions delivered through the internet help patients with specific health problems such as depression, anxiety or chronic pain. To help patients maintain positive developments in the future, eHealth interventions include features to educate the patient and offer social support to help manage the disease effectively. These services contribute to changes in patients' reactions and cognitions regarding their suffering, enhance their selfmanagement through suggestions for effective health behaviors, lead to improvements in knowledge and quality of life, and promote maintenance of behavior changes as well as

reductions of the negative impact of pain (Kristjánsdóttir et al., 2013; Buhrman et al., 2013; Williams et al., 2013; Nevedal et al., 2013; Wantland et al., 2004; Murray et al., 2003; Ritterband et al., 2006).

Different studies on online ACT-based interventions support these findings by revealing to be effective in targeting problems chronic pain patients encounter such as hopelessness, interference of pain with daily activities, depressive feelings, pain intensity and catastrophizing - enhancing psychological flexibility and overall functioning (Buhrman et al., 2013; Trompetter, Bohlmeijer, Veehof, & Schreurs, 2014).

Web-based interventions produced better improvement in patients than offline interventions (Wantland et al., 2004). This positive effect of eHealth can be due to the facts that eHealth programs are tailored to the patients' needs, provide support for large user groups and other stakeholders, the information provided can be easily updated, costs for health services are reduced, and users can more easily stay in contact with other users and have more control over how they use the intervention (Kreps, & Neuheuser, 2010; Griffiths et al., 2006).

Moreover, different studies evaluated guidance by a health care professional offered next to eHealth interventions. They all supported the idea that feedback via telephone or email was experienced as helpful by patients because it enhanced their willingness to deal with pain, reduced disability, enhanced over-all health and the application was tailored to the patients' needs, and health professionals learned to better understand the patients' symptoms (Kristjánsdóttir et al., 2013; Buhrman et al., 2013; Trompetter, Bohlmeijer, Schreurs, & Veehof, 2014; Neverdal et al., 2013; Kearney et al., 2006).

Research shows that enhancements experienced during treatmentfor chronic pain often result in relapse into ineffective coping strategies such as avoidance after therapy completion because they lacked support after the treatment period at home (Fledderus, Schreurs, Bohlmeijer, & Vollenbroek, 2015; Wicksell et al., 2008). Therefore, eHealth interventions, such as 'NaDien' were implemented by Roessingh to prevent patients from falling back into avoidance behaviors (Roessingh, 2017b).

'NaDien' is an ACT-based application offered to patients after completing their therapy at Roessingh to support the maintenance of behavioral changes at home. The program offers features such as clarifying personal life values and committed actions, exercises based on ACT and mindfulness, tips that can be viewed and shared with other users for inspiration and a coaching option which offers the patient to remind him via SMS or email to motivate

himself to keep going and to use the program. These messages can be written by the patient himself for more individualized messages or they are written by a health care professional (Fledderus, Schreurs, Bohlmeijer, & Vollenbroek, 2015). E-health is a promising development to support chronic pain patients in living with a positive outlook. Interventions such as 'NaDien' support chronic pain patients in their development.

Chronic pain treatment at Roessingh

The effective therapeutic methods described above are also integrated in the chronic pain treatment at "Roessingh – centrum voor revalidatie", a rehabilitation clinic in Enschede, Netherlands. This clinic supports people suffering from chronic benign pain, lower back pain, fibromyalgia, neck and shoulder pain, and whiplash by helping to reduce the impact of pain on the patient.

The patient sets personal goals and further defines them with regard to treatment goals and values-based actions. Free periods during this phase enable the patient to try out the newly learned methods in his daily life (Roessingh, 2017a). The try-out can be executed in the safer environment of the clinical setting. Furthermore, patients are able to choose to participate in a group treatment which can help them to share their experiences with other patients and learn from each other. Different professionals guide the patient through the transition process (Roessingh, 2017a). In conclusion, Roessingh helps chronic pain patients enhance their life with pain with care tailored to the needs of the individual.

Current study goals and research questions

The goal of the current study is to explore user-experiences by chronic pain patients with the program 'NaDien' as well as their experiences with support by a human counselor offered in addition to the application to find out if the support will affect the usage of the application and their coping with pain. The analysis will cover topics such as which functionalities the pain patients did or did not use and how they experienced the support of the program and the professional. The goal is to gather in-depth information of chronic pain patients on whether guidance by a human counselor changed the usage of the program and how they evaluate all functionalities (especially the ones based on ACT). Based on the study goal and the literature review proving the helpfulness of eHealth, ACT and mindfulness for chronic pain - the following research questions arise:

1. "Does support by a human counselor affect the usage of NaDien and how are these evaluated?"

2."How do chronic pain patients evaluate the online aftercare program NaDien and its functionalities?"

3."How are the ACT-based features of the aftercare program: 'values & actions' and 'exercises' evaluated?"

4. "How does the aftercare app affect the daily life of patients with chronic pain?".

Methods

Design

The study about patient experiences with the application NaDien included a qualitative design. The participants were previously part of a RCT, whereby they were divided into two groups, one group that stayed in contact with a counselor at Roessingh while using NaDien and the other group using NaDien independently. Semi-structured interviews were executed.

Procedure

A psychologist (KMGS) adverted the study about NaDien to patients at the clinic, who finished their treatment. The participants gave their consent to participate in the study via email. The names and email-addresses were given to the researcher (CM). The researcher then contacted the patients via email informing them about the goal of the study, the anonymity of data usage, their willingness to participate, and that they are invited to give their opinion openly. A date that fitted the schedule of the patients, during five weeks in April until May 2017 was set and the patients were called via telephone. The interviews were conducted by following the semi-structured interview scheme (Appendix 1). The group in contact with a counselor at Roessingh as well as the group without contact were asked group-specific questions. The interview was done in Dutch in a quiet environment and recorded. The interviews took between 12 - 59 minutes. During the interview questions of the semi-structured interview questions of the semi-structured interview and recorded.

Intervention

The application NaDien was introduced to the patients during their last week of treatment by a psychologist and a counselor at Roessingh. The patients tried NaDien at home and could consult the psychologist and counselor when questions arose. The goal of the application was to support chronic pain patients in adhering to the behavioral changes accomplished during treatment. Patients met the counselor one time at Roessingh, whom they could contact via email as often as they wished and the human counselor responded one time per week. In case the participant did not send any emails, the counselor contacted the patient two times via email inviting them to respond.

The application consisted of six different components. The first component was "values and actions" consisting of writing down personal values and actions to clarify how to integrate them in daily life. Moreover, the user could represent in numbers how often specific actions were executed. The library offered inspiration; therefore, values and actions given in the library, could be added to a personal list.

The second component "How are you?" (monitoring functionality) encouraged the user to report behavior in accordance with personal values on a scale from 1 to 10. These numbers are presented in a bar chart with smileys to give the patient an overview of his adherence.

The third component "tips" consisted of "my own tips" where the patient wrote down tips for himself of how to cope with chronic pain and shared them with others. Furthermore, the patient could see the "Top 10 of the week", where he could look at the best tips of the week, give them a "thumbs up" and add them to his own list. The "shared tips" showed tips shared by others, which could be added to the "my own tips".

The fourth component "coach" made the user receive motivational messages once a week via SMS or email as well as after he filled out the "How are you?"-functionality. Further, he could be reminded via SMS or email that he should log in into NaDien after forgetting to use it for a week or use the "How are you?"-functionality. A third option the patient could choose to use was messages formulated by himself and sent to him once a week.

The fifth component was the "exercises" divided into "my exercises" where the patient could write down personal exercises and a plan of how to execute them and a "library" consisting of many exercises and plans that could be added to "my exercises".

The "frequently asked questions" included a list of symbols with their meaning as well as a handbook for the usage of NaDien.

Participants

The participants were included in the current study if they were above 18 years old, had finished an inpatient pain rehabilitation at Roessingh rehabilitation center, and used the aftercare program NaDien for three months or were currently using the application. A flow chart of the inclusion is given in figure 1.



Figure 1 Process of Including Patients in the Research Study.

The sample consisted of 9 participants, where all of them used at least one part of the program NaDien after completing their therapy at Roessingh. Three participants did not use the whole program after therapy but the experiences and opinions of all 9 participants were used for the analyses. All participants were Dutch. The age of them varied between 37 and 62 with a mean of 44.67 (SD= 22.91). Almost half of the group was male (N=4) and the other part was female (N=5). One group (N= 6) of the participants was in contact with a counselor at Roessingh during the time they used the program and the other group (N= 3) used the application independently.

