Applying User Centered Design principles

Evaluating the use and implementation of an online supplement for weight loss treatment

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Contents

Abstract

Developing eHealth programs that comply with end-users needs and expectations and offer a good means of receiving care is a challenge for developers. Involving end-users in the development of eHealth programs offers possibilities to fit the program to the specific needs users have. By fitting the features and user friendliness to end-users' needs, users are better able to profit from the program's effect on the quality of care. By involving end-users throughout the development and evaluation phases, implementation and acceptation can be facilitated. Thus, evaluating programs on these aspects offers insight into the acceptation and perceived increase in quality of care. In this study, UCD principles are applied to the evaluation of an online supplement to weight loss treatment. During the pilot study dieticians and their clients used this program and participated in usability tests and interviews. Further, interviews and surveys were conducted. Also, actual use was registered in log files. These methods provided information on the target group characteristics, program functioning and user experiences, implementation issues, and the perceived quality of care. The results show that program functionalities, functioning, and implementation affect users' perception of the quality of care the program delivers. Involving end-users in the developmental process has proven to be of importance for successful program development.

Samenvatting

Het ontwikkelen van eHealth programma's die aansluiten op de precieze wensen en eisen van de eindgebruikers vormt een uitdaging voor ontwikkelaars. Door de eindgebruiker te betrekken in het ontwikkelingsproces van eHealth programma's kunnen deze beter aangepast worden aan de specifieke wensen en mogelijkheden van de doelgroep. Wanneer de functies en de gebruiksvriendelijkheid van het programma overeenkomen met de wensen van de eindgebruikers kunnen zij gemakkelijker profiteren van het effect dat het programma op de kwaliteit van de zorg heeft. Ook kan door eindgebruikers te betrekken in de ontwikkeling en evaluatie van programma's de implementatie en acceptatie van het eindproduct worden vergemakkelijkt. In dit onderzoek zijn UCD methoden gebruikt om de Dieetcoach, een online aanvulling voor gewichtsverliesbehandeling, te evalueren. Tijdens het pilot onderzoek maakten diëtisten en hun cliënten gebruik van het programma en deden zij mee aan gebruikerstesten en interviews. Ook werden interviews gehouden en vragenlijsten verspreid. Tot slot werd het gebruik van het programma geregistreerd in logfiles. De resultaten laten zien dat de functies, de werking en de implementatie effect hebben op de ervaren kwaliteit van de zorg wat het programma biedt. Het betrekken van de eindgebruiker in het ontwikkelproces blijkt van belang bij het succesvol ontwikklen van eHealth programma's.

Introduction

New technologies are increasingly being applied in health care and health communication. Technology can aid persons in exchanging health related messages and managing health and disease, especially when chronic care is concerned (Demeris & Eysenbach, 2002). eHealth can be used within healthcare in different ways, for example to increase patient self management. Also, different types of users can be involved in an eHealth application; patient self directed, patient focused with case manager linkage, patient focused with physician linkage, and clinician focused (LeGrow & Metzger, 2001).

Several examples exist of how eHealth is applied to the field of weight loss interventions. For example, interventions with or without personal (face-to-face) treatment were compared (Svetkey et al., 2008) and interventions aiming at short term weight loss and weight loss maintenance have been tested, all with promising results for eHealth (Rothert et al., 2006; Tate, Wing & Winett, 2001; Tate, Jackvony & Wing, 2003; Harvey-Berino, Pintauro & Gold, 2002). eHealth weight loss interventions seem to sort the best effect and the least participant dropout when eHealth is combined with regular, personal care and/or when the eHealth components are personalized or tailored (Tate, Wing & Winett, 2001; Tate, Jackvony & Wing, 2003; Glasgow et al., 2007b; Oenema, Brug & Lechner, 2001). Thus, eHealth possibilities are promising, but some hurdles have to be cleared before online programs can be implemented, accepted and used by its intended target group.

User characteristics that influence use

For eHealth programs to be used correctly and thus sort the desired effect, good program design and implementation strategies are necessary. Developers should look further than the program's content alone, because several barriers can obstruct eHealth use and thus prevent the user from reaching and learning the treatment's content, such as users' computer/internet access and skills, motivation, attitude, beliefs about relevance, usefulness, and privacy, and cost in time and money (Bush, Bowen, Wooldridge, Ludwig, Meischke & Robbins, 2004; Brouwer, Oenema, Crutzen, de Nooijer, de Vries & Brug, 2008; Glasgow, 2007a; Nijland, 2009; Gallant, Irizarry & Boone, 2009).

Internet access, and more specific health-related internet access, is comprised of two components according to Bush and colleagues: connectivity and human interface (Bush, Bowen, Wooldridge, Ludwig, Meischke & Robbins, 2004). The first, connectivity focuses on access to and the quality of hard- and software to use the internet. Human interface is defined by factors as language, literacy, or eHealth literacy, education, race, ethnicity and culture, income, disability, age, experience and familiarity, and skill and training (Gerber et al., 2005; Norman & Skinner, 2006a; Bush, Bowen, Wooldridge, Ludwig, Meischke & Robbins, 2004).

Besides these background- or *factual* factors that explain access to eHealth, attitude, motivation, and other *psychological* factors have to be considered (Tate & Zabinsky, 2004). Persons can differ in their appreciation of the internet, their motivation to use it, and their confidence or self efficacy (SE) to use it correctly (Bush et al., 2004; Brouwer et al, 2008). Also, motivation to accomplish (treatment) goals may influence eHealth use and its effect (Tate & Zabinsky, 2004; Glasgow et al., 2007b). More specifically, motivation plays an important role in visiting an online treatment website, but originates in attitude, perceived behavioral control or self efficacy, and other psychosocial constructs (Brouwer et al., 2008). In addition, patients' and care providers' beliefs may influence their motivation and intention to use eHealth: trust in the reliability, privacy and confidentiality of eHealth can function as barriers (Anderson, 2007).

Knowing the end-users' internet access levels and possible psychosocial barriers are important when designing interventions and eHealth programs, in order to ensure the program can be implemented, adopted, and used effectively. But how can designers take into account the specific wishes and characteristics of their end-users throughout the development process?

User Centered Design

As mentioned before, research has shown that eHealth can be just as effective as regular communication means within treatment, but access and psychological factors can be obstacles. User Centered Design (UCD) may offer eHealth designers a means to evaluate and adjust their products to specific end-user wishes and needs and by this, facilitate implementation and acceptance (Stone, Jarret, Woodroffe, & Minocha, 2005; Glasgow, 2007; Mauro & Bernaldo de Quiros, 2009). In addition, involving the end-users and program stakeholders in different ways during the evaluation improves the quality, usefulness, and effectiveness of the end product (Eng et al, 1999). Product or program evaluation should take place throughout the different stages of development; during the design phase, the implementation phase, and the assessment and refinement phase evaluation is needed (Eng, Gustafson, Henderson, Jimison & Patrick, 1999). UCD methods offer a means to accomplish such evaluation:

In UCD, developers adjust the design to the wishes, needs, limitations, and skills of the end-users. The end-user, or patient when eHealth is concerned (Patient Centered E-Health Design, PCEH), can be involved in the developmental and evaluative process in several ways. Mauro and Bernaldo de Quiros (2009) describe several research methods fit for PCEH. In early stages, applying contextual inquiry, ethnographic studies, and questionnaires provides information about the user's needs and environment. These methods try to reveal the user's situation or background by asking about and/or observing it. When a design or prototype has been made, a cognitive walkthrough and/or usability tests give information about the functioning and appreciation of the design/prototype. A cognitive walkthrough is done by executing tasks while using the prototype/design and registering which precise actions are needed to reach

the goal (completing the task). This renders information about possible unclearness in the design or malfunctioning of the prototype which may be further tested in usability tests. During usability tests end-users are asked to perform tasks with the prototype which are audio-visually registered by means of video equipment or software, and later analyzed. These tests give insight into the way users use the prototype. In addition, applying think-aloud protocols gives insight into users' appreciation of the prototype and other thoughts because it requires users to express their thoughts verbally while performing the tasks (Mauro and Bernaldo de Quiros, 2009; Kaufman et al., 2003; Kushniruk & Patel, 2004). These methods are often applied to adjust designs or prototypes to end-users skills and wishes. Often, these users are considered the patients, even though researchers stress the importance of involving all stakeholders throughout the development and evaluation process (Eng et al, 1999).

Acceptation and implementation

Using UCD principles can and should thus be applied not only during the design phase of eHealth programs, because applying UCD principles can also aid adaptation and implementation (Eng et al, 1999). All stakeholders, thus not solely end-users, should be involved in program development and evaluation (Glasgow, 2007; Stone, Jarret, Woodroffe & Minocha, 2005; Eng et al, 1999). Researchers have shown that different aspects are of importance for future eHealth users. Gallant, Izarry and Boone (2009) propose constructs from the Technology Acceptance Model and the UCD approach to describe why users adopt eHealth. Usefulness, ease of use, trust, privacy and personalization are important in possible users' acceptance of eHealth (Gallant, Izarry & Boone, 2009). A study on usability and acceptance of eHealth programs has shown that users (patients and care providers) judge programs on their content, presentation and interactive components, and trustworthiness (Kerr, Murray, Stevenson, Gore, & Nazareth, 2006).

Even though eHealth programs need to fit all end users' capabilities and needs and overcome barriers relevant to them, care providers play a key role in the implementation process; they take up the eHealth program as a part of treatment and offer it to the patient. Or, as Whitten & Mackart (2005) put it, they are gatekeepers of eHealth. For care providers, additional considerations to those mentioned above may play a role in accepting and using eHealth, such as costs and reimbursements, incentives, compatibility with current practice methods and possibility to exchange data with others and other programs, the program's complexity, ease of use, and reach or acceptance among patients (Tate & Zabinsky, 2004; Whitten & Mackart, 2005; Anderson, 2007; Demeris & Eysenbach, 2002). In addition to these possible barriers, insufficient training, privacy concerns, perceived clinical usefulness, insufficient cooperation between developers and health care personnel, and a perceived increase in workload were identified in a study on general practitioners' attitude towards eHealth (Richards, King, Reid, Selvaraj,

McNicol, Brebbner, & Godden, 2005). Lastly, considering the dynamics of diffusion of innovation, as described by Cain and Mittmann (2002), can help understanding implementation and acceptation issues. Among other things, the relative advantage of the program needs to be addressed to ensure acceptation. Also, good instructions and being able to try out a new program and observing others using it can increase acceptation likelihood (Cain & Mittmann, 2002).

During the evaluation of the implementation process, multiple UCD methods can be applied and complement each other to gather a variety of information about the programs' user-friendliness, the way it is used, and whether it meets user demands (Greene, Caracelli, & Graham, 1989; Eng, et al., 1999; Nijland et al, 2009). By involving users, the implementation strategy can be adjusted to the needs and demands of future users.

Thus, to ensure no barriers obstruct the implementation process, an implementation strategy that addresses the above mentioned barriers and dynamics is necessary. For example, care providers need to be informed about the program's intended target group. Based on the above possible barriers to eHealth adaptation and implementation, sufficient instructions for all end users are indispensible for correct use and acceptation. Observing others using it, or being able to try out the program can help during this first introduction. Also, the program's costs and possible reimbursements need to be addressed. Further, changes to the care providers' and care receivers' equipment or work procedures may be necessary for a good fit into current practice methods. In addition, the program needs to fulfill users' wishes regarding ease of use, trust and security, usefulness (functionalities), and content (Richards et al., 2005; Whitten and Mackart, 2005; Gallant, Irizarry, Boone; Cain & Mittman, 2002; Epping-Jordan, Pruitt, Bengoa, & Wagner, 2004; Anderson, 2007).

Weight loss intervention

Combining the usual (behavioral) treatment with an online program can lead to greater treatment compliance and better self management (Tate & Zabinsky, 2004; Nijland et al., 2008). Further, regulations from the KNMG (Royal Dutch Society for the advancement of Medicine) prescribe that physicians can only use eHealth as an addition to (the usual) face-to-face treatment (KNMG, 2007). Dieticians are also held by this standard regarding eHealth. Thus, eHealth cannot (legally) replace medical or professional treatment but can be used to complement it. The eHealth application central to this study offers dieticians a means to provide their clients an online program, the Weight Loss Coach (WLC, original Dutch name is 'Dieetcoach') in addition to the usual weight loss treatment. The factors related to eHealth use; the factors involved in the development and implementation of an eHealth program can be viewed as follows:
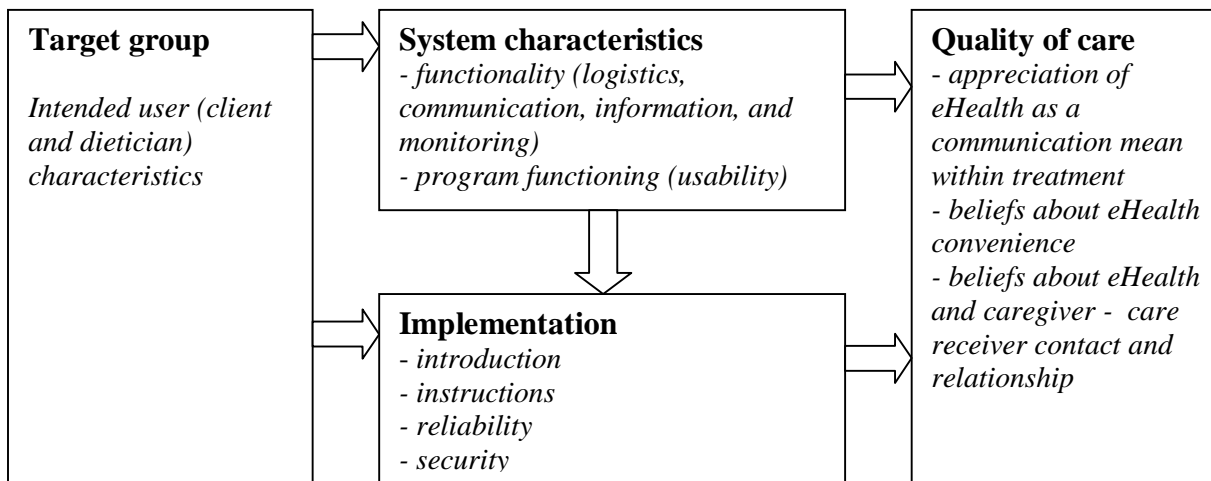
Figure 1. schematic overview of factors related to implementation and acceptation

First, an understanding of the intended target group (end users) needs to be gained by determining the characteristics of the target group. These characteristics include background, literacy, eHealth literacy, computer access, computer skills, (co)morbidity, motivations, (treatment) self efficacy, and satisfaction with care.

Based on the end-users' needs, a program can be designed. The system can have certain functionalities such as (1) a logistical function: exchanging data, offering assignments, etc. Also, (2) the system can offer a means of communication: clients and dieticians can interact via the system (ask questions, send email, and give feedback). Another function can be (3) providing information: the system gives information via general texts, assignments, or automatic feedback. Monitoring (4) is a function that enables clients and dieticians to keep track of variables important to determine progress. For example, weight, mood, or physical activity levels can be kept and reviewed via the system. In addition to the system's functions, usability influences future use. The level of user-friendliness and the way the system is operated needs to be adjusted to the end-users wishes and abilities.

The implementation strategy depends from the systems' characteristics and user characteristics and demands. For example, when the system is user friendly, when it is easy to learn how to operate it, and users have sufficient computer skills, few instructions are needed. Also, users' expectations about security and the way this is expressed in the system (e.g. by secured log in) determines if security concerns will hinder implementation.

The system characteristics and the way it is implemented together influence how the quality of care via this eHealth program is experienced. For example, a system can have all relevant functions, but when insufficient instructions are given, users will be unable to use it and experience the beneficial effects on care. Vice versa, a program can be implemented perfectly, but when users feel the program is not user friendly or when essential functions lack, the program adds little to the experienced quality of care. The elements of the framework and their interdependence are researched by applying UCD principles to the WLC and result in research questions that are described in the next paragraph.

Research questions

The goal of this study is to gain insight into the background, motivations and expectations of both users and non-users of the WLC. Also, WLC use is researched to determine user appreciation of the WLC, and to provide insight into usage problems and necessary improvements for the WLC. Furthermore, (future) users' wishes and prerequisites regarding implementation process of an eHealth program are investigated. The following research questions were formed:

1. What are the WLC user characteristics?

For clients this includes background, level of computer literacy, eHealth literacy, and general literacy, motivations for use or non-use, expectations, self efficacy regarding treatment and treatment goals.

Dietician characteristics include level of computer literacy, eHealth literacy, and general literacy, motivations for use, and expectations.

2. How do users experience working with the WLC?

The experience is expressed by appreciation of the functionalities, possible changes in judgment with increasing experience, the level of fulfillment of expectations, possible difficulties encountered during implementation, and suggestions for improvement users have.

3. Which aspects play a role in the implementation and acceptation of the WLC?

What expectations and demands do future users have regarding the introduction, functionalities, effectiveness, advantages, disadvantages and the target group?

4. In what way contributes the WLC to the treatment according to users?

What does the WLC offer in terms of motivating clients, getting clients actively involved in their treatment, interaction possibilities between client and dietician, and impact on their relationship.

Methods

Setting

From January 2009 until June 2009, three dieticians of healthcare organization Thebe used the WLC during a pilot phase. These dieticians were involved in the development of the WLC and were stimulated to use the WLC in their daily practice. Their clients were opted the WLC by their dietician as an addition to the regular treatment and twelve clients agreed to use the WLC. The dieticians and their clients were located in and around the city of Tilburg (the Netherlands). Interviews and usability-tests took place at the dietician's office or in the client's home.

Program description

The WLC is an online program which is used as a supplement to regular (face-to-face) weight loss treatment by dieticians. At the time of the study, the program was available exclusively to dieticians and clients of healthcare organization Thebe. Dieticians offer clients who need to lose weight the WLC instead of the regular pen and paper assignments. WLC using clients receive the same amount of face-to-face guidance as clients who do not use the WLC. During the face-to-face consults assignment results and treatment progress are discussed, so clients do not rely on online or automatic (WLC) feedback solely.

During the first consult the dietician explains what the WLC is and asks the client if he or she wants to use it. Subsequently, the dietician creates a new user account and gives the client a login name and password. Besides login information, users need a computer with internet connection to access the WLC. The home page (see Figure 2) can be accessed without logging in.

Figure 2. WLC front page

The WLC has several functionalities; logistics (data or assignment exchange), client-dietician communication, provision of information, and monitoring. The functionalities are translated into several features. The main WLC components are discussed briefly: the home page offers different sorts of information; Tips, News (weight loss related), Facts and fables, and the WLC demo. After clicking on one of the tabs, dieticians and clients enter the secured area by entering in a username and password. Depending on the type of user (dietician/client), menu options appear in tabs. Figure 2 shows the (default) client options: Home, My page, Nutrition diary, Exercise plan, Assignments, Progress, and Email and calendar. Via these menu options, clients can access different assignments that aim at giving information, insight into behavioral or emotional patterns, or suggestions and tips on adopting a healthier lifestyle. An example of an assignment can be seen in Figure 3. The assignments can be sent to the dietician when they are finished and the dietician can then give the client standardized or personal feedback via the built-in feedback option or by sending an email. Clients and dieticians can keep track of the client's progress via charts and overviews. With the email function, clients can exchange email messages with their dietician.

The dieticians' secured page consists of a calendar and email box, and a client overview. Dieticians can check each client's use or treatment status by opening the client's page, where they can also open new assignments or give feedback (see Figure 4 for a client overview). Dieticians can offer guidance to clients via email, by giving feedback or hints, or by commenting on progress. Lastly, dieticians can create new user accounts for new clients and dieticians. Not functional yet are the text

messages alerts and the export function which should allow dieticians to export client files to locations outside of the WLC.

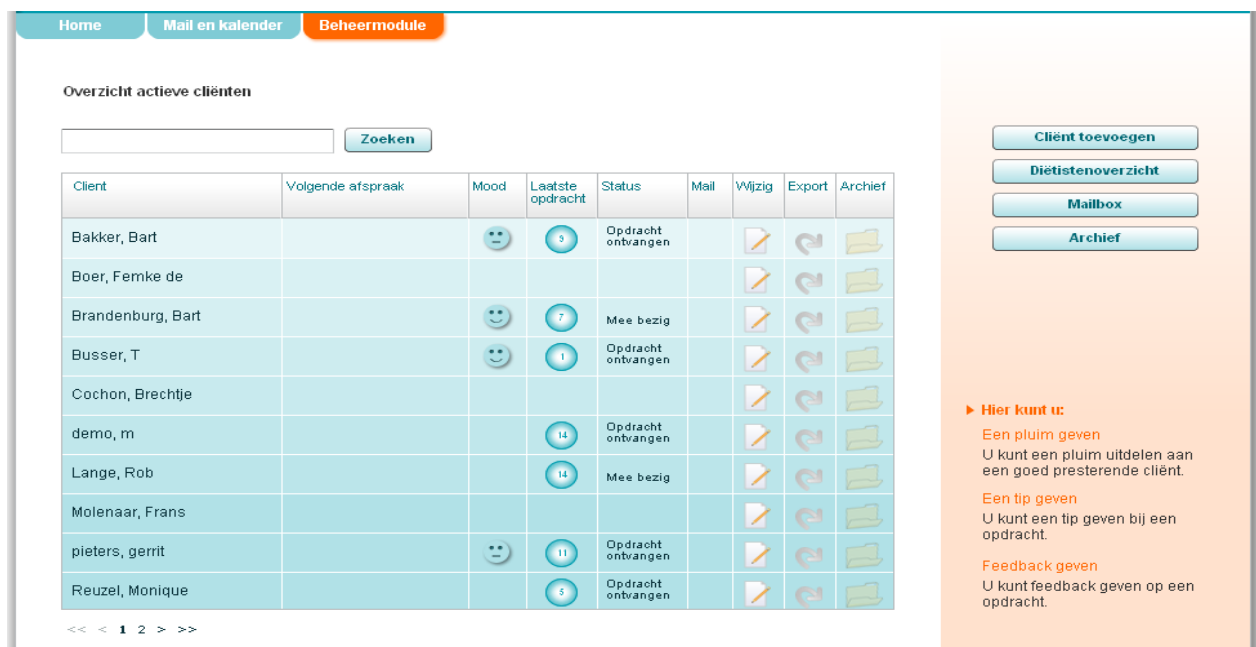Figure 3. WLC assignment example: the Snack checker

Figure 4. Example of a client overview (for dieticians)

Recruitment

Dieticians selected clients that were eligible to participate in the pilot based on age, computer experience, and morbidity (receiving weight loss treatment). These clients were informed about the project and the possibilities of the WLC by their dietician. Also, they were told that the project was in a developmental phase and that they could, by using the WLC and participating in the study, contribute to its development. All 13 clients who used the WLC and the 3 dieticians involved in the development of the WLC were approached by the researcher to participate in the study. All 3 dieticians and 7 clients agreed to participate. Dieticians who had no knowledge of the WLC project were approached by phone or email to invite them for an interview. Further, clients of healthcare organization Thebe who did not use (or chose not to use) the WLC were involved in the study through a survey on direct invitation of their dietician.

Subjects

In this study, multiple methods were used within, and between different groups of subjects. First, a division was made between subjects who use (or had used) the WLC (users), and subjects who do not use the WLC (non-users). These users and non-users can be further divided into two categories: dieticians and clients. The usability test sample was based on convenience, because of the restricted availability of the WLC for dieticians and clients at the moment of the study. In addition, a questionnaire was distributed among all clients of the participating dieticians (also clients who did not participate in the pilot study and had no experience using the WLC). Dieticians with no knowledge of the WLC (non-user dieticians) were approached for interviews.

Table 1 shows general characteristics of all participating subjects (participating in usability tests, interviews, or survey). Overall, more women than men participated: 34 women and 8 men. The participants' age ranges from 21 to 74 years old, with an overall mean of 48.6 years. Almost all subjects use the internet and have an internet connection at home (respectively 92.9% and 97.6%), group specific figures show that not all non-user clients use the internet (88.5% use the internet) and nearly all have an internet connection at home (96.2%). Further, eHealth literacy was measured with the eHealth Literacy Scale, EHEALS (Norman & Skinner, 2006b), the subjects score on average 3.5, on a scale of 1 to 5 (1 is low and 5 is high eHealth literacy). Table 1 shows that dieticians score slightly higher on eHealth literacy than clients: 4.1 and 4.0 versus 3.4 and 3.5.