Material

Data was sampled by a structured telephone interview to gather information about the patients' evaluation of the application NaDien and how it was influenced by guidance of a human counselor. The interview scheme is given in Appendix 1. The questions were based on

functionalities of the application NaDien and subdivided into four categories: the evaluation of the aftercare program, the effects of guidance on the evaluation, the evaluation of the ACT-features, and the effect of the program on the patients' daily living with pain.

The interview included information on the study, a short review of the information of the emails sent to the participants, and how the information given by the participants will be used. General information of participants such as age and gender were noted.

At first the participants were asked about their evaluation of guidance via email and support at Roessingh ("How did you experience the guidance via email in general?"). When the participants were not guided by a counselor they were asked about their independent usage ("After your treatment you used NaDien independently without guidance from Roessingh. How did you like this?").

After that, the evaluation and usage of all functionalities were elicited ("How did you experience using this feature?", "What did this feature bring you in return?"). When the participant did not use NaDien after treatment only "values and actions" and the "coach" were discussed due to that all participants have seen these functionalities during their first meeting with the functionality coach explaining the application to them. ACT-based functionalities were: "values and actions", "exercises" and how 'NaDien' affected behavioral changes made during therapy. The effect of the program on the patients' daily living with pain included answers to two questions about all functionalities ("Did this functionality affect your daily coping with pain?"; "Which effect? May I ask you to give an example?").

In the end, the patients were offered to suggest how the program should be further implemented by Roessingh and could add other remarks.

Data analysis

For the current study, a qualitative design was used. In the beginning, all interviews were transcribed. One interview was summarized because the patient was difficult to understand. After that, the transcripts were coded in Microsoft Word. The codes were designed based on the four categories. Because all patient answers could not be covered by the codes based on the categories a bottom-up approach was used, whereby based on the given data, codes were formulated including the following: "Other resources used" and "General experience of the program". The developed code scheme consisted of 23 codes with different sub-codes (see Appendix 3). The most relevant quotes best describing the code were used to illustrate the patients' evaluation of the application.

To answer the first research question the codes: "evaluation support values/coach", "evaluation of with guidance", "email contact", "evaluation of without guidance" were used. The second question was represented by the codes: "usage", "evaluation", "other resources", "opinion availability", "tips last week" were used. The third question included: "evaluation values & actions", "evaluation exercises". The fourth question was covered by: "coping with pain" and "adherence behavioral changes".

Results

Guidance at Roessingh and at home

Six of the nine participants received email-guidance by a health care professional from Roessingh while using the app at home. In general, guidance via email was scarcely used but mostly regarded as helpful, especially the practical tips included in the emails and knowing the human counselor was appreciated. Patients liked the personal support at Roessingh, which helped to use and understand 'NaDien'. All patients supported the idea of receiving guidance but some wished for more practical and personal support.

Five participants had a negative view regarding guidance and minimally used the functionality because of feeling strong enough to handle their situation alone (see Appendix 3), they used it only in emergencies, using it felt as an obligation causing stress and headaches and they wished for more direct communication with a human counselor they knew. One patient, being positive about the functionality, mentioned that the support by her human counselor was very comforting (see Appendix 3).

Four patients knew their human counselor from their treatment at Roessingh and mentioned to be very happy to be treated by someone who knew about them and their story because it helped to support them in difficult situations. Someone added, despite experiencing it as positive, that it was more difficult to write his problems down than talking to the counselor directly during treatment. Two patients did not know their counselor and mentioned as feedback that the contact was not personal enough but one said that it was no problem because the professionals will take all patients' problems seriously.

The emails themselves were experienced as helpful by three patients including good and practical tips that motivated to adhere to goals set during treatment and were easy to understand (*"Ik had elke keer bij de mail zijn gezicht erbij, beetje de stem erbij zoals of het gewoon echt gesprek was.",40*). One did not write emails because they were not helpful. Two

experienced them as negative due to short and impersonal answers, wishing for more personal contact.

Three participants would choose email contact, even though they experienced it as negative, because it made them feel safe and had a more added value than all other functionalities. Two, who would not choose the contact added that personal or more practical support would have been better such as an aftercare program organized at Roessingh. Moreover, the number of emails sent and received did not depend on negative or positive evaluations, making the usage and experience of the functionality strongly individual.

Three patients used the app on their own after treatment without receiving guidance via email. Two of them evaluated it as negative because they encountered problems with receiving the functionality coaches' messages, logging in or felt that the app did not help with negative feelings. They had wished for a function to receive tips by a counselor on how to go on (see Appendix 3).

Additionally, the rehabilitation center offered personal support with setting up the coach functionality and writing down values and actions during the last weeks of treatment to all patients using the application. The support was by almost every participant experienced as positive. The patients described the support as helping to understanding 'NaDien' and to better define personal "values and actions". Three different types were offered: support by a team leader, a psychologist or both.

Four out of nine patients were supported by one or two counselors, which helped three patients to understand the app and it was helpful, clear and well communicated. One patient mentioned that it was not practical enough, wishing for more personal and intense support (see Appendix 3). Further, three participants that were supported by a counselor and a psychologist experienced it as positive because the counselor offered more general support about how to use the app at home and the psychologist helped in depth regarding finding their personal values (see Appendix 3). Two patients wished to be supported by a counselor they knew. The smallest group, two out of nine, being supported by a psychologist experienced it as positive because it clarified their personal values.

To summarize, the overall guidance and the support were experienced as positive but it was wished for more personal contact and practical support. From now on, the two groups are discussed as one group because they did not differ greatly in their experiences of the program (for frequencies of usage and experience see Appendix 2).

Evaluations of the functionalities of 'NaDien'

To begin with the time of usage, the participants used the app between one and a half to four months. One without guidance did not use the app at all. 'NaDien' was used between only receiving messages by the functionality counselor to using it four times. The usage time per sitting ranged between 2-30 minutes in the group with guidance and between 30-150 in the group without guidance. One participant did not mention the time used per setting.

The patients were asked which features of the app they used most often, which helped them most to adhere to changes made in therapy at Roessingh. Three participants did not answer the question. The other six participants expressed that the most used and most helpful parts were "values and actions", including the "my own values", the "exercises", especially the "living according to one's values", the monitoring functionality "How are you?" and the "coach".

Five out of nine patients positively evaluated the program describing its added value to their daily life (see Appendix 3) as well as its ease of use and understanding it. Two experienced it as not having an added value for coping with pain or not being able to use it due to technical problems ("Dus die verbinding was volgens mij een beetje fout [...] en dat vond ik een beetje slordig", 62, without guidance), wishing for clearer explanations of how the program worked. Two patients, one from each group, did not mention their general experience of the program during the interview.

All patients agreed that it would be a good idea to make it accessible for everyone after completing treatment because they thought others will also experience it as useful and supporting.

Other parts of the app such as "How are you?", "Tips", "Coach", "Exercises" and "Frequently asked questions (FAQ)" will be analyzed in detail. All experiences with the subfunctionalities were coded according to being "positive experiences" that had an added value to the participant, "negative experiences" when it did not have any added value and "unique experience" when the experience could not be coded into positive or negative.

Four patients did not use the "monitoring functionality" because it lacked an added value. Three out of six with guidance experienced the "monitoring" as negative because it did not help them to see how good and bad days in coping changed due to that they were already aware of that but one wished to fill it out several times per day or night. One patient experienced it as helping to think deeper about the reasons for her feelings. Additionally, the "outcomes" were as well mostly without added value, except for one patient, who felt better

by seeing her improvement. Someone mentioned to be willing to add box for descriptions of the reasons for feelings to better understand fluctuations.

Two patients without guidance experienced the "monitoring" as positive, making them be more alert to their feelings. The learned to control themselves and realized that they felt better than expected. One found the overview to be a good reminder of feeling not as bad as expected, but for the other it had no added value. This let one assume that the usage and evaluation of this functionality depends strongly on the individual's needs.

One patient did not use the "tips" at all because he already knew how to think of tips for himself. The four users experienced "My own tips" as making them feel more aware and reminded them of helpful coping strategies. Especially *"mentale tips waren goed te gebruiken" (39, with guidance)* to start the day calm and more self-aware. The "Shared tips" were experienced as helpful because they were similar to the pleasant mindfulness exercises causing awareness. But one user, without guidance, experienced them as negative because he did not know how to use some of the tips stressing the importance of clearer explanations.

The only user without guidance of "Top 10 tips" said they helped to value her body and to be more aware of the moment. Only the "My own tips" and the "shared tips" were used by the group with guidance because other functionalities (emails and "values & actions") were helpful enough.

Two patients did not use the "Coach" because they did not know how it worked or it had no added value. The "motivating messages" and the "motivating messages after using the monitoring functionality" were not regarded as different parts by the patients because they described them altogether as motivating messages. Only one patient described that both were very helpful for her (see Appendix 3). Six out of seven users regarded the "motivating messages" as a good reminder to remember personal values and as a perfect match with their personality but the content was not always remembered.

Only one patient disliked that the messages written by someone else and the used abbreviations were confusing. Three patients wished for a button to change the timing of the messages and a function to contact the functionality coach.

The four users of the "reminder to use the monitoring functionality" said it raised awareness of own feelings and pain-experiences and made them habitually use 'NaDien'. Two patients added it did not help to use the monitoring functionality or was not used due to carelessness. Only two patients used the "self-written messages", reminding them that they

moved in the right direction. The other five were unsure about what to write or rather consulted a personal script from the therapy.

In general, the program was easy to use. Therefore, the majority did not use the "FAQ". Four patients used the "list of symbols" evaluated differently from being wellstructured and pleasant to negative because of mistakes and unique by only reading through it without really needing the explanations. Others did not use it because they already received guidance at Roessingh. The "user guide", only used by two people with guidance, was evaluated as being unclear in explaining the program adding that mistakes such as errors in messages should be corrected.

During the interviews, it appeared that some of the participants used "other resources" next to the app such as a GGZ-app, Youtube or a CD instead of the "exercises" because they did not work for them as intended or were not comprehensible. One person wrote down "values and actions" on paper because this was easier to use.

The patients mentioned tips to be realized during the last week of treatment such as offering guidance and explanations concerning the application. In a one-hour format, it should cover questions about the purpose and usage of all functionalities. They admitted that it would make 'NaDien' more approachable, practical and offer good support. Especially, the older generation, who are not used to computers would benefit.

ACT-features

Five out of nine patients wrote down their values and actions and most of them experienced it as stimulating because it confronted them with their most important values and helped to remember them in daily life. One patient mentioned that the feedback of the program was missing. Three others did not use the functionality because it was not meaningful or too demanding. It was wished for larger boxes to see them properly.

One patient with guidance experienced the "number actions" as negative because he did not see the goal of this functionality but two others without guidance, found it to be a good reminder for useful coping with pain. Others, who did not use this functionality, did not know why.

The "library", used by five people, inspired them to find new values to develop in a positive direction; it was easy to use and very personal. Only one patient did not know about the functionality and another one evaluated the examples as mismatches with his own values. It would have been a good idea to enable the user to personalize the values in the library.

The "Exercises" were only used by four patients because the others used their personal exercises set up during treatment, it did not work properly, they were unsure about what to write down in "My exercises" and preferred the library. Using "My exercises" was evaluated as a reminder to focus on oneself, to start being calm, to be good to your body and it helped to learn to live according to the exercises by writing them down. One patient with guidance used the "library" but mentioned that the offered exercises were not personal enough ("[..] net niet hoe het voor mijn situatie was.", 38, with guidance) In contrast to that, two patients without guidance evaluated it as helping to calm down and function better. Five patients negelected the "library" because the exercises did not meet their needs ("[..] omdat sommige oefeningen niet fijn waren in de app zoals [..] waarbij je op een stoel moet zitten terwijl je liever ligt", 39, with guidance).

Coping with pain

To see whether the application helped patients to cope with pain, "adherence to behavioral changes", as well as the effects of "values & actions", "monitoring function", "tips", "coach" on coping behavior were examined. The opinions of six patients about their adherence to behavioral changes due to the application 'NaDien' were positive, e.g. they remembered to focus on themselves and reflected more on how they behaved in daily life with their pain to do the right thing (see Appendix 3). For two patients, only the motivating messages were effective in tantalizing them to remember behavioral changes. Two participants did not say anything about how the app helped because they did not use the app that much. Only one person added that his behavioral changes only occurred due to having values and actions written down on paper. Thus, for most participants, at least one part of the application facilitated adherence to behavioral changes.

The functionality "values & actions", for the most part, positively affected coping with pain. Four patients recalled that writing down personal values and actions had a positive effect on their experience with pain such as remembering to take some rest, to be less stressed and focus on what they were taught in therapy. One in the group with guidance stated that it had no effect because the feedback of the program was missing.

For two patients without guidance, the "number actions done" helped them to better cope with pain ("Dan heb je dat beter in de hand.", 62) by stressing how to behave to feel less pain. It had no effect on the one with guidance: "Want ik zou echt niet weten wat ik hiermee zou moeten doen. Ik heb daar geen moeite mee maar ik haal daar ook niks uit" (38).

The "library" affected coping with pain in three users by making them calm down, focus on their values and get inspiration to further develop in the right direction (see Appendix 3). It had no effect on one patient.

The "montoring" of the "monitoring functionality" had no effect on pain for three users because it had no added value in coping with pain and the patients already knew how they felt without the functionality. Only two patients experienced it as helpful adding that it helped to reflect on why they felt as they did and changed behavior detrimental to coping with pain into more useful behavior. Someone else experienced it as not having an added value: "*Nee, dat heb ik gewoon ingevuld en dan denk ik: Nou, klaar.*" (62).

All users, five out of nine, did not notice any effect of the "overview" on their pain. One patient wished for a function to enter information about why he felt the way he did to learn from mistakes. The "My own tips" from "tips" had a positive effect for three people on handling pain such as learning to cope mentally with pain through staying calm, defining one's own limits such as getting to know what makes one feel better or worse. The "Shared tips" had an effect for two patients mentioning that seeing others use specific tips was inspiring to try them and helped to be more aware of one's coping strategies. For one the "Shared tips" had no effect because they did not match his wishes. The "Top 10" had only a positive effect on one patient without guidance helping to be aware of one's limits (*"En de tips halen me weer terug op de wereld. De voetjes op de grond.", 62*).

The "motivating messages" by the "coach" were by six patients experienced as inspiring to decide and do what was best for them ("[..] dan denk ik: Ja, daar hebben gelijk aan. Waarom doe je dat niet?", 62, without guidance) and to be less affected by pain. Only for one patient the messages were not personal enough. One patient added that the "motivating messages after using monitoring" helped to make the best decision for handling pain.

The "reminder to use the monitoring functionality" helped three patients to cope effectively by reflecting on their pain experience (see Appendix 3) or to respect their daily limits ("[..]Ik heb nog geen pijn? [..]Nou, dan ging ik gewoon door zodat ik 's nachts en de volgende dag niks ben. En dat ga ik dus nu niet meer doen."; 40, with guidance). For one person, it had no effect. The "self-written messages" motivated only one patient to be more active in coping with pain.

All four users described that the "exercises" helped coping with pain. The "My exercises" supported all three to create healthy moments of rest, made them understand and use the

exercises to experience the pain less as a burden. The "library" had a positive effect as well because they learned which exercises helped, e.g. especially the meditation exercises reduced the impact of pain.

Discussion

The current research tried to find out how the aftercare application 'NaDien' was evaluated by chronic pain patients. Receiving guidance by a health care professional was a useful source of support, but all participants, especially the ones without guidance, wished for more personal contact with a counselor they already knew, i.e. through phone calls. The emails included good tips for but should be more tailored to the patients' needs. All support offered to understand the program was helpful but should be more practical.

Generally speaking, the application 'NaDien' was easy to use representing a good interception after the treatment, which should be offered to all patients after treatment. Most functions only displayed subtle differences between the two patient groups, i.e. the group with support by a counselor and the group without support.

In general, all functions of the application were positively evaluated, e.g. the "tips" made patients more cognitively aware of coping strategies to ultimately alter their behavior. The ACT-functionalities ("values & actions", "exercises") reminded patients of their personal values in daily life and taught them to function better through focusing on their body. The "monitoring functionality" was more valued by the group without guidance. Next to the application patients consulted other apps/websites and methods for "exercises" and "values & actions". Some participants wished for clearer explanations of the whole program as well as a more structured user guide and practical guidance to better understand 'NaDien'.

In summary, the app was a good reminder in adhering to behavioral changes because mostly all functions had, in different degrees, an effect on helping the patients cope with pain. Moreover, functions such as "values & actions", "exercises", the "monitoring function" and the "coach" supported adherence to behavioral changes made in therapy. Most patients, encountered problems in adherence to behavioral changes because they still found themselves in the process of reflection on coping effectively, which went wrong in times.