Table 1. Subject characteristics

	N	% Female (n)	Mean age (sd)	% use internet (n)	% internet at home (n)	eHealth literacy mean
Dieticians (user)	3	100 (3)	38.3 (12.9)	100 (3)	100 (3)	4.1
Clients (user)	7	85.7 (6)	40.0 (12.8)	100 (7)	100 (7)	3.4
Dieticians (non-user)	6	100 (6)	40.7 (14.7)	100 (6)	100 (6)	4.0
Clients (non-user)	26	73 (19)	54.0 (13.5)	88.5 (23)	96.2 (25)	3.2
Total	42	81.0 (34)	48.6 (14.8)	92.9 (39)	97.6 (41)	3.5

Mixed methods

By using different methods (see Table 2), a variety of data was collected about the usability and implementation of the WLC (Greene, Caracelli, & Graham, 1989; Eng, Gustafson, Henderson, Jimison, & Patrick, 1999). Usability tests were administered to gain information about the user friendliness of the WLC and user experiences. Also, the usability tests rendered cues for refinement of the program based on the difficulties clients and dieticians encountered when interacting with the WLC (Kushniruk & Patel, 2004).

Questionnaires were distributed among users and non-users of the WLC to retrieve information about users and non-users such as computer/internet use, motivation and self efficacy levels, WLC experience, appraisal of WLC characteristics and functionalities, motives and intentions for use or non-use (Nijland et al., 2005; Glasgow et al., 2007a; Glasgow, 2007b). eHealth Literacy was measured with the eHealth Literacy Scale (Norman & Skinner, 2006b) and eating self-efficacy was measured on a three item scale adapted from Wamsteker and colleagues (2005).

The usability test session (for WLC users; dieticians and clients) was concluded with an interview. These interviews provided in-depth information about the proceedings and results of the usability test, and the responses in the questionnaire that was filled in at the beginning of the session. Probing was done on issues such as satisfaction, functioning, trust, and impact on treatment. Interviews

were also held with non-user dieticians to discuss reasons and prerequisites to WLC and more generally eHealth use (Richards et al., 2005; Whitten & Mackart, 2005; Gallant, Irizarry, Boone; Cain & Mittman, 2002; Epping-Jordan, Pruitt, Bengoa, & Wagner, 2004; Anderson, 2007).

Lastly, to measure and analyze the actual WLC use (frequency, assignments offered and completed), log files were kept and analyzed. These log files contained the following information: date/time, user id (who logs on), status of assignments (inactive/active/handed out/completed/finished/ provided with feedback), and content of sent email messages. Log files were kept from April 11, 2009 until July 18, 2009 (14 weeks). Email messages were logged from January 11, 2009 until July 18, 2009.

Table 2. Methods

Method	Subject/target group	Aim	Result
Interviews	Dieticians non-users n = 6	To determine motivation for possible use and implementation prerequisites	Information about demands and important implementation barriers
Usability tests and interviews	Users n = 10; 7 clients and 3 dieticians	To detect and discuss user problems, errors in the application's functioning, to obtain the users' judgement of the application, to determine the application's degree of usability, and motives and expectations of users	Suggestions for improvement (errors or usability challenges), guidelines for instructions and implementation. Also, insight into subjective experience and motives of eHealth users
Questionnaires	Clients, non-users and users, n = 33 (7 users, 26 non-users). Dieticians n = 9 (3 users, 6 non-users)	To determine the target group's characteristics, user-demands and motivations. For users, in addition, to obtain user's motivation and experience with the application	User and non-user profile, prerequisites for use and implementation at the client level
Log files	Users, clients and dieticians, n = 13; 3 dieticians and 10 clients	To register the frequency of use of the application and email message content	Insight into the experience-level of users and use of the application

Procedure

Users (both clients and dieticians) did a usability test and were interviewed about their experience with the WLC. This was done in a 1h-1.5h session, during which a questionnaire was first completed, then a real-time usability test was taken, and lastly the interview was held. The questionnaires, occurrences during the usability test, as well as an interview schedule were used to guide this interview. The session

with clients took place at their homes. Audio recordings were made during the session, as well as computer recordings of the WLC use. The clients received a €15 gift voucher after the session. The dieticians' sessions took place at their offices and again audio and computer recordings were made. Since the dieticians were part of the pilot and initiated the project, they were not (monetary) rewarded for their participation.

The non-using dieticians were interviewed about their attitude and motivation towards eHealth and the WLC during a one hour interview in their office. Audio recordings of these interviews were made. Afterwards the dieticians received an entrance voucher for an exposition. All interviews were verbatim transcribed. All participants were ensured confidentiality and anonymity during further data processing and in the final reports of the results.

The questionnaires for non-using clients were handed out by the dieticians before or after a regular appointment. Subjects were asked to complete the questionnaire in the healthcare center and return it in a closed envelope to the dietician, or take it home and send it back through regular mail. Completing the questionnaire took about 10 minutes. The participants were ensured anonymity but received no reward.

Materials

Questionnaires

For the survey, questionnaires were developed using existing scales and previous similar studies and literature (Nijland et al., 2005; Glasgow et al., 2007a; Glasgow, 2007b; Norman & Skinner, 2006b; Wamsteker et al., 2005). The type of questionnaire a participant received depended on the group they were part of (dietician/client, user/non-user). All questionnaires were divided into different subsections; some were equal among all groups (computer/internet, background), some sections were group-specific: the WLC section differed for users/non-users and dieticians/clients, and the treatment section was administered to clients only. In sum, the questionnaire contains the following sections: computer/internet (all subjects), treatment (user and non-user clients), WLC (client user, dietician user, client non-user), and background (all subjects). A more detailed description of the questionnaires can be found in appendix A.

All dieticians and WLC-using clients filled out a questionnaire. Of the 120 questionnaires that were spread among clients of Thebe that were receiving weight-reduction treatment, 27 were filled out and returned to the researcher (response rate 23%). One questionnaire was excluded from further analysis because the subject was underage and thus did not belong to the WLC target group.

Usability tests

Different tasks were performed by clients and dieticians during the usability tests. The main functionalities of the WLC were translated into different tasks and were checked by the dieticians to ensure they represent normal WLC use (for clients as well as dieticians). Within some tasks, the subject asked to perform actions that may not be regular but can be useful to probe for problems when using the program or that may evoke a reaction about the subjective experience of the user. For example, changing a user's password is not a regular action performed by users. It may however be difficult to perform, due to users' unawareness of the secured 'profile' section. Therefore, letting users change the password renders possibilities to talk about trust and security of the WLC. See Table 3 for the tasks used in the tests. During the tests, users were asked to think aloud and thus verbalize their thoughts.

The tasks were performed using the WLC (online), on a Dell Inspirion 6400 laptop. A regular mouse and keyboard were connected to the laptop to increase the subject's convenience. The computer actions were recorded using Morae (3.1.0) and recordings of the users' face during the test and sound (talk) were made using a webcam with integrated (Logitec) microphone. Also, an mp3 player (iAudio, F2) was used for audio recordings during the user tests and the interviews.

Table 3. Usability test tasks

Task client	Task dietician
Log in	Log in
Insert/introduce a new weight (weighted at home)	Check and reply email
Check an appointment date	Check the status of clients' assignments
Change the password	Check and judge a client's progress
Send an email to the dietician	Hand out assignments
Search for information (in the Facts and Fables section)	Give a client suggestions
Check for feedback on an assignment	Create a new client account
Complete the Nutrition Diary (Eetverslag)	Register new appointments with clients
Identify and start a new assignment	
Print the pages of the Nutrition diary	

Interviews

Interview schedules were created based on existing literature about barriers and advantages of eHealth for users such as usability, concerns about safety, reliability of information, and contact opportunities (Kerr, Murray, Stevenson, Gore, & Nazareth, 2006; Eng, Gustafson, Henderson, Jimison, & Patrick, 1999). The interviews with users after the real time usability tests were guided by the interview schedule and the questionnaire.

To gather information about the motives and demands of health professionals to use, or start using eHealth applications, interviews were also held with dieticians who do not use the WLC. Based on literature, several underlying factors of eHealth use and barriers to use are discussed. These topics include ease of use (usability), computer/internet skills of the user, benefits of the application, trust, security, fit with current work procedure, compatibility with current techniques, social norm, incentives, financial costs, development and content, and implementation (Richards et al., 2005; Whitten & Mackart, 2005; Gallant, Irizarry & Boone, 2009; Cain & Mittman, 2002; Anderson, 2007; Epping-Jordan, Pruitt, Bengo, & Wagner, 2004; Stone, Jarret, Woodroffe, & Minocha, 2005). The (non-using) dieticians were probed about these topics. To encourage the dieticians to think about different possibilities of eHealth applications, several scenarios were discussed. The scenarios represent different ways of using eHealth in weight loss treatment and they are based on existing and fictive applications. The scenarios differ in the following eHealth aspects: online/offline, interactivity (none, patient-to-patient, caregiver-to-patient, or one-way-communication), advice (general information, personalized), and professionalism (Tate, Wing, & Winett, 2001; Yoon, & Kim, 2008; De Dieetcoach, Medicinfo; De Gezond Gewicht Assistent, Voedingscentrum; Tate, & Zabinski, 2004). Appendix B gives an overview of the scenarios.

Analyses

The usability tasks and interviews were analyzed by means of content analyses. Codebooks were created to be able to code all events and remarks during the usability tests and interviews. During the test, only events that marked a problem or difficulty with use were coded; successful actions were not coded. All remarks about using the WLC and its functioning that users made during the test (positive or negative) were coded. The codebook was based on three main categories: user friendliness, implementation, and quality of care (Nijland et al., 2008). After a first analysis of the data small adjustments were made to the codebook and all data was coded accordingly using Morae Manager (3.1.0). A second coder coded two tests (one dietician test, one client test). Differences in coding between both coders were discussed until agreement was reached, resulting in minor changes to the codebook. All usability tests were then coded according to the new codebook. The combined usability test, user interview, and non-user interview codebook can be seen in Table 4.

The interviews were analyzed similarly, using a predefined codebook resembling the usability test codebook, but with some differences (Table 4). The interview transcripts were coded using Nvivo (8). A second coder coded >10% of the data and where disagreement existed, discussion was held and adjustments to the codebook were made until agreement on all categories and codes was reached. All interviews were then coded again using the agreed upon codebook (Table 4).

Table 4. Combined codebook for usability tests, user interviews, and non-user interviews

Category*	**Subcategory** & Description
Background [a]	Dieticians' experiences with eHealth, remarks about use of eHealth within their own practice
Usability [b]	Remarks about or occurrences of error-notifications and **technical malfunctioning** of the system
	Remarks about or events concerning users' effort to **orientate** or navigate through the program to execute the tasks. Remarks about the intuitiveness of the program and the menus/tabs. A sense of knowing where one is in the program and how to get to the desired next location
	General usability or user friendliness of the program, its subparts, and different ways to provide input (click, scroll, drag). The clarity of the program and the way it is used
	Absent/late/unclear **system response** or feedback causing confusion or problems
	Problems or remarks (positive and negative) regarding **appearance**: design, aesthetics, color and readability
	Problems, events, remarks concerning **hardware use**: mouse coordination, keyboard use, screen settings, etc.
Implementation	Dieticians' **demands** [a] or expectations about program functionalities and features
	Dieticians' **preconditions** [a] for use, conditions that have to be able to accept and implement an eHealth program
	Remarks about the possible influence of (perceived) **social norms** [a] on implementation and acceptation
	Problems or difficulties caused by a lack of **instructions** [b] or faulty instructions. The user is unaware of the application's possibilities and its operating procedures. Also, remarks about received instructions and their effect
	Remarks about **experience** [b] or difficulties performing tasks due to a lack of experience
	Remarks about the **target group** [c] and target group characteristics. Why would or wouldn't the application be fit for certain persons
	Other [c] remarks about the implementation/introduction of the application
	Remarks about the **introduction** [c] or desired introduction to the WLC/eHealth applications
	Remarks or concerns about privacy and **security** issues regarding the exchange of private information via the application and the internet
	Remarks about the correctness and **reliability** of information in the program.
Quality of care	**General appreciation** of the application/eHealth as a treatment means in terms of relevance, enjoyableness, and motivating and stimulating effects
	Appreciation of interaction opportunities with dietician/client through the application related to treatment **relation** and trust
	Remarks or events about the **convenience** of giving and consuming care through the application and practical advantages or disadvantages

*Based on Nijland et al., 2008.
[a] only used in dietician non-user interviews
[b] only used in usability tests and user interviews
[c] only used in user and non-user interviews

The questionnaires were analyzed using SPSS (version 16.0). Because of the low non-user response rate (23%) and the disappointing amount of clients using the WLC (twelve clients, of whom seven participated in tests and interviews), no statistical tests were done to compare WLC users to WLC non-users. However, descriptive statistics (mean, frequency, standard deviation) were applied to gain some insight into users' and non-users' characteristics, motives, and expectations.

Frequency of use was calculated based on the log files and all logged email content was analyzed using Nvivo (8), by applying a codebook based on the content of the emails. Also, a second coder coded all email messages according to the codebook. The inter rater reliability was calculated by Nvivo; κ values on the separate categories ranged from 0.72 to 0.93. Differences in coding were discussed and agreement was reached. Small changes to the codebook were made and all email messages were again categorized (see Table 5).

Table 5. Codebook sent email messages

Category	Subcategory	Description
Weight loss or treatment information	Assignment-induced question/response	Questions/responses as a reaction or response to WLC assignments
	General question/response	Questions/responses regarding diet, nutrition, emotion, etc.
WLC use	Use status	Assignments and instructions for the WLC (make, check, correct, hand in, etc.); performed actions or actions to perform
	Practical information	Questions/responses and information about working with the WLC. Reports of malfunctioning, errors, etc.
Organization & procedure	-	Questions/answers and remarks about treatment procedures and administration as appointment time/date, insurance reimbursements, etc.
Progress	-	Remarks about motivation and perceived support or motivating remarks. Findings/questions about treatment progress

Results

Questionnaires

As was mentioned before, no statistical tests were performed on the questionnaire data. However, some results may still be of interest and will therefore be displayed by showing frequencies or mean values. No strong conclusions can however be drawn from these results since statistical testing could not be done.

Table 6 shows that the majority of user and non-user clients fall into the low level of maximum completed education: fifteen non-user clients (57.6%) and 5 user clients (71.4%). Almost one third of non using clients has completed some form of education that falls into the middle category; 30.8%, whereas 14.3% of user clients did. Having completed some form of higher education is uncommon in both groups; 14.3% of user clients and 11.5% of non-user clients fall into this category.

Table 6. Clients' highest level of completed education*

	% Lowest	% Low	% Middle	% High
User (7)	0 (0)	71.4 (5)	14.3 (1)	14.3 (1)
Non-user (26)	3.8 (1)	53.8 (14)	30.8 (8)	11.5 (3)

*according to CBS classifications (SOI 2006)

The WLC is used in weight loss treatment, but 65.4% of non-user clients and 42.9% of the user clients report to have some sort of co-morbidity besides being overweight. These mentioned co-morbidities include: diabetes (9), high blood pressure (4), joint problems/rheumatism (4), high cholesterol (3), diaphragmatic or hiatus hernia (2), asthma (2), depression (1), hernia (1), breast cancer (1), serotonin shortage (1), pregnancy (1), heart disease (1).

Not all non-user clients (N=26) are equally interested in using the WLC if they could; 8 clients do not want to use it, 6 clients are neutral, and 12 clients want to use the WLC. Table 7 shows what reasons clients have for using (user clients) or (not) wanting to use the WLC (non-user clients).

Table 7. Clients' reasons for use or non-use

Non-users (26)	(n)	Users (7)	(n)
I need more support during my treatment	13	The ease of an online program	6
The WLC will make me more motivated to complete my treatment	8	My dietician's enthusiasm	5
I like to try new things	8	I needed extra support during my treatment	4
I think it is easy to keep in touch with my dietician via the WLC	6	I wanted to try something new	2
I am satisfied with my treatment the way it is now [a]	12		
I think online contact with my dietician is impersonal [a]	8		
I cannot handle computers very well [a]	4		

[a] *reasons for not wanting to use the WLC*

Table 8 shows the expectations non-users have, and users had about the WLC. Expectations about motivation occur most in both groups.

Table 8. Clients' expectations about the WLC

Non-users (26)	(n)	Users (7)	(n)
More motivation to engage in my treatment	13	A greater motivation to engage in treatment clients	6
More motivation to finish my treatment	10	A bigger motivation to finish my treatment	4
More insight into my own progress during treatment	10	More insight into my own progress during treatment	3
More knowledge about food and losing weight	10	A faster treatment	3
More contact with my dietician	5	More knowledge about food and losing weight	3
A faster treatment	3	More contact with my dietician	1
Being involved in my treatment in between appointments more often	7		
Treatment will be more fun	3		
No addition to my treatment	1		

Based on differences in mean scores (Table 9) non-user clients (mean score 4.00) appear slightly more satisfied with their treatment than WLC users (mean score 3.86). There is no strong need for more face-to-face contact with the dietician in both groups, but non-users (mean score 3.27) show a slightly higher need than users (mean score 3.00), who score neutral. Non-users also score slightly higher than users on the need for more contact with the dietician, with mean scores of respectively 3.35 versus 3.00. Further, both groups seem motivated to finish their treatment but again non-users score higher than users; mean scores are respectively 4.31 and 4.00. Non-users and users are neutral to positive about being capable to reach their target weight, with higher scores for non-users (3.64) than for users (3.50). Both groups score slightly more positive than neutral in their belief that their current treatment helps them accomplish treatment goals, and again this belief is stronger in non-users (3.77) than in users (3.29). Non-users appear to have a higher eating self efficacy than users who score nearly neutral on eating SE, but again differences between non-users and users are small: mean scores of 10.1 and 9.14 (see Table 9).

Table 9. Cognitions about treatment

	Client user mean score (sd)	Client non-user mean score (sd)
Satisfied with treatment	3.86 (0.7)	4.00 (0.9)
Need for more face-to-face contact	3.00 (1.0)	3.27 (1.0)
Need for more contact	3.00 (0.8)	3.35 (0.9)
Motivation to finish treatment	4.00 (0.8)	4.31(0.6)
Target weight self efficacy	3.50 (0,5)	3.64 (0.8)
Belief in helpfulness treatment	3.29 (1.1)	3.77 (0.7)
Eating self efficacy (3 items)	9.14 (0.9)	10.1 (1.7)

Client user n=7, client non-user n=26
All items were measured on 5-point scales; 1=fully disagree to 5=fully agree

Usability tests

The usability tests were coded according to the codebook displayed in Table 4. Most problems or remarks were coded in the *usability* category. *Implementation* was coded second most often and *quality of care* third (Figure 5). Figure 5 also shows that dieticians and clients show the same pattern of coded events per category. They roughly encounter the same problems or make remarks on similar topics, except specific comments about functionalities that are unique to their user-type. For example, many clients encounter problems when entering times by using a clock in the nutrition diary; they show difficulties operating the

clock, and express their discontent with this subparts' user friendliness. Dieticians however have no such data-entry methods but have encountered other usability-problems that are impossible for clients to experience.
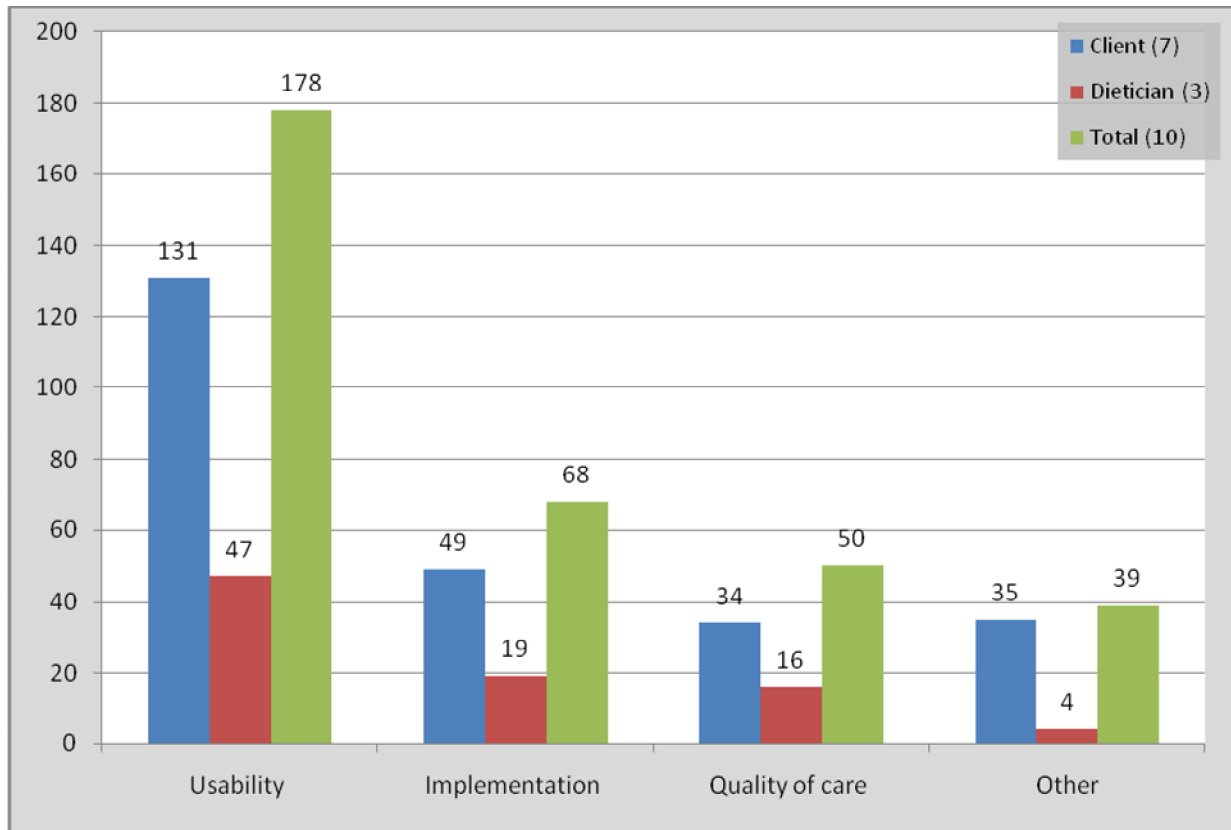
Figure 5. Usability test coding per main category
N=10 (3 dieticians and 7 clients)

Table 10 shows how often each subcategory was coded and how many remarks/events were positive or negative. The positive and negative events do not necessarily add up to the sum of coding per category; sometimes one event or comment contained both positive and negative elements, or was neutral (not marked negative or positive). Usability coding concerns mostly problems with use during the test or problems with general use (past experiences of users). Implementation and quality of care consist of remarks users made during the test about one of the topics. The 'other' category consists of instructions that were given by the test leader to help users to continue when they did not know how or where to proceed, or when something was unclear.

Table10. Usability test remarks or events

Category		Client (7)	+	-	Dietician (3)	+	-	Total (10)
Usability	User friendliness	54	17	40	23	5	20	77
	Hardware use	4	0	4	2	0	2	6
	Orientation	31	0	31	18	0	18	49
	Appearance	8	6	3	1	0	1	9
	System response	12	0	12	3	0	3	15
	Technical malfunctioning	22	0	22	0	0	0	22
Implementation	Instructions	6	2	4	7	1	2	13
	Experience	40	6	36	12	1	11	52
	Security	1	1	0	0	0	0	1
	Reliability	2	2	1	0	0	0	2
Quality of care	General appreciation	21	13	9	11	5	7	32
	Convenience	9	2	7	1	0	2	10
	Relationship	4	1	2	4	1	2	8
Other	Instructions by test leader	35	x	x	4	x	x	39

Usability

User friendliness was coded negatively 40 times during the client tests, and 20 times during the dietician tests (Table 10). Typical user friendliness problems were: not being able to find the right button or clickable element to enter the desired page, not being able to skip data entries when they are not relevant to the user or change data entries when a mistake was made, laborious data-entry methods (typing is easier than using the mouse or + and – buttons, but sometimes there is no choice). Negative remarks were also made, for example about the client overview which provides insufficient and irrelevant information according to dieticians. Clients also made negative remarks about some WLC features' user friendliness, such as the print option in the nutrition diary; printing one day at a time is laborious and renders poor overview. Positive user friendliness coding consists of comments (17 by clients and 5 by dieticians): 'the

program is clear, but you have to look good or search a bit sometimes', and 'once you know how it works it is clear'.