Viewing the application 'NaDien' in a larger context illustrates that it supports the development of psychological flexibility in chronic pain patients, which makes it reach the goal of ACT-treatment (Hayes et al., 2012). It helped its users to be reminded of their personal values and values-based actions, accept pain more, which are processes of psychological flexibility that reduce the impact of pain on the patient (McCracken, &

Velleman, 2009). Thus, the application reminds the patient to focus more on the positive, despite the pain, and to reduce their attempts to control the pain (Roessingh, 2017b; Wicksell et al., 2008). Moreover, the individual support in assessing personal values was valued by patients not only in the current study (Wicksell et al., 2008). In addition, the mindfulness exercises reduced the burden of pain experiences because mindfulness can enhance wellbeing (Harrison, Lee, Goldstein, & Brooks, 2016) and helps monitoring e.g. emotions, thoughts and physical activity (Nes, Roach, & Segerstrom, 2009). The difficulties in adhering to behavioral changes in the current sample occurred due to patients who were currently making progress in overcoming avoidance by reflecting on their behavior and trying to act in ways to reduce pain, as explained by the "fear avoidance model" (Vlaeyen, & Linton, 2000). Changing beliefs to ameliorate behavior is a cognitive coping strategy (Skinner, Wilson, & Turk, 2012) employed by the current sample through 'NaDien'.

The need for online ACT-based programs becomes apparent because positive changes made during treatment are less present after treatment completion (Wicksell et al., 2008), making eHealth a support in upholding behavioral changes in the patient's personal environment such as at home. In addition, eHealth enables patients to monitor their health such as in chronic pain in real-time because the information can be easily made accessible for different health care professionals, without needing face-to-face visits that can be costly and time-consuming (West, 2012). Thus, eHealth technologies such as apps can effectively improve health care (De la Vega, & Miro, 2014). Moreover, ACT- and CBT-based online-interventions help chronic pain patients to enhance self-management abilities (Kristjánsdóttir et al., 2013), reduce depression, anxiety, distress (Buhrman et al., 2013), rumination, disability (Williams et al., 2013) and pain interference in their daily lives (Nevedal et al., 2013).

The current study underlined that emails including tips on how to cope with pain by a human counselor, supported chronic pain management but could be more personalized. This was shown to be effective in enhancing self-monitoring and acceptance in a study on a smartphone after-care app, where patients received tailored feedback the same day on diary entries about coping with pain (Kristjánsdóttir et al., 2013). Current participants wished for more practical support such as individual sessions to get used to the online-intervention, which was realized by Kristjánsdóttir et al. (2013) offering in-person nurse-patient sessions that proved to be supporting and useful.

Another self-help internet-based intervention offered chronic pain patients emailcontact with their personal therapist, who called the patients two times after completing part of the program to support their progress (Buhrman et al., 2013), which would as well be of added value for 'NaDien' because some patients wished to stay in contact with their personal therapist from Roessingh and wished for more individualized contact.

More support for the effectiveness of online ACT-treatment and especially the usage of mindfulness exercises and guidance via email once a week such as integrated in 'NaDien' was provided by "Living with pain" (Trompetter, Bohlmeijer, Schreurs, & Veehof, 2014). The current study adds to their findings that emails should be more personal and send more than once a week, individual coaching via telephone should be offered and users should be able to personalize the application. Nevertheless, "Living with pain" included a personal diary and the possibility to read the experiences of other ACT patients, which would be a valuable addition to the monitoring function.

Another study focused on online CBT-treatments supported the impression that in being tailored to the patients' unique needs through email-contact, providing feedback after filling out the program and individualized suggestions for exercises. The programs were experienced as more personal relevant, highly usable and had strong effects on the pain management and over-all health of the patients (Neverdal et al., 2013).

The current research is of added value to earlier bachelor theses. In the current study, most patients regarded 'NaDien' as well-structured and easy to use, which is underlined by earlier research stating that patients easily got used to the app (Roovers, 2013). Additionally, care providers assumed that ehealth should enable them to keep track of their patients' progress through personal contact, which was realized by the email contact current patients had with a human counselor, mostly experienced as useful. The guidance via email was realized because earlier research on the app suggested evaluations of support next to the intervention (Bolk, 2015). Professionals were rather worried that guidance could cause dependence on the therapist, contrary to the current findings, where patients longed to receive the most personal guidance possible.

More explanation of the application is needed in the last weeks of treatment. This idea was supported both by professionals (Kwakkenbos, 2015) as well as patients of the current study. Moreover, the program was easy to understand but still, the application should be introduced during treatment to help patients get used to it (Maklenburg, 2013). Some patients

did not fully understand 'NaDien'. Therefore, the application could only be used by some patients without support.

Strong and weak points of the current research study

There are several strong and weak points of the current research study. Strong points are that the qualitative nature of the current research including open questions enables patients to vividly describe their experience with the app more as a story helping the researcher receive valuable information on the patients' evaluations and opinions of 'NaDien', even though the number of participants is small (n=9). Their statements, encountered problems and recommendations can be used to ameliorate the usage of the app.

During the current research, weaknesses of the research method and in contact with the patients were detected. First, the research was conducted by one researcher, which makes it susceptible to an interpretation bias. To receive a higher inter-rater reliability, indicated by Cohen's kappa, more than one researcher should be involved. The German researcher might also have given words a different meaning than the Dutch participants. In the analysis process, it appeared that some interview questions on the "monitoring function" were misunderstood due to their close similarity. The answers of the participants were with respect to some features very unique, which made it difficult to code into one category.

As mentioned earlier, the patients were difficult to understand via telephone. To prevent this from happening the interviews should be conducted in person to better understand the users and produce more precise transcripts. Additionally, some patients misunderstood a question. This can be overcome by executing pilot interviews to avoid misunderstandings.

In the current research, the patients' answers were sometimes difficult to put into different categories to answer the research questions that might have happened due to the current topdown coding scheme, which should be more based on the content of the patients' answers than the research questions.

During the interviews, the participants mentioned the following recommendations that would enhance their experience of the usage of the application:

- Fill out the monitoring function more than one time per day
- Add a box to the "outcomes" of the monitoring function for notes about e.g. feelings or tips
- Include a management functionality of the "coach" to receive messages according to current needs

- Possibility to contact the coach by responding to the messages
- Offer patients guidance by their personal team leader next to their usage of the application
- Human support should be provided to everyone using the app
- Avoid faults in the motivating messages
- Enlarge the boxes for self-written values and actions
- Let patients personalize the values and actions in the library
- Health care professionals should mention that sharing tips might help other patients benefit from the personal tips

In summary, the usage and experience of the program 'NaDien' offers the individual user the opportunity to use the application in line with own needs and values, such as one of the patients concludes: *"Het ligt er maar net aan wat je er zelf mee doe ten welke behoefte je hebt. Je kunt er zoveel mee doen als je zelf wil." (39, with guidance)*. In general, eHealth aftercare interventions such as 'NaDien' provide users with effective support to cope with chronic pain. However, they should be carefully tailored to the users' needs.

References

- Association for the Study of Pain (IASP) (2016). Retrieved on 6.12.16 from: http://www.iasp-pain.org/files/Content/ContentFolders/Publications2/FreeBooks /Classification-of-Chronic-Pain.pdf
- Arends, R.Y., Bode, C., Taal, E., & Van de Laar, M.A.F.J. (2013). A Goal Management Intervention for Polyarthritis Patients: Rationale and Design of Randomized Controlled Trial. *BMC Musculoskeletal Disorders*, 14, 1-14.
- Baer, R.A., Smith, G.T., & Allen, K.B. (2004). Assessment of mindfulness by self-report: The Kentucky Inventory of Mindfulness Skills. *Assessment*, 11(3), 191-206.
 DOI: 10.1177/1073191104268029
- Breivik, H., Collett, B., Ventafridda, V., Cohen, R., & Gallacher, D. (2006). Survey of chronic pain in Europe: Prevalence, impact on daily life, and treatment. *European Journal of Pain*, *10*, 287-333. DOI: 10.1016/j.ejpain.2005.06.009
- Bolk, A. (2015). *De implementatie van NaDien Nazorgapplicatie voor chronisch pijnpatienten* (Bachelorthesis). Available from UT Publications.
- Buhrman, M., Skoglund, A., Husell, J., Bergström, K., Gordh, T., Hursti, T., Bendelin,
 N., Furmark, T., & Andersson, G. (2013). Guided internet-delivered acceptance and commitment therapy for chronic pain patients: A randomized controlled trial. *Behaviour Research and Therapy*, *51*, 307-315. DOI: 10.1016/j.brat.2013.02.010
- De la Vega, R., & Miro, J. (2014). mHealth: A strategic field without a solid scientific soul. A systematic review of pain-related apps. *PLoSONE*, 9(7). DOI: 10.1371/journal.pone.0101312
- Eccleston, C., & Crombez, G. (1999). Pain Demands Attention: A Cognitive-Affective Model of the Interruptive Function of Pain. *Psychological Bulletin*, 125(3), 356-366.