Problems with *hardware* did not occur often; only six times during the test. Problems in this category consist mainly of not typing correctly (passwords) and not being able to double-click.

Orientation was a problem during the user tests (49 negative references). These problems may be caused by users' lack of WLC use experience, as was often mentioned while searching. For example, users sometimes had difficulties finding the email box section of the WLC, even when they were already on the correct page. Especially users without any prior experience with the email box had to search, but also dieticians who claimed to use the email regularly sometimes lost track of how to get there. Users most often had problems finding the right page or location, they sometimes were insecure about which buttons to use or where to find the right button. For example, a client wanted to save an assignment by pressing the 'send' button instead of the 'save' button that was right next to it.

Appearance coding was positive regarding the program's and looks and clarity (6 positive references). For example, email box was considered lucid and easy to use because it looks like the Microsoft Office Outlook mailbox. Negative remarks (4) were made about the layout or titles, for example, the facts and fables and news sections on the front page are not recognizable as such.

During the test some users became confused because of slow *system response*. It occurred that an action did not yield visible results, making the user wonder if anything had happened. In one case, the system response was unclear; the client forgot to enter the new password twice (confirm it), but the system responded with 'invalid entry'. It was not clear to the client that the response was because a confirmation had to be done. Overall, 15 negative system response events were coded.

Only clients experienced *technical problems* during the test, or reported prior technical malfunctioning of the program; 22 negative events were coded. Saving assignments or entering data often resulted in system errors. Some remarks were made about the negative effect it has on users' motivation to continue to work with the WLC. For example, one user experienced technical errors when saving data which was frustrating because all entered data got lost.

Implementation

Clients mentioned that they received few or no *instructions*. The remarks were mainly positive (2); the WLC is easy to learn with few instructions. Dieticians mentioned they have little time to explain clients a lot about the WLC, but the program speaks for itself. Also, some parts have not been explained to dieticians either.

A negative event or remark regarding *experience* was coded 47 times. They were often caused by a lack of experience and resulted in users' remarks that they had little experience with a specific part of

the program which resulted in orientation problems. Most dieticians and clients mentioned that they have no experience sending or receiving Clues/hints. Three clients remarked they have not used the WLC much at all. One dietician regretted her lack of experience which was caused by inactive clients. Positive remarks (7) were made about successfully used features and motivations to start using features that were first noticed during the test; sometimes you have to see it first before it becomes clear.

During the test, one positive remark was made about *security;* it was not considered a problem barrier to use. Because the dietician created the account, changing the password is not considered important and it is assumed to be safe.

Regarding reliability and appreciation of the information, two clients mentioned that they appreciate the information the WLC offers. Without change however, the information becomes uninteresting and outdated.

Quality of care

The *appreciation* category holds positive (18) and negative remarks (16) about the usefulness and relevance. Some assignments are appreciated by clients and dieticians because they look good, give useful information, or entertain. The snack checker for example was appreciated on all these three points by some clients and dieticians. Negative coding concerns judging of irrelevancy, such as entering home-weight weightings. Clients differed in their opinions; filling in why a certain food was eaten is considered useful by some and not useful by others. The dieticians remarked this too, not all features are useful for all clients.

A dietician mentioned the WLC offers little *convenience* since it is not compatible with their current electronic registration system. Some clients remarked that an online program is more convenient because it is accessible everywhere, others said that using an online program is less convenient because one needs to have a computer nearby in order to use it; using pen and paper is more convenient.

Mixed remarks were made about online interaction and *relationship*. Positive remarks (2) include one dietician's assumption that the interaction possibilities are appreciated by clients. Negative remarks (4) include clients mentioning they do not need the email or other online interaction possibilities. On the other hand, a dietician and a client expressed the need for more or other interaction possibilities; more automatic responses and being able to respond directly to a dietician's feedback as a client.

Summary

Overall, the usability tests showed that clients and dieticians encountered problems orientating themselves in the WLC; they had difficulties finding the right page or knowing where to click. Also, user friendliness is not high due to unclear overviews and complicated ways of entering data. Dieticians and clients praised

the WLC's clear structure, its logical menus and nice looks. Concerning implementation the usability tests showed that users' WLC experience levels are low. Dieticians further mentioned that they do not give many instructions because the program speaks for itself and dieticians lack time during consults for extensive instructions. A coding overview of positive and negative coding can be seen in Figure 6.
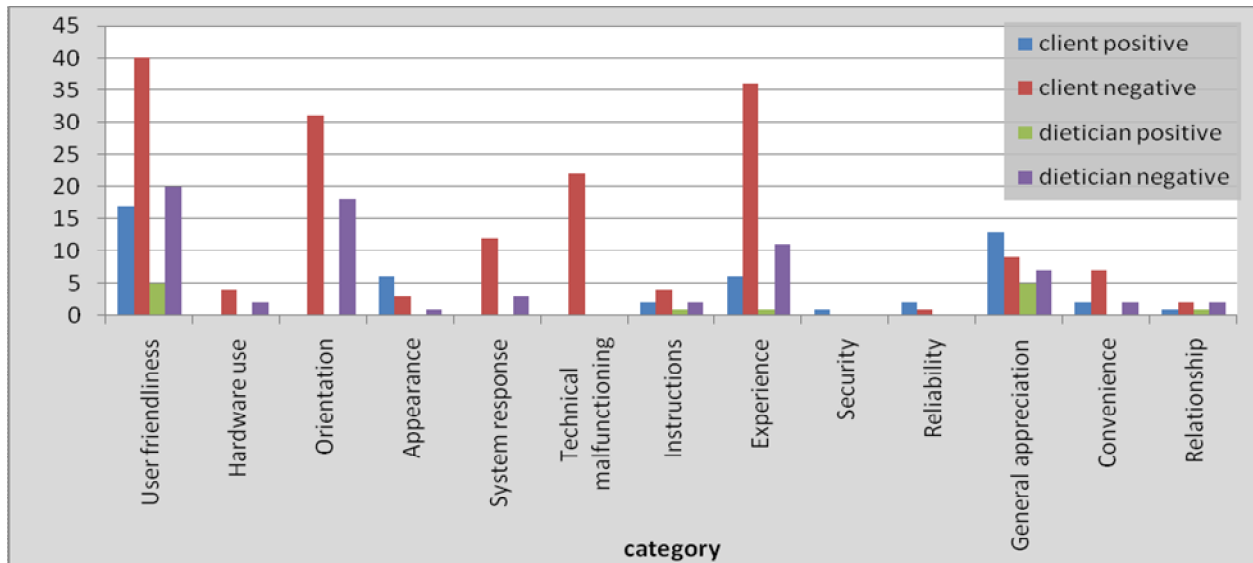
Figure 6. Usability test coding: positive and negative events/remarks

User interviews

After the usability test was performed, interviews were held. Figure 7 shows how the interviews were coded on the main categories. In comparison to the usability tests, usability was coded less, and quality of care was a more prominent topic. Dieticians and clients show similar patterns in main category coding.
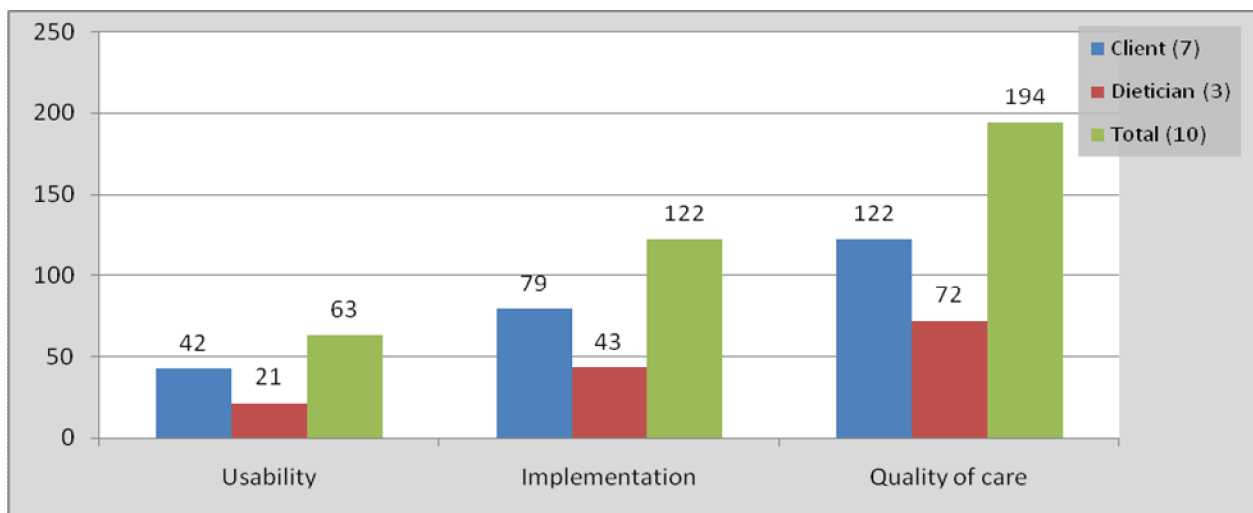

Figure 7. User interview coding per main category

Usability

Usability was coded less often in the interviews than during usability tests. Table 11 shows that 12 remarks concerned **technical malfunctioning**, comprising complaints about errors or malfunctioning of the system:

> *Interviewer: You are not particularly motivated to keep using the WLC. Is that*
> *because of the technical...*
> *Client: Yes, that is because of the technical errors. Because if that wasn't there, I*
> *would really, I would work with it more. But because of the technical malfunctioning,*
> *you always encounter problems: 'it is not working again'.*
> *Interviewer: So that reduces you motivation a bit?*
> *Client: Yes.*

Two users mentioned not having experienced **technical problems** with the system. Users who had encountered a technical error stress that these should be resolved because it prevents them from using the WLC optimally.

Users made 17 comments about the *appearance* of the WLC and in general, users are positive about it, as a client said: *"I think it looks err, not too intensive, very subtle. So yes, it looks very good"*. Some users mentioned that the layout is not very clear or attractive: *"I can read it very well, but it concerns the layout. I think they did not do much with it, they just typed the text and supposed it was ok (…) because the other assignments look good and have pictures in them, so yes, put some effort into that too"* (dietician).

User friendliness coding (31) contains positive remarks about the program's user friendliness such as: *"It is a clear and easy webpage"* (client). However, some parts of the program need improvement:

> *Client: A disadvantage of the Snacks assignment, or what went wrong with it, is that*
> *when you've eaten more than one item of something, so you enter two or three, it stays*
> *set on that number automatically.*
> *Interviewer: So if you do not notice that...*
> *Client: You'll eat a lot, and you cannot undo it. It's too bad that that's not possible.*

Dieticians mentioned they the program lacks good overview in the client overview and the handed in assignments: *"I think, when they fill it in they get a clear outline, why don't I get an outline too? First of all it costs a lot of time and paper, and well, what do I do with this? (shows printed pages) It's pitiful"* (dietician).

Three times a user remarked that the absence of a clear **system response** caused uncertainty about the performed action: "*What I said, sometimes I think: well, has that been send or not?*" (dietician).

Implementation

Remarks about **instructions** were coded 33 times. On the one hand clients and dieticians said that dieticians give a short instruction and that clients just figure it out by themselves: "*I just clicked on a lot of things and just tried it. (…) that worked fine, she'd explained it a little bit, and told me to look there and there*" (client). On the other hand, clients appreciated the extra instructions they received during the usability tests: "*Well, it might be useful at the beginning, when you start with the WLC to receive instructions like these. (…) because now I know more about the possibilities and I think I am more likely to look at it*" (client). Dieticians feel that a short explanation should be enough when clients are familiar with computers. Also because the program, contains a help and demo function: "*Well, I have seen that there is a short manual. I do not know if it can be found under the help function. But I think, one can learn by doing it. Yes, that is how I have learned it. But I will not give extensive instructions. (…) I think the clients that I have now are pretty skilled regarding internet use*" (dietician).

Client and dieticians expressed how much **experience** they have with the program and what effect this has on WLC use and treatment judgment (25): "*Well, I took a look at it when I came from her office and maybe afterwards once again. That's it*" (client), "*I am not using it enough to be able to judge that*" (dietician).

Introduction was coded 25 times. Clients use the WLC because their dietician gave them a choice between the WLC and pen and paper assignments. Working online fits some clients' daily activities and was thus preferred: "*I told her: I'll take the internet option. Because I spend much time online, so that's why*" (client). Also, clients mentioned they were interested in helping to test the program and receiving extra guidance. Dieticians said they had some problems fitting the program into their practice, since giving instructions, using the program, and keeping files and expense claims up to date takes time: "*Well, it might be useful for the client but I feel like I'm doing things double because they come to an appointment and I write it down on an appointment card. And I'll tell them to check that card. I could do it with the WLC, it's a choice I make, but I will not do it twice*" (dietician). In a response to the question whether the dietician prefers to treat clients with the WLC or without it she answered: "*At this moment it depends. If there are already six clients who have said yes, I would say 'no' for the seventh because it just costs much more time. But eventually I think, again, it has its advantages and you have to consider the service for clients (…). And yes, if the client wants it, fine*".

About the WLC **target group**, 11 comments were made. Since the program is simple to use, clients and dieticians believe it might be useful for everyone who can handle computers and needs to lose

weight: *"Everyone who goes to a dietician and knows a little bit how to use the computer, because that may be a problem for many persons"* (client). Dieticians claimed they select WLC clients on age, only not-elderly adults, and background; non-ethnic, preferably working with computers. Dieticians ask clients if they use the computer often and would like to use the WLC. They acknowledged that their own assessment is not always correct: *"This one person I treat with the WLC I thought would be very enthusiastic but I get few if any responses via email and I did not expect that at all. So it shows how wrong you can be [in your assessment]. And I suppose I make mistakes the other way around too. Of course"* (dietician).

None of the 14 remarks made about the **security** of online treatment regarding privacy and information exchange expressed great concerns. Before accessing one's personal page users need to log in, which generates a sense of security and trust, as well as the fact that the program is supplied by the dietician *"I have faith in my dietician and if it wasn't reliable, she wouldn't let me do it"* (client). One client mentioned that the information that is introduced into the program is not highly privacy sensitive anyway: *"I think, who would even care what I eat? So, I think it is not very privacy sensitive"* (client). Also, many clients draw a comparison between the WLC's security and that of a regular email program: *"Well, I look at it a bit like Hotmail®, because Hotmail® also exists without an account; you can just look on Hotmail.com, but you can also log in and access you personal information. So yes, I think that is similar, yes"* (client). Dieticians are equally satisfied about the WLC security.

Reliability of information was mentioned 9 times. Clients and dieticians rely on WLC information. For clients, trust in the dietician's professionalism was the main cause of this, since they recommend the program. One client mentioned that the professional look and way of introduction added to this feeling.

Remarks in the **other** category consist of reasons why clients and dieticians started using the WLC. For clients, extra contact or guidance and trying something new are mentioned as reasons for use. A dietician says she wants to use the WLC when she knows it helps the client.

Quality of care

General appreciation is the largest subcategory and 118 times some form of appreciation of eHealth or the WLC was given (Table 11). Dieticians and clients mentioned how the program or subparts of it are useful or useless to them and why. Clients and dieticians comment on the WLC's incapability to increase clients' motivation: *"It has as much value as the dietician. About that I also think, well, it does not really motivate you. Nothing really does. If you're not motivated yourself, than this will not motivate you either"* (client). The WLC is valued by clients because they are involved more; they can easily get involved and work on their treatment via the online page: *"Yes, just that little bit of extra, how do I say this. Because I*

want to lose weight now I want to go to the dietician. This gives me that little extra push because I have to weigh myself there. That is the confrontation. But, I can be involved every day. That is really important to me. Look, I am not saying I will be working with it every day, but now I have taken a look at it I want to be working with it about 3 times a week. It stimulates you a bit extra I think (...) I can take a look every minute of the day, look up things" (client). Also, the extra contact with the dietician and online information was valued: "*I appreciate, like I just said, the contact. I value that and, like the assignments about snacks which shows you how much slices of bread a snack is, yes, I like that as something to fall back on. If I have doubts about something or I am not sure I can just look up how it really is*" (client). Dieticians felt that for clients, the WLC's added value is in its entertaining and feedback giving capacities. Also, it should be more fun and look nicer than pen and paper assignments: "*That is especially the case in assignment 8, and with the bottleneck-assignment too, I think those are the nicest assignments, that the computer gives you lists and tells you what kind of eater you are. Yes, I like those things; I think that that is the added value of the program*" (dietician). In some cases, the features the WLC offers were considered not relevant or are insufficient for users: "*Well, it [the WLC] does not give me daily menus for weight loss, like Sonja Bakkeren, you know?*" (client). "*It looks good, but some information about diabetes type one and two would be good*" (client). "*(...) that I sometimes find it hard to see the program's added value because I.... For example with the nutrition diary, I think the overview here is very unclear so I first print it and then I think, well, I've got the same thing as usual, when I let clients write it down. (...) And giving feedback with this program is not easy either, because you cannot mark anything or write down remarks in the assignment. So that is also something. And yes, you're discussing it during the consult anyway and so I think that I'm doing the same as I always did (...) it takes more work and these things are less useful*" (dietician).

The interaction and the effect of WLC interaction on the **relationship** was mentioned 36 times by dieticians and clients. Clients appreciated the possibility to ask their dietician questions via email and have regular contact. As long as they continue seeing the dietician face-to-face on a regular basis, online contact was considered no problem: "*For me it's positive. Because you're not depending only on the face-to-face appointments. And the advantage of email is that I can send email when I have time, and she can respond when she has time. It is thus complementary. And it strengthens the relation and interaction on that point*" (client). Dieticians held similar views:

> *Dietician: Whether you send an email or talk, it's a different way of communicating but yes. No I don't think it is different really.*
> *Interviewer: Ok, and do you think that something like that could replace your face-to-face consult?*

> *Dietician: No, it is more like a supplement, but a real contact moment is much more confidential than an email. So in that sense email is fine as a supplement, but not as a replacement.*

A similar view was exposed when clients and dieticians were asked about the possibilities of using the WLC without regular face-to-face contact: *"As long as the practice hours would continue, it could be a bit less but you need to have a reference point, someone that you can see face-to-face, because [communicating] with text differs from being able to look into someone's eyes. I suppose this goes for both sides [dietician and client]"* (client). In addition, clients and dieticians mentioned that it is important to get to know each other and establish a relationship of trust first, before starting online treatment or contact. Both sides need to know who is on the receiver's end of the online program.

The **convenience** of consuming or offering care via the internet differed somewhat for dieticians and clients. For most clients, being able to consume care online offers ease of use; they already spend time behind a computer regularly and doing some WLC assignments or checking information is done easily, and can be done at different locations. Also, typing can be faster than writing. Further, being able to do everything (making assignments, searching for information, sending emails) in one program is considered convenient. Dieticians experienced less convenience, since their electronic registration and email/calendar programs are not compatible to the WLC. Also, because of all added features and possibilities of the WLC, treating clients with the WLC costs dieticians more time than the regular treatment: *"Because it requires more actions. Like I said concerning the nutrition diary, that you have to print it, and those sorts of things I need not think about normally. And persons email me, and the normally wouldn't do that. (...) And I can't say at once, well, we'll start charging those costs, and so it takes up my own time to answer those emails"* (dietician). Mentioned by a client as well as a dietician, is the inconvenience of needing a computer and having to log in on the WLC.

Table 11. User interviews coding

Category	Subtype	References clients (sources)	References dieticians (sources)	Total (sources)
Usability	Technical malfunctioning	8(5)	4(3)	12 (8)
	Appearance	11(7)	6(2)	17 (9)
	User friendliness	22(7)	9(3)	31 (10)
	System response	1(1)	2(1)	3 (2)
Implementation	Instructions	20(7)	13(3)	33 (10)
	Experience	19(5)	6(1)	25 (6)
	Introduction	12(5)	13(3)	25 (8)
	Target group	5(4)	6(3)	11 (7)
	Security	12(7)	2(2)	14 (9)
	Reliability	7(6)	2(2)	9 (8)
	Other*	4(4)	1(1)	5(5)
Quality of care	General appreciation	84(7)	34(3)	118 (10)
	Interaction	27(7)	9(3)	36 (10)
	Convenience	11(7)	29(3)	40 (10)

*later defined as reasons for use: 5 remarks

Summary

Overall, usability was judged positively, even though users mentioned some usability problems. The problems regarding technical malfunctioning, laborious or difficult data entry methods and unclear layout prevent users from using the WLC in an optimal way. Dieticians appeared slightly more critical about usability issues than clients.

About the implementation of the WLC dieticians and clients said that they give or receive few but sufficient instructions. Users stated that a demo, help function, or (written) user manual should be available, even though most users remark they do not use such things. The program's clear overview makes learning how to operate it easy. Clients, and dieticians to a lesser extent, were however not always familiar with all basic functions of the WLC. Clients were informed about and

invited to use the WLC during a consult. Some computer skills and a positive attitude towards internet are necessary according to clients. The clients said they agreed to use the WLC because of the ease of online treatment and because they want to try something new. Dieticians said they selected clients based on age and computer use. After a client shows interest, the dietician briefly shows what the program looks like and creates a new user account for the client. The program offers dieticians little relief in terms of time and ease of use; it does not yet fit well into the dieticians' practice. Dieticians say they need to be compensated for the time they spend guiding patients, for example by being able to claim the costs with health insurance companies. Clients felt that reliability and security form no barriers to use, because the WLC is offered by the dietician. Also, the required login ensures security. Keeping information up to date was considered important to ensure reliable information.

Clients claimed that they appreciate the WLC because it involves them in treatment in between consults and offers extra contact with the dietician and guidance. The WLC is incapable to increase treatment motivations, according to the clients. Dieticians felt that the WLC looks better, is more fun for clients, and offers extra information and feedback. Not all WLC elements are relevant for all users and dieticians chose not to use some features because they are irrelevant or because they take a lot of time and effort to use (for the dietician). As long as the consultation hours remain unchanged, online contact via the WLC is considered no threat to the client-dietician relationship. The extra contact may even strengthen the relationship according to dieticians and clients. Even though clients appreciate the WLC's convenience, dieticians feel the WLC offers little ease of use to them because using the WLC costs extra time for which dieticians are not compensated.

Non-user interviews

Interviews with non-user dieticians offered information about dieticians' experiences with eHealth, their opinion about it and the way it can used within treatment, and their wishes and ideas about the implementation of eHealth programs. Table 12 shows how often dieticians' remarks were coded into the different subcategories.