- Fledderus, M., Schreurs, K.M.G., Bohlmeijer, E.T., & Vollenbroek-Hutten, M.M.R. (2015). Development and Pilot Evaluation of an Online Relapse-Prevention Program Based on Acceptance and Commitment Therapy for Chronic Pain Patients. *JMIR Human Factors*, 2 (1), 1-12. DOI: 10.2196/humanfactors.3302
- Flor, H. (2014). Psychological Pain Interventions and Neurophysiology. *American Psychologist*, 69(2), 188-196. DOI: 10.1037/a0035254
- Frewen, P.A., Evans, E.M., Maraj, N., Dozois, D.J.A., & Patridge, K. (2008). Letting go: Mindfulness and negative automatic thinking. *Cognitive Therapy and Research*, 32, 758-774. DOI: 10.1007/s10608-007-9142-1
- Gaskin, D.J., & Richard, P. (2012). The Economic Costs of Pain in the United States. *The Journal of Pain*, 13(8), 715-724. DOI: 10.1016/j.jpain.2012.03.009
- Gemert-Pijnen, L. (2013). *The CeRHes Roadmap*. In: Gemert-Pijnen, L. (Ed.). (2013). Improving eHealth (pp.49-64). Den Haag: Boom uitgeverij.
- Griffiths, F., Lindenmeyer, A., Powell, J., Lowe, P., & Thorogood, M. (2006). Why are health care interventions delivered over the Internet? A systematic review of the published literature. *Journal of Medical Internet Research*, 8(2). DOI: 10.2196/jmir.8.2.e10
- Hardt, J., Jacobsen, C., Goldberg, J., Nickel, R., & Buchwald, D. (2008). Prevalence of chronic pain in a representative sample in the United States. *Pain Medicine*, 9(7), 803-812. DOI: 10.1111/j.1526-4637.2008.00425.x
- Harrison, S.L., Lee, A., Goldstein, R.S., & Brooks, D. (2016). Perspectives of healthcare professionals and patients on the application of mindfulness in individuals with chronic obstructive pulmonary disease. Patient Education and Counseling. In press. DOI: 10.1016/j.pec.2016.08.018

- Hayes, S.C., Luoma, J.B., Bond, F.W., Masuda, A., & Lillis, J. (2006). Acceptance and Commitment Therapy: Model processes and outcomes. *Behaviour Research and Therapy*, 44, 1-25. DOI: 10.1016/j.brat.2005.06.006
- Ilgen, M.A., Perron, B., Czyz, E.K., McCammon, R.J., & Trafton J. (2010). The timing of onset of pain and substance use disorders. *American Journal of Addiction*,19(5), 409–15. DOI: 10.1111/j.1521-0391.2010.00065.x
- Jensen, M.P., Turner, J.A., Romano, J.M., & Karoly, P. (1991). Coping with chronic pain: a critical review of the literature, *Pain, 47*, 249-283. DOI: 10.1016/0304-3959(91)90216-K
- Johannes, Le, Zhou, Johnston, & Dworkin (2010). The Prevalence of Chronic Pain in United States Adults: Results of an Internet-Based Survey. *The Journal of Pain*, 11 (11), 1230-1239.
- Kabat-Zinn J. (1982). An outpatient program in behavioral medicine for chronic pain patients based on the practice of mindfulness meditation: theoretical considerations and preliminary results. *General Hospital Psychiatry*,4, 33-47.DOI: 10.1016/0163-8343(82)90026-3
- Kabat-Zinn, J. (1990). Full catastrophe living. Using the wisdom of your body and mind to face stress, pain, and illness. New York, NY: Delta.
- Kearney, N., Kidd, L., Miller M., Khorrami, J., McGee, M., Cassidy, J., Niven, K., & Gray, P. (2006). Utilising handheld computers to monitor and support patients receiving chemotherapy: results of a UK-based feasibility study. *Support Cancer Care, 14*, 742-752. DOI: 10.1007/s00520-005-0002-9
- Kreps, G.L., & Neuhauser, I. (2010). New directions in ehealth communication:
 Opportunities and challenges. *Patient Education and Counseling*, 78, 329-336. DOI: 10.1016/j.pec.2010.01.013

- Kristjánsdóttir et al. (2013). A smartphone-based intervention with diaries and therapist-feedback to reduce catastrophizing and increase functioning in women with chronic widespread pain: Randomized controlled trial. *Journal of Medical Internet Research*, 15(1), 1-22.
- Kwakkenbos, K.T. (2015). NaDien: E-Health nazorg bij chronische pijn Onderzoek naar de implementatie van NaDien onder behandelaars van Het Roessingh (Bachelorthesis). Available from UT Publications.
- Magni, G., Moreschi, C., Rigatti-Luchini, S., & Merskey, H. (1994). Prospective study on the relationship between depressive symptoms and chronic musculoskeletal pain, *Pain, 56*, 289-197. DOI: 10.1016/0304-3959(94)90167-8
- Maklenburg, N. (2013). How do chronic pain patients and professionals assess the usability of the on Acceptance and Commitment Therapy based mobile application and website NaDien? (Bachelorthesis). Available from UT Publications.
- McCracken, L., & Velleman, S.C. (2009). Psychological flexibility in adults with chronic pain: A study of acceptance, mindfulness and values-based action in primary care. *Pain*, 148(1), 141-147. DOI: http://dx.doi.org/10.1016/j.pain.2009.10.034
- McCracken, L. M., & Vowles, K. E. (2014). Acceptance and commitment therapy and mindfulness for chronic pain: Model, process, and progress. *American Psychologist*, 69, 178–187. DOI:10.1037/a0035623
- Melzack, R., & Wall, P. D. (1965). Pain mechanisms: A new theory. *Science*, 150(3699), 971–979. DOI:10.1126/science.150.3699.971
- Molton, I.R., & Terrill, A. (2014). Overview of Persistent Pain in Older Adults. *American Psychologist*, 69(2), 197-207. DOI: 10.1037/a0035794
- Morley S. (2008). Relapse prevention: Still neglected after all these years. *Pain*, 134(3), 239–240. DOI: 10.1016/j.pain.2007.12.004

- Murray, E., Lo, B., Pollack, L., Donelan, K., Catania, J., & White, M. (2003). The impact of health information on the Internet on the physician–patient relationship: patient perceptions. *Archive of Internal Medicine*, *163*, 1727–1734.
- Nes, L.S., Roach, A.R., & Segerstrom, S.C. (2009). Executive functions, selfregulation, and chronic pain: a review. *Annals of Behavioral Medicine*, 37, 173-183. DOI: 10.1007/s12160-009-9096-5
- Nevedal, D.C., Wang, C., Oberleitner, L., Schwartz, S., & Williams, A.M. (2013).
 Effects of an individually tailored web-based chronic pain management program on pain severity, psychological health, and functioning. *Journal of Medical Internet Research*, 15(9), 1-19. DOI: 10.2196/jmir.2296
- Owens, J.E., Menard, M., Plews-Ogan, M., Calhoun, L.G., & Ardelt, M. (2016). Stories of growth and wisdom: a mixed-methods study of people living well with pain. *Global Advanced Health Medicine*, 5(1), 16-28. DOI: 10.7453/gahmj.2015.065
- Plews-Ogan, M., Owens, J.E., & May, N.B. (2013). Wisdom through adversity: Learning and growing in the wake of error. *Patient Education and Counseling*, 91, 236-242. DOI: 10.1016/j.pec.2012.12.006
- Ritterband, L.M., Andersson, G., Christensen, H.M., Carlbring, P., & Cuijpers, P. (2006).
 Directions for the Internet Society for Research on Internet Interventions (ISRII).
 Journal of Medical Internet Research, 8 (3). DOI: 10.2196/jmir.8.3.e23
- Roessingh (2017a). *Chronische pijn*. Retrieved on 23.02.2017 from: https://www.roessingh.nl/Revalidatie/Pijnrevalidatie/Chronische-pijn
- Roessigh (2017b). *Trends in de zorg*. Retrieved on 25.02.2017 from: https://www.roessingh.nl/over-roessingh/Trends-in-de-zorg