Table 12. Dietician non-user interviews codes

Category	Subcategory	References (sources*)
Background	-	31 (5)
Implementation	Feature requirements	37 (5)
	Preconditions for use	26 (5)
	Introduction	18 (5)
	Target group	31 (5)
	Social norms	4 (2)
	Security	14 (5)
Quality of care	General appreciation	51 (5)
	Relationship	43 (5)

*Six dieticians were interviewed in five different sessions

Background

The dieticians have different **background** experiences regarding the use of internet or other electronic applications within their practice. In general, they are all familiar with email and sometimes get confronted with clients who search for online information or have questions about it. Through their own websites or email they try to offer clients trustworthy sources for online information. The first dietician is currently involved in an online weight loss program as dietician. Another dietician once participated in an online weight loss project, but her experiences were not positive. ”*Well, at the moment it [the program] was simply too complicated to explain it to them [the clients] and because of that you leave it, you let it go”,* a dietician explained. Email is also used as a communication means by all dieticians. They now see it as an extra service but foresee problems when it becomes too popular and time-consuming:

> *Dietician: (…) I do it too, support via email, you know. But it is still a service (...) It*
> *costs me time, too. And I have some crazy clients, they email me every day, really.*
> *Interviewer: Yes, in the regular treatment?*
> *Dietician: Yes. Well, now I feel like, I think it is service. It is not yet standard, but*
> *when it really starts to become bigger you have to do something, right?*
> *Interviewer: Yes, because it costs you time of course.*
> *Dietician: Yes, that is why.*

The dieticians mention they choose to offer some clients the possibility to keep in touch via email because it is convenient. Information can also be sent via email. A dietician said: "*We also give e-consults. The funny thing is that just before you got in, I had a contact from Germany and, well, the distance is of course larger than with clients who live in the area. And I then also offer giving e-consults. That is of course very convenient in such cases. I also have digital information that can be sent. And e-consult is one of my treatment options for my current clients.*"

Implementation

The ideas about what an online weight loss tool should look like and what functionalities it should have are often related to practical barriers (and preconditions for use), the target group they try to reach, and the effect dieticians believe such programs can have. The dieticians mentioned the following functional **requirements**, wishes and ideas:

- clients should be able to keep charts, diaries, and do tests (e.g. nutrition diary, self image tests)
- a possibility to give or generate clear (automatic) feedback
- the program needs to provide information and practical tips
- there have to be possibilities to have regular contact (email/messages)
- sending reminders can be useful, but only if it can be done automatically (either via email or text messaging)
- an online agenda where clients can make appointments is considered useful
- client have to be able to access their own electronic patient files via the program
- dieticians have to be able to access client pages and to colleague's pages
- features and functionalities need to be optional (turned on or off by the dietician), because not everything a program offers is good for every client
- there need to be clear demo and help functions
- dieticians want to be able to generate client progress reports with the program (short summary and overview of client proceedings)
- the program needs to track the time spent per client for declaration purposes and it thus has to be compatible with electronic registration systems and declaration systems

In addition, dieticians want an online program to be simple, clear, and it cannot contain large texts, because "*people don't read*", according to a dietician. A program has to be user friendly and the contents' accent should not lie on counting kilos and calories but on the psychological guidance and health. Lastly, regular updates should be made, to ensure reliability and clients' interest. With their demands, dieticians

show they have ideas about what a good online weight loss program should contain for it to function within the current weight loss treatment.

In order for dieticians to be able to and want to work with an online program, some **conditions** need to be met, according to the dieticians. Dieticians remarked that for them to invest in a new online program that offers convenience for dieticians and clients, and offers clients more online information and guidance, the time the dietician invests needs to be compensated for: *"Yes, if you want that service to be cost- lowering in a way that it doesn't cost 15 minutes but 5 minutes, then you would have to be able to be compensated for 5 minutes"*. Also mentioned by this dietician (and by others) are concerns about relative costs regarding the restricted target group a weight-reduction program can reach: *"Well, the quality looks ok. Then price becomes a matter. This is of course only for obesity and I have already mentioned that it is a big part, but not the entire practice. What are the costs involved for me or the client? So, what I find important is the financial settlement when you offer this. Yes"*. It needs to be clear for dieticians how much time they can spend guiding a client online within the (financial) budget, as this quote shows: *"Yes, I think you should always keep an eye on, well, how much money can I spend on this client. Or, how much money does this client supply"*. Further, the program needs to be good, and easy to use, and it has to be compatible with current e-registration systems, dieticians said: *"Well, what the condition is. Yes, it has to be user friendly. Otherwise everyone will pull out"* and *"This would be a really nice program if you could link it to your registration system"*. Lastly, dieticians do not to have to enter data while talking to a client; they want to be able to update information after they saw a client, not during the client's visit.

> *Dietician: But look, yes, I do not want to have a computer in my face when I am having a conversation [with a client].*
> *Interviewer: No. That is not an option.*
> *Dietician: No. Look, I know very well how someone is doing. Even after the conversation, I am still able to recall the essential issues. So that is ok. But then you would have to insert some time in between consults, to process it right away. Otherwise it does not work.*

How can an online program be **introduced** into the dieticians' practice and among their clients? The dieticians claimed that the program should be easy to learn and its structure should be well organized because elaborate instruction sessions for dieticians or clients are undesirable: *"If it is very well organized, and when you keep it easy, then I don't think you should spend additional time to give a workshop for it"*. Also, a demo and help function, or even a manual should be enough. Using the online program in treatment should be decided together with the client, according to the dieticians. If a client

wants to use it, agreements can be made about the way it will be used (for contact, assignments, and follow-up) and how frequently the client will use it.

> *Dietician: I would make agreements about set moments. Imagine, I would use such a program, besides what I normally do and I would make a division in hours: I use three hours for face-to-face contact and one hour for this thing, that would work pretty good of course. Then I would decide, in consultation with the client, will I use it weekly with you, or once every two weeks. And I would pick a fixed day, you [the client] would have to make sure the input is there, you know?*
>
> *Interviewer: So you expect them to weekly...*
>
> *Dietician: Yes, because otherwise it is free of obligations and you know, that does not work.*

Informing clients that the online program is an actual part of treatment is also important. Dietician 5: "*That they realize that yes, with this program you are still under treatment, which compares to a dietician visit. That they realize that it is not all free of charge.*"

Comments about which type of clients or **target group** would be suitable for online treatment were numerous. Older persons, computer novices, and migrants who speak little Dutch are mentioned as groups who would not benefit from an online treatment supplement as the WLC: *"This will be the case for the time being, not everybody has an internet connection and has affinity with it. No, that will be less because, the ageing of the population continues so the persons who do work with it now. (…). Not everybody yet. But it is a lot more than ten years ago, when we started, an explosive increase"*. Dieticians said that when they suspect little emotional or psychological problems, online contact can be a good method to guide clients: *"Because in that case, e-consulting is fine. I now say to some clients that we will send emails, you know. Because they come all the way over here, then it turns out that everything goes well, they may have had one question, and I think well, we are done in 15 minutes and I planned half an hour for you. To be really honest I think that I could better use this time for someone who does really need it. So for these persons I reckon it's ideal to email. No problem"*. Also, using the internet or a computer may be more appealing for some clients because it better fits their usual habits:

> *Dietician: But how close that is emotionally, the person who does the craziest things with text messaging, you can let them type without a problem. You should let those persons type; writing would not make any progress for them.*
>
> *Interviewer: It is more appealing.*
>
> *Dietician: It might be more appealing. Can't they do it typing? It might be nice to write it down then.*

> *Interviewer: for a change.*
>
> *Dietician: Yes, to break the pattern.*

However, dieticians called for caution when offering the possibility to add online guidance to the treatment; you need to know the client and the client needs to know that it is just an addition to face-to-face treatment. Finding out how familiar a client is with computers to assess online treatment potential is done by dieticians by asking 1) if they have computer access, 2) if they would like to receive information and advice or keep in touch via email, 3) if they use an online agenda or organizer or prefer their paper booklet.

Among the six dieticians, **social norms** play a small role and they do not seem to perceive other dieticians' opinion about the use of eHealth as a barrier: "*Antique. Yes. Horrible. I know exactly who. It's a small world, the dietician field. Yes, oh, awful. (...) I know exactly who will get up on their hind legs. Just let them go, they are not ready for it*". One dietician mentions most online health activities come from commercial organizations of young dieticians: "*I think email and internet are slowly on a rise. That the persons you will find on the internet are either very commercially focused, or it's the younger generation dieticians who are starting*".

About exchanging information online, dieticians expressed some doubts and they feel everything needs to be secured properly with passwords. The dieticians doubt whether it is possible to get 100% **security** and are therefore not enthusiastic about keeping online electronic records or EPD (electronic patient files). The trustworthiness of programs and information that is offered to clients online is not always good. Dieticians want to know the information sources of websites or programs they refer their clients to. This is a downside of eHealth, clients may not always be able to tell the difference between a good and bad websites. Educating persons about trustworthy sites is done to ensure persons access the right information. "*Clients find it difficult to make a right judgment of where they are and what is or is not trustworthy information when they search online, which may increase their insecurity about a disease or treatment, so that is why I show on my website what is reliable and what websites I support*".

Quality of care

The dieticians **valued** the practical advantages eHealth applications have. Communicating becomes easier and faster, one dietician said: "(...) *I like it. And I tell [clients], if you have questions, email me because I am busy talking to clients often and it does not disturb me. I think it is perfect*". For clients, it can sometimes be more pleasurable and entertaining to use electronic ways to communicate or provide information according to the dieticians. The fact that persons might not be able to find the right and reliable information was however mentioned as a problem regarding eHealth. Moreover, dieticians do not know if the information is understood and used correctly. A dietician said: "*I think it is nice that persons*

do this. It at least it shows that they are searching for information. But it lacks something to go on. It is like if you search for any random subject that you have never occupied yourself with, you'll google quite a bit in the beginning. But where do you find something to go on? Is that the tone that appeals to you?" Also, communicating online can sometimes be difficult because interpreting an email correctly can be impossible whereas in a face-to-face conversation dieticians can use all senses and keep asking questions. Especially when psychological support needs to be given because persons have emotional eating problems, eHealth may not be able to provide the desired support: *"(...) what I consider a great disadvantage is that you lack a clinical eye. Look, I can have someone sitting in front of me and I can see the nails for example, that they do not look good (...). Or that his eyes look tired or his skin looks bad (...) you can see how someone is doing. And still a person can lose a lot of weight but he might be losing weight the wrong way and you'll overlook that with the internet. So, for someone who just wants to lose weight it is ok but you have to take care of the psychological issues"*. In general, eHealth applications such as websites or programs that offer automatic feedback were considered useful because they give insight into weight and health. However, when behavioral changes needs to be made or emotional issues are present, seeing a dietician regularly was considered indispensible. A dietician explained: *"They need more, the physical, the stimulating, and feedback in order to accomplish a change of behavior. (...)I myself do not believe that I would actually change my behavior because a computer indicates that I should"*.

All dieticians felt that it is very important to get to know a client during the first visit. This needs to be done face-to-face but when a relationship of trust is established, the dieticians see no problems regarding **relationship** in communicating indirectly via email or an online program:

> *Interviewer: (...) do you think that it is a barrier?*
> *Dietician: No, not at all, because you see them the first time anyway. Maybe the second time also and then a bit longer in between and under while working with that [online guidance program]. And then after about a month or six weeks another face-to-face meeting. Yes, I think that that can work fine. Absolutely, totally convinced.*
> *Interviewer: And regarding involvement in treatment?*
> *Dietician: Very good. (...) As long as you keep in touch.*

However, dieticians questioned the effectiveness of online communication, especially when motivation levels are low: *"You are for some part a motivator because you have to be able to stimulate the clients to work on it. And talking can sometimes be easier than writing, and talking can also be easier than reading for persons (...) So in that sense I think the dietician does have added value"*. Another consideration concerns online applications or programs that do not involve treatment from a dietician. The dieticians

felt that these 'tools' may offer insight or awareness, and are used within treatment for that purpose, but in itself cannot help persons to become motivated and actually lose weight. There needs to be a dietician who gives personalized feedback and sees the client regularly.

Summary

The dieticians all have some experience with eHealth. Mostly, they use (or will use) email and e-consults to keep in contact with clients who need some extra care, or are unable to attend consultation hours due to distances. Currently, e-consults or email contact are seen as a service.

Dieticians said that eHealth can be a useful complement to treatment, but they have concerns about the client groups they can reach with it, the way they will be compensated for the time they invest in it, and the way it can be fitted into the treatment. For example dieticians want to know if they can use it incidentally for doing tests or information supply, as a follow up tool, or as a constant part of treatment. Furthermore, compatibility with current (electronic) registration systems was considered important. Different clients may benefit from different ways of using an online treatment program. Therefore, being able to offer just those parts that are relevant is important, according to the dieticians. Good usability and a clear structure are required so that few instructions are necessary; dieticians do not want to waste too much time introducing the program to clients. Clients can choose if they want to use it, but if they do, usage should not be without obligations; agreements on use & costs should be made and made clear to the client. Concerning reliability and security, the dieticians feel 100% security is never possible, but appropriate security measures should be taken (secured log in, being able to make back-ups). Further, the WLC offers possibilities to provide clients with reliable information whereas online searching or programs without contact with a personal dietician may leave clients with wrong or wrongly interpreted information.

Dieticians were positive about the added value of eHealth to weight loss treatment. It can be used to give information, give insight into one's health status, monitor progress, or have contact with clients. In these functions, a supplementary eHealth program can support the treatment and practice because of its convenience and time saving capacities. Also, it may appeal to some clients more because they like to use computers and new technologies. However, dieticians felt that online communication cannot replace face-to-face contact because it is harder to interpret written messages in comparison to direct interaction. Also, checking if information is read and understood can be difficult. Especially when clients have emotional problems or when behavior change needs to be made (as opposed to solely increasing knowledge), dieticians fear that eHealth accomplishes little results. When a relationship of trust exists and face-to-face contact continues, online communication is no problem at all. Also, when face-to-face contact is impossible, eHealth is considered a good solution.