- Roovers, M. (2013). Het testen van de gebruiksvriendelijkheid van de mobiele nazorg app "NaDien", gebaseerd op Acceptance and Commitment Therapy, door chronische pijnpatienten, professionals en experts (Bachelorthesis). Available from UT Publications.
- Roth-Isigkeit, A., Thyen, U. Stöven, H., Schwarzenberger, J., & Schmucker, P. (2005). Pain Among Children and Adolescents: Restrictions in Daily Living and Triggering Factors. *Pediatrics*, 115(2), 152-162. DOI: 10.1542/peds.2004-0682
- Skinner, M., Wilson, H. D., & Turk, D. C. (2012). Cognitive-behavioral perspective and cognitive-behavioral therapy for people with chronic pain: Distinctions, outcomes, and innovations. *Journal of Cognitive Psychotherapy*, 26, 93–113. Doi:10.1891/0889-8391.26.2.93
- Shapiro, S. L., Carlson, L. E., Astin, J. A., & Freedman, B. (2006). Mechanisms of mindfulness. *Journal of Clinical Psychology*, 62, 373–386. DOI:10.1002/jclp.20237
- Trompetter, H.R., Bohlmeijer, E.T., Veehof, M.M., & Schreurs, K.M.G. (2014). Internetbased guided self-help intervention for chronic pain based on Acceptance & Commitment Therapy: A randomized controlled trial. *Journal of Behavioral Medicine*, 38(1), 66-80. DOI: 10.1007/s10865-014-9579-0
- Turk, D.C., & Rudy, T.E. (1991). Neglected topics in the treatment of chronic pain patients-relapse, noncompliance, and adherence enhancement. *Pain*, 44(1), 5-28. DOI: 10.1016/0304-3959(91)90142-K
- Übelacker, L.A., Weisberg, R.B., Herman, D.S, Bailey, G.L., Pinkston-Camp, M.M., & Stein, D. (2015). Chronic pain in HIV-Infected Patients: Relationships to depression, substance use, and mental health and pain treatment. *Pain Medicine*, *16*, 1870-1881.
 DOI: 10.1111/pme.12799
- Vlaeyen, J.W.S., & Linton, S.J. (2000). Fear-avoidance and its consequences in chronic musculoskeletal pain: a state of the art. *Pain*, 85, 317-332.

- Veehof, M.M., Trompetter, H.R., Bohlmeijer, E.T., & Schreurs, K.M.G. (2016).
 Acceptance- and mindfulness-based interventions for the treatment of chronic pain: a metanalytic review. *Cognitive Behaviour Therapy*, 45(1), 5-31. DOI: 10.1080/16506073.2015.1098724
- Veehof, M. M., Oskam, M. J., Schreurs, K. M., & Bohlmeijer, E. T. (2011). Acceptance-based interventions for the treatment of chronic pain: A systematic review and meta-analysis. *Pain*, 152, 533–542. DOI:10.1016/j.pain.2010.11.002
- Vowles, K.E., McCracken, L.M., & O'Brien, J.Z. (2011). Acceptance and valuesbased action in chronic pain: A three-year follow-up analysis of treatment effectiveness and process. *Behaviour Research Therapy*, 49, 748-755. DOI: 10.1016/j.brat.2011.08.002
- Wantland, D.J., Portillo, C.J., Holzemer, W.L., Slaughter, R., & McGhee, E.M.
 (2004). The effectiveness of web-based vs. non-web-based interventions: A metaanalysis of behavioural change outcomes. *Journal of Medical Internet Research*, 6(4).
 DOI: 10.2196/jmir.6.4.e40
- West, D. (2012). *How mobile devices are transforming healthcare*. Retrieved on 17.06.2017 from: http://www.insidepolitics.org/brookingsreports/mobile_health_52212.pdf
- Wicksell, R.K., Ahlqvist, J., Bring, A., Melin, L., & Olsson, G.L (2008). Can exposure and acceptance strategies improve functioning and life satisfaction in people with chronic pain and Whiplash-Associated Disorder (WAD)? A randomized controlled trial. *Cognitive Behaviour Therapy*, 37(3), 169-182. DOI: 10.1080/16506070802078970
- Williams, A.D., Blackwell. S.E., Mackenzie, A., & Holmes, E.A. (2013). Combining imagination and reason in the treatment of depression: A randomized controlled trial of internet-based cognitive-bias modification and internet-CBT for depression. *Journal of Consulting and Clinical Psychology*, 81(5), 793-799. DOI: 10.1037/a0033247

Appendices

Appendix 1

Interviewschema NaDien

Introductie:

Welkom bij het onderzoek naar de app NaDien. Mijn naam is Caroline Miethe en u heeft een afspraak met mij gemaakt. Ik heb gehoord dat u in de laatste weken gebruik heeft gemaakt van de applicatie NaDien.

Om het nog kort samen te vatten: Het doel van mijn onderzoek is om te ontdekken hoe u het programma NaDien ervaren heeft. U mag uw mening vrij uiten en alle gegevens worden anoniem verwerkt. U mag op ieder moment met het interview stoppen. Ons interview zal ongeveer 30 minuten duren. Ik zal graag het interview met u opnemen om het later terug te kunnen luisteren. Bent u hiermee eens?

Gedurende het interview ga ik u enkele vragen over uw gebruik van NaDien en de impact op uw pijn stellen.

Algemene Informatie:

Proefpersoon

Leeftijd:

Geslacht:

Het doel van NaDien is om te helpen bij het volhouden van wat u anders bent gaan doen en vast te houden wat u heeft geleerd in de behandeling.

In hoeverre vindt u dat dit is gelukt?

NaDien:

- 1. Heeft u na de interventie NaDien nog geopend? Ja
- 2. Hoe lang heeft u NaDien (in het geheel) gebruikt? _____
- 3. Hoeveel keer per week heeft u NaDien gebruikt? 4 keer
- 4. Hoe lang ongeveer per keer?

Heeft u email-contact met een begeleider gehad?

Indien wel email-contact: U heeft een begeleider gekregen die u met emails kan ondersteunen.

5. Hoe heeft u de begeleiding via email in het algemeen ervaren?

- 6. Zou u (meer) voorbeelden kunnen geven hoe de begeleiding heeft geholpen/ niet heeft geholpen?
- 7. Was uw begeleider een groepsleider die u al kende uit de behandeling? Wat vond u daarvan?

- 8. Hoe vaak heeft u een email gestuurd?
- 9. Hoe vaak heeft u een email ontvangen?
- 10. Wat vond u van de emails van uw begeleider?
- 11. Als u mocht kiezen, zou u dan wel of geen begeleider kiezen?

Indien geen email-contact: Na de behandeling gebruikt u NaDien zelfstandig, zonder begeleiding vanuit Roessingh.

12. Hoe vindt u dat?

NOG VRAGEN:

In de laatste behandelweek heeft u waarden en acties ingevuld en de coach ingesteld.

- 1. Heeft u daarbij ondersteuning gehad van een groepsleider of van een psycholoog?
- 2. Wat vond u daarvan?

Zoals eerder beschreven ga ik nu enkele vragen over uw gebruik van de nazorgapplicatie NaDien stellen.

Indien ja:

Mag ik u vragen om nog eens op NaDien in te loggen. Dan kunnen we de onderdelen stap voor stap samen doorkijken.

Welke onderdelen heeft u het meest van de applicatie gebruikt?

Welk onderdeel heeft u het meest geholpen in het vasthouden wat u in de behandeling heeft geleerd?

Welk onderdeel het minst?

Met welk onderdeel zullen we beginnen?

-	Waarden en acties en bibliotheek
	Waarden en acties opschrijven (voor duidelijker beeld van persoonlijke waarden en acties)
	Hoe vaak bepaalde acties gebruikt (om acties daadwerkelijk te doen)
	Bibliotheek (om meer acties te bekijken, acties aan eigen overzicht toevoegen)
-	Hoe gaat het?
	Aangeven in hoeverre naar eigen waarden geleefd (per dag, week)
	Overzicht bekijken (met smileys)
-	Tips en opsomming van tips (bibliotheek)
	Mijn eigen tips (zelf tips opschrijven, delen met anderen)
	Top 10 van de week (top 10 tips bekijken, tips liken, tips aan eigen lijst toevoegen)
	Gedeelde tips (tips van anderen bekijken, aan eigen lijst toevoegen)
-	Coach
	Motiverend bericht per week ontvangen
	Motiverend bericht nadat "Hoe gaat het?" werd ingevuld

Herinneren (herinnering per week, om de vraag "Hoe gaat?" in te vullen) Zelfgeschreven bericht ontvangen (zelf motiverende berichten schrijven)

- Oefeningen en bibliotheek
 Mijn oefeningen (oefeningen en stappenplan opstellen)
 Bilbiotheek (voorbeelden bekijken van oefeningen en stappenplannen)
 Veelgestelde vragen
- Veelgestelde vragen Symolenlijst doorkijken Handleiding NADien

Per onderdeel doorvragen:

1. Heeft u van alle functies van het onderdeel _____ gebruik gemaakt? Ja/ Nee

- Indien nee: Welke onderdelen heeft u niet gebruikt? Wat was de reden hiervoor?

Indien ja en voor de wel gebruikte onderdelen:

2. Hoe heeft u het ervaren het onderdeel ______ te gebruiken?

- 3. Wat heeft u het gebruik opgeleverd?
- 4. Heeft het onderdeel ______ en effect op uw dagelijkse omgang met pijn gehad? Ja/ Nee
 - Indien **ja**: Welk effect? Kunt u mij een voorbeeld geven?
- 5. Heeft u nog tips om het onderdeel te verbeteren?

Indien nee:

Mag ik u vragen om nog eens op NaDien in te loggen. Dan kunnen we twee van de onderdelen stap voor stap samen doorkijken. Als ik het goed heb begrepen heeft u tijdens uw behandeling "waarden en actie"s opgesteld en bij de "coach" aangegeven dat u motiverende berichten wilt ontvangen. Klopt dat? Dan zou ik deze graag met u door willen spreken.

Alleen op de volgende onderwerpen ingaan:

Waarden en acties:

1. Heeft u van alle functies van het onderdeel "waarden en acties" gebruik gemaakt?

- Indien nee: Welke onderdelen heeft u niet gebruikt? Wat was de reden hiervoor?

Indien ja en voor de wel gebruikte onderdelen:

- 2. Hoe heeft u het ervaren het onderdeel "waarden en acties" te gebruiken?
- 3. Wat heeft u het gebruik opgeleverd?
- 4. Heeft het onderdeel "waarden en acties" en effect op uw dagelijkse omgang met pijn gehad?
 - Indien **ja**: Welk effect? Kunt u mij een voorbeeld geven?
- 5. Heeft u nog tips om het onderdeel te verbeteren?

Coach:

1. Heeft u van alle functies van het onderdeel "coach" gebruik gemaakt?

- Indien **nee**: Welke onderdelen heeft u niet gebruikt? Wat was de reden hiervoor?

Indien ja en voor de wel gebruikte onderdelen:

- 2. Hoe heeft u het ervaren het onderdeel "coach" te gebruiken?
- 3. Wat heeft u het gebruik opgeleverd?
- 4. Heeft het onderdeel "coach" en effect op uw dagelijkse omgang met pijn gehad?
 - Indien **ja**: Welk effect? Kunt u mij een voorbeeld geven?
- 5. Heeft u nog tips om het onderdeel te verbeteren?

Tot slot

Roessingh wil het programma na het onderzoek beschikbaar stellen voor alle patiënten. Wat vindt u daarvan?

Wat raadt u aan om in de laatste behandelweek al te doen? NaDien in laatste behandelweek gebruiken?

Heeft u nog meer tips over de manier waarop dat moet gebeuren?

Heeft u nog opmerkingen die nog niet aan de orde zijn geweest?

Appendix 2

	Counselor known	Counselor unknown	Guidance in general
N total	4	2	6
Positive	3	1	1
Negative		1	5
Neutral	1		

Table 1.1 Evaluation of the Contact With a Counsellor

Table 1.2 Overview of Frequency of the Email Contact

Email by patient	Every week	Every 2 weeks	3-4x in total	2x in total	None
Sent	1	1	1	2	1
Answer by counselor	All	Not all	2-3x	None	
Received	3	1	1	1	

Table 1.3 Evaluation of the Content of the Emails by a Counsellor

	Yes	No	Not used
N total	5		1
Positive	3		
Choosing contact	2	1	
Negative	2		
Choosing contact	1	1	

Table 1.4 Evaluation of the Support With the Application Offered by Roessingh in the Last Week

Support		With guid	ance		Without gui	dance
	Ν	Pos	Neg	Ν	Pos	Neg
Human counselor	4	3	1			
Psychologist				2	2	
Both	3	3		1		

	In	sum		Per week		Per sitting		
	1,5-2	3 - 4	1x	2-4x	Only	2 - 30	30 - 150	
	months	months			messages	min.	min.	
					2x			
With guidance (N=5)	3	2	1	3	1	5		
Without guidance (N=2)		2	1	1			2	

Table 2.1 *Time of Usage*

Table 2.2 Usage and Evaluation of "FAQ", "Monitoring Functionality" and "Tips"

	With guidance						Without								
		Usag	e	Evalu	uation	Eff	Effect		Usage			Evaluation		Effect	
	Yes	No	Not used	Pos	Neg	Yes	No	Yes	No	Not used	Pos	Neg	Yes	No	
FAQ (N total)	3		3					1		2					
List of symbols	3			1	2			1	1		1				
User guide	2	1			2				2						
Monitoring functionality (N total)	3		3					2		1					
Monitoring	3			1	2	1	2	2			2		1	1	
Overview	3			1	2		3	2			1	1		2	
Tips (N total)	2		4					2		1					
My own tips	2			1		1		2			2		2		
Top 10		2						1			1		1		
Shared tips	1	1		1		1		2			1	1	1	1	

					With g	guidance					
		U	Isage		Evaluation				Effect		
	Yes	No	Not used	Nothing	Pos	Neg	Unique	Yes	No	Nothing	
N total	5		1								
Motivating messages	4	1			4	1		4	1		
Motivating messages monitoring	1			4	1			1			
Reminder	3	2			3		1	1	1	2	
Self-written messages	1	4			1			1			
				,	Without	guidance	e				
N total	2		1								
Motivating messages	2	1			2			2			
Motivating messages monitoring				2							
Reminder	1	1			2			2			
Self-written messages	1	1			1			1			

Table 2.3 Usage and Evaluation of the Functionality "Coach"

Table 3 Usage and Evaluation of the Functionalities "Values & Actions" and "Exercises"

					With	guidan	ce					Withou	ıt guid	ance		
			Usage)	Eval	uation		Eff	ect		Usage		Eval	uation	Eff	ect
		Yes	No	Not used	Pos	Neg	Yes	No	Nothing	Yes	No	Not used	Pos	Neg	Yes	No
Values & a (N total)	actions	4		2						2		1				
N C	Write down	3	1		2	1	2	1		2			2		2	
n a c	Number actions done	1	3			1		1		2			2		2	
Ι	Library	4			3	1	2	1	1	1	1		1	1	1	
Exercises (N total)		2		4						2		1				
N e	My exercises	2			2		2			1	1		1		1	
I	Library	1	1			1	1			2			2		2	

Appendix 3

Codescheme

Concepts codes	Codes**	Definition of code	Examples
belong to			
1. Guidance	1.1 Evaluation of with guidance	How guidance was evaluated in general.	"Ik vond het niet nodig. Ik ben daar gewoon sterk uitgekomen." (37, without*)
	Evaluation counselor known	How patients liked the contact knowing their human counselor.	"En dat, dus ik weet dat ik daar heel blij was dat ik na die tijd hem kreeg als begeleider." (40, with)
	Evaluation counselor unknown	How patients liked the contact not knowing their human counselor.	"Ik heb daar niet zo veel problemen mee als ik dan iemand nieuws of vreemds ontmoet." (40, with)
	1.2 Evaluation email contact	How patients liked the emails by their counselor.	"Ik had ook een hele fijne begeleiding[]. Ik kon daar altijd wat mee. Ik heb dat gewoon echt als heel positief ervaren."(40, with)
	Number emails sent	How often patients sent emails.	"In het begin elke week, en later om de week, om de 14 dagen." (39, with)
	Number emails	How often they	"Ja, elke week weer
	Choosing email contact	If patients would choose the email- contact again.	"It denk dat in de "Ik denk dat in de begeleiding meer zit dan in het programma asl ik zo eerlijk ben." (38, with)
	1.3 Evaluation of without guidance	How the independent usage of NaDien was evaluated.	"Met dus een hele gerichte praktische vraag van: Dit is het problem. Ik twijfel wat ik moet doen. [] En dan gewoon checken van: Is dat ook jouw idee?" (54, without)
	1.4 Evaluation support coach and values & actions	How the support at Roessigh with setting up the "coach" and "values & actions" was evaluated.	"Dat je [] zeg maar drie weken voordat je stopt, elke week iemand met jou even een uurtje daarnaar kijkt of jou iets meer begeleid."(40, with)

	Support counselor	How the support with the app by a counselor was evaluated.	"Oh, prima. Ik had een goeie bond met hem dus dat was altijd wel goed communiceren" (46, with)
	Support psychologist	How the support with the app by a psychologist was evaluated.	"[] ja een beetje perfectie maken [] om het precies af te stemmen zoals het voor mij goed zou werken"(38, with)
	Support both	How the support with the app by a counselor and a psychologist was evaluated.	"Ja, dat vond ik dus eigenlijk prima. Nou, dat vond ik wel prettig." (62, without)
2. Functionalities	2.1 Time		
	In sum	How long the app was used in total.	"Ja, ehm, ruim drie maanden." (40, with)
	Per week	How often the app was used per week.	"Twee-drie minute ofzo." (40, with)
	Per sitting	How long the app was used per time that it was opened.	"Ja, vairerend van een half uur tot een uur. Ik denk nu dat het een kwartiertje tot een half uur is." (46, without)
	2.2 Usage NaDien		
	Most used	Which functionalities were used the most.	"Als ik inlogde keek ik even bij warden en acties" (46, with)
	Helped most	Which functionalities helped the most in coping with pain.	"Ja, Hoe gaat het? En de warden en oefeningen." (38, with)
	Helped least	Which functionalities helped least in coping with pain.	"Ja, het waren vooral de tips en Hoe gaat het?" (46, with)
	2.3 Evaluation monitoring functionality	How "How are you?" was evaluated or why it was not used.	"Volgens mij heb ik de eerste weken een beetje ingevuld hoe het gaat maar ja het gaf mij geen meerwaarde." (46, with)
	Monitoring	How entering if the patient lived according to his values was evaluated.	"Ik voelde me daar ook wel prettig mee." (62, without)
	Overview	How the overview of the values entered of living in accordance with personal values was experienced.	"[] dan zie je daar van gezichten om het zo maar te zeggen. Ik haal daar niks uit"(38, with)

2.4 Evaluation tips	How the "tips" were generally evaluated or why they were not used.	"[] maar daarvan had ik zoeits van: Ja, de tipsja, dat ken ik. Dat zit weldat zit wel in me." (54, without)
My own tips	How writing down tips was evaluated.	"mentale tips waren goed te gebruiken" (39, with)
Top 10 tips	How seeing the top 10 was regarded.	"De tips halen me weer terug op de wereld. De voetjes op de grond" (62, without)
Shared tips	How the shared tips were seen.	"Ja, daar waren ook dingen die weldie hadden betrekking op mij en daar ik een aantal van neergezet." (40, with)
2.5 Evaluation coach	How the messages were evaluated or why they were not used.	"Volgens mij heb die berichten allemaal niet gehad [] zeg maar geen stok achter de deur, gehad." (40, with)
Motivating messages	How motivating messages were seen.	"Dat is niets wat op de ene van de manier blijft hangen" want "[]het is niet dat ik over de inhoud van het bericht zeg: Daar heb ik iets aan"(38, with)
Motivating messages after using monitoring functionality	How the praising messages after using the monitoring were evaluated.	"Ja ,en op het laatste moment ging het wel [] steeds beter en na ja en op gegeven moment had ik een zeven. Na ja, dat is heel mooi. [] Ja, en daar kreeg ik een heel hoop berichtjes op van: Ga zo door!"; (40, with)
Reminder to use monitoring functionality	How patients found the reminder to use the monitoring.	"Het was heel fijn om het programma op te starten en meer gewoonte te krijgen[]." (38, with)
Self-written messages	How patients felt to write their own messages.	"Nee, daar wist ik absoluut niet wat voor teksten ik erin moest zetten." (38, with)

	2.6 Evaluation FAQ	How FAQ were generally evaluated or why it was not used.	"Nee, heb ik geen gebruik van gemaakt. Ja, het was heel duidelijk." (46, without)
	List of symbols	How all listed symbols were evaluated.	"Dat vond ik ook wel prettig. Dan kun je nog wel eens even terugbladeren." (62, without)
	User guide	How patients evaluated the user guide.	"Ja, de handleiding is vrij beknopt []. Maar voor mij was het programma een beetje nog steeds vrij onduidelijk qua doel wat je daarmee kunt bereiken." (38, with)
	2.7 General experience of the whole program	How the whole program was evaluated.	Ik word helemaal losgelaten maar NaDien, het programma, vangt het goed weer op"(40, with)
	2.8 Opinion availability	How patients evaluated the idea to offer NaDien to other chronic pain patients after treatment.	"Ieder hulpmiddel wat je kan krijgen is natuurlijk goed"; (38, with)
	2.9 Tips last week	Which tips were given on how NaDien should be introduced during the last treatment week.	"En ik heb zelf de laatste week ervaren als echte afsluiting en ja eh die week telt mee als afsluiting en dan is dat weer een mooie stap om verder te gaan" (37, with)
	2.10 Other resources	Which other resources patients used in addition to the app and why.	"[]alleen maar lezen en dan denk je: Ja, oke. Maar wat is het precies? Hoe bedoelen ze dat? En dan is de uitleg daar niet." (62, without)
3. ACT- functionalities	3.1 Evaluation values & actions	How "values & actions" were generally evaluated or why they were not used.	"Nee. Ik vond dat ik het goed deed op mijn eigen manier[]." (37, with)
	Write down values & actions	How writing down personal values and actions was experienced.	"Dat je daar meer bij stil gaat staan, Dat je rustiger wordt." (46, without)
	Number actions done	How patients liked to enter in the program,	<i>"Meer bij jezelf blijven." (46, without)</i>

		which actions were done in accordance with personal values	
	Library	How examples of values and actions were liked.	"Die heb ik wel veel gelezen: Ja, die komt me wel bekend voor. Of die. Die is niet van toepassing op mij maar die wel." (40, with)
	3.2 Evaluation exercises	How the "exercises" were evaluated or why they were not used.	"[]tijdens de behandeling heb ik mijn eigen oefeningen waar ik me het meest prettig bij voelde [] geleerd." (46, with)
	My exercises	How entering personal exercises was liked.	"Met eigen oefeningen vulde ik dat in voor mezelf omdat ik dat al op het Roessingh behoorlijk had geleerd. Dan ging ik daar [] prima mee om." (62, without)
	Library	How examples of exercises were evaluated.	"[] dat heeft mij wel leren daarmee [pijn] om te gaan", (46, without)
4. Coping with pain	4.1 Effect on pain values & actions		
	Write down values & actions	If writing down values and actions helped coping with pain or why they had no effect.	<i>"Je schrijft de pijn van je af" (62, without)</i>
	Number actions done	If entering the usage of actions helped coping or why they had no effect.	"Want ik zou echt niet weten wat ik hiermee zou moeten doen. Ik heb daar geen moeite mee maar ik haal daar ook niks uit" (38, with)
	Library	If more examples supported coping with pain or why they had no effect.	"[] kom je andere dingen weer tegen waar je op dat moment tegen aan liep [] zo kom je gewoon verder"(46, without)
	4.2 Effect exercises		
	My exercises	If personal exercises supported coping or why they had no effect.	"Dat eh hoe beter ik met mij omga hoe minder ik daarin belast wordt." (38, with)

	If other examples for exercises had an effect or why they had no effect.	"[] door de meditaties ga je minder snel over je grenzen heen. Dus je wordt minder snel moe, waardoor je ook minder [] pijn hebt" (46, without)
4.3 Effect monitoring functionality		
Monitoring	If monitoring affected pain or why it did not.	"[] ook als ik instortte, ook even bewust bedenken van waarom voel ik me nou zo []" (40, with)
Overview	How the overview affected pain or why it did not.	"Ja, dat het pieken en dalen zijn. Maar da twist ik al van tevoren. [] Kan alleen maar aangevend dat ik slechte dagen heb en goeie dagen." (62, without)
4.4 Effect tips		
My own tips	If personal tips affected coping or why they did not.	"Jazeker. Je moet je eigen grenzen, die moet je gewoon voor jezelf aangeven." (62, without)
Top 10 tips	If the top 10 tips supported coping or why they did not.	"En de tips halen me weer terug op de wereld. De voetjes op de grond." (62, without)
Shared tips	If shared tips had an effect on handling pain or why not.	"En dan denk je van: Ja, die andere mensen doen dat ook en ik doe dat ook. Maar echte geode tips."(62, without)
 4.5 Effect coach		
Motivating messages	How the messages helped coping or why not.	"[] dan denk ik: Ja, daar hebben gelijk aan. Waarom doe je dat niet?" (62, without)
Motivating messages after using monitoring functionality	How the messages helped coping or why not.	"Dat was mooi, heel prettig. [] Ja, bewuster van geworden." (40, with)
Reminder to use monitoring functionality	How the reminders helped coping or why not.	"Ja, het was een geheugensteuntje. Het zet me toch aan het denken. [] Je gaat

			daar anders mee om" (62, without)
	Self-written messages	How the messages helped coping or why not.	"Dat zed an zichzelf kon motiveren om bijvoorbeeld te gaan lopen." (39, with)
	Adherence to behavioral changes	If and how the app helped to adhere to behavioral changes made during therapy.	"En ik pakte het weer op en ga gewoon weer verder. En dat ben ik nu aan het doen en dat gaat met vallen en opstaan." (54, without)
5. Other	5.1 Other statements	Additional statements patients gave that could later be used for additional information and that did not fit in any other category.	"Ik hoorde voordat ik begon van mensen die naar het Roessingh zijn geweest van: Oh ja, dat moet je niet doen. Je komt daar alleen maar slechter vandaan. Ik ging daar heel negatief in." (40, with)