Log files

The log files show how often clients and dieticians logged in on the WLC (Figure 8). Logins were counted as separate sessions when they were at least 5 minutes apart. Week 1 started on April 11, week 14 started on July 11. On average, the 10 clients who used the WLC (they logged in during this period at least once) logged in 0.5 times per week per client during these fourteen weeks. The 3 dieticians logged in on average once a week per dietician. The client sessions decrease over time which means clients tend to log in less frequent over time. The dieticians are more consistent in their sessions, although they too show a decline in weekly login frequency. Similarly, a decline in the amount of unique clients per week can be seen, starting with 5 unique clients in week 1, the number drops to zero in week 6 and 7, and later increases to two unique clients. The dieticians appear more consistent, ranging from three to one, but here a decline in unique users can be seen too.
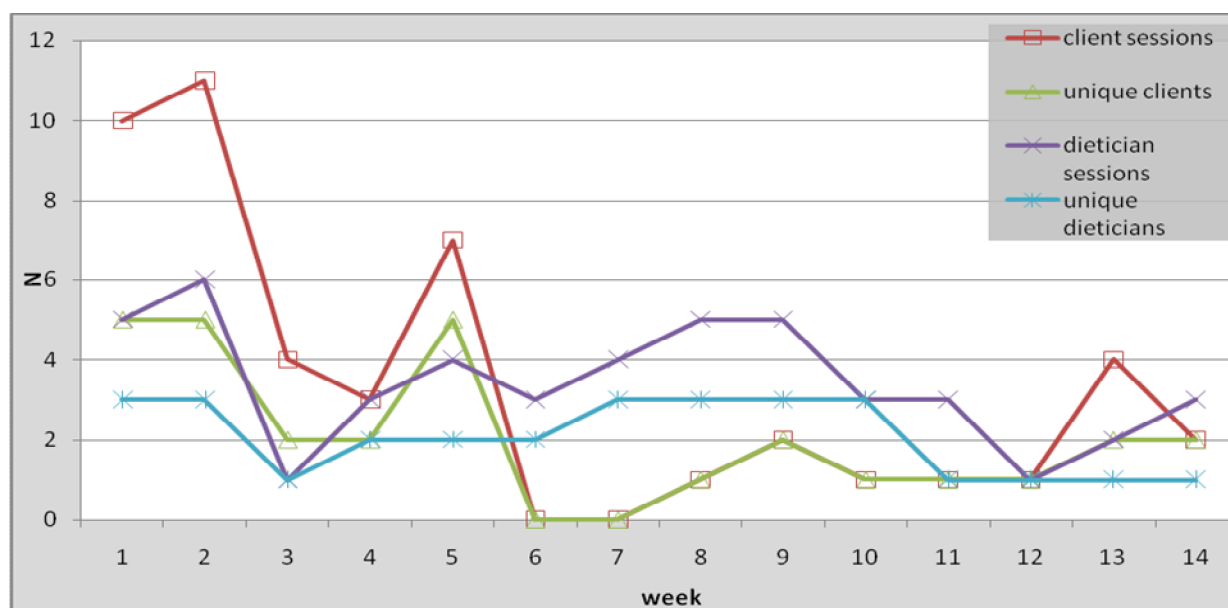

Figure 8. Log in sessions and unique users

A total of 15 assignments were handed out by the three dieticians during the 14 weeks (see Figure 9). Of these assignments, 5 were completed by clients and these 5 assignments were accepted by the dieticians.
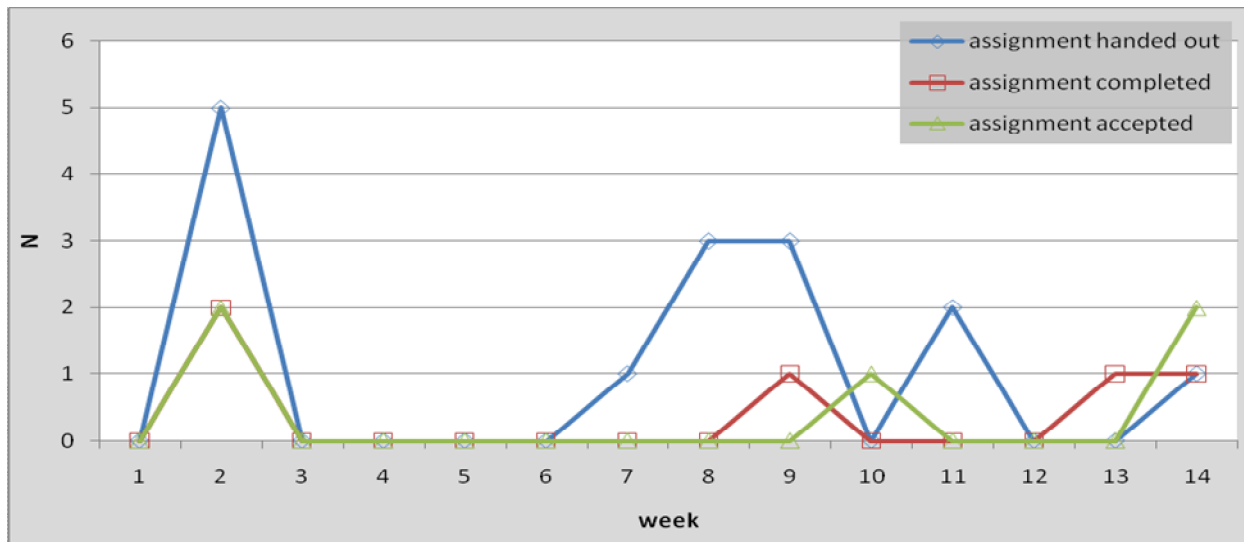
Figure 9. Assignment activity

During the email logging period (January 4, 2009 - July 18, 2009), 63 email messages were sent via the WLC. The three dieticians sent a total of 42 messages, addressed to eleven different clients and four clients used the email function to send email, they together sent 21 messages to their dieticians. Figure 10 shows email usage during the 28 weeks of email logging, and it can be seen that over all, dieticians sent more email than clients. Although the amount of sent emails varies per week, the trend line of sent email messages shows a decline.

Figure 10. Sent emails
In week 15, WLC login and activity logging started (Figure 7 and 8)

Besides the amount of sent emails content was also logged, and analyzed according to the codebook (Table 5). Table 13 shows how often each category of that codebook was c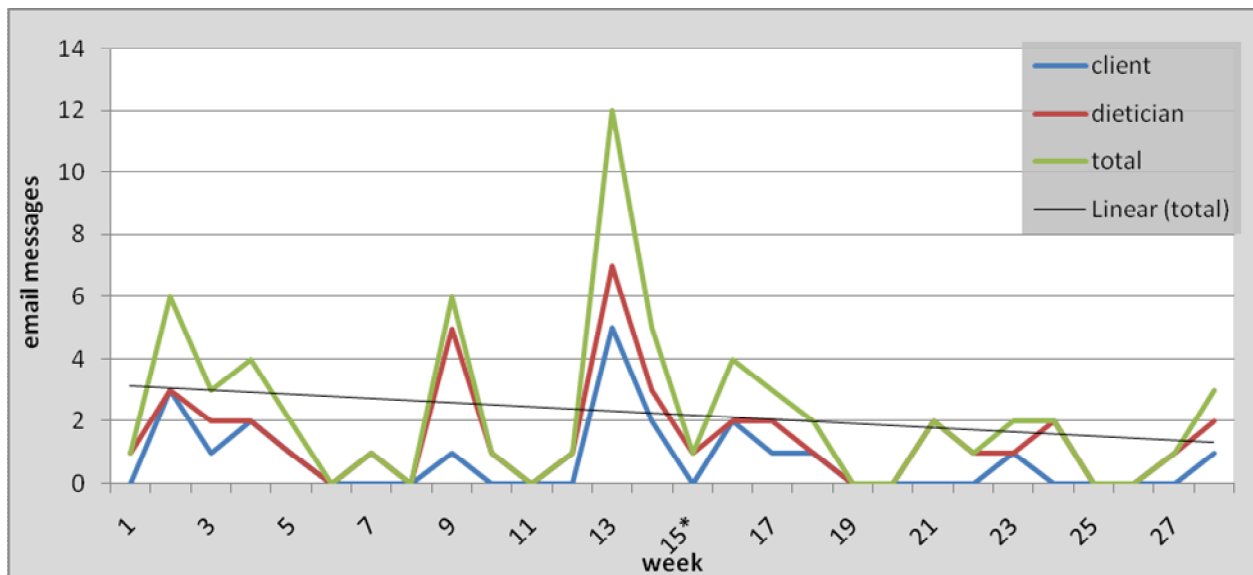oded and in how many different messages the category occurred. Most emails contain content that was coded as *WLC use*, followed by *weight loss or treatment information, progress, and treatment organization & procedure*.

Table 13. Email content coded

Category	Subcategory	References (sources)
Weight loss or treatment information	1. Assignment-induced question/response	12 (9)
	2. General question/response	10 (10)
WLC use	1. Use status	33 (29)
	2. Practical information	28 (25)
Treatment organization & procedure	-	14 (13)
Progress	-	19 (19)

Table 13 shows that nearly half of the messages refer to the **WLC use status**: a referral is made 33 times in 29 separate messages. Also, practical information occurs often; 28 times in 25 messages. Examples of use status-messages are notifications from dieticians that new assignments are handed out:

> *(…)The first 4 assignments are ready for you to start working on. For our next meeting on April 12 I would like you to work on these and send them to me. (…)*
> (From dietician E to client J)

Also, messages that mention that assignments are received or results are noticed by the dietician are *use status*-messages:

> *(…)I saw you did the assignment, super! (…)* (From dietician A to client C)

Further, clients have also used email to notify their dietician of their use status, usually after some error occurred while trying to send assignments (hand them in):

> *(…)This morning I was able to send the nutrition diary. You should have received it by now. (…)* (From client L to dietician E)

Practical information-messages contain information about how the WLC works, how to use it, and problems that users (could) encounter and how they can work around them:

> *(…)I can now change the status. You should be able to fill in the nutrition diary. I can open the nutrition diary for a maximum of 4 weeks. If we want to continue after that*

> *you would have to send it to me again and then I can open again. (…)* (From dietician
> A to client B)
>
> *(…)When saving the physical activity-planning I continuously receive error messages
> and loose half of my data. Can this be resolved? (…)* (From client L to dietician E)
>
> *(…)If you have any questions or encounter problems, let me know! (…)* (From
> dietician A to client D)

Weight loss or treatment information is also subject to email messages: twelve references in nine emails contain a response or question induced by an assignment that was made by the client. For example:

> *(…) I said I would open some new assignments. Because assignment 7 showed that
> emotional eating stands out, I opened assignment 11 and 13. (…)* (From dietician A to
> client C)

Also, in ten messages a general question or response about weight loss or weight loss treatment was issued:

> *(…) I have a small question right away. I had a nice weekend, with two times eating
> out and once eating French fries unexpectedly (very annoying!) Is there something I
> can compensate with this week? Use or eat something more or less often?(…)* (From
> client C to dietician A)

To a lesser extent, remarks or questions about (treatment/weight loss) **progress** were made. Most often the dietician showed support by wishing the client good luck:

> *(…) Good luck with the assignments! (…)* (From dietician A to client B)

Also, question or remarks about progress occurred:

> *(…) How did the eating go this week? Are you succeeding in keeping the good eating
> patterns that you had? And how is the physical activity coming along? (…)* (From
> dietician A to client D)

Questions, answers and remarks about **treatment organization and procedure** also occurred in the emails (14 times). This category contains for example questions about appointment dates:

> *(…) I saw you filled in June 24 at 08.00h in the appointment section. I wrote down
> 08.50h in my diary. Both times are convenient for me but which one is the right one?
> (…)* (From client L to dietician E)

Also, questions or remarks about when to hand in and discuss assignments fall into this category:

> *(…)You can send me the nutrition diary on Sunday so I can have a look at it before we
> have our appointment. (…)* (From client L to dietician E).

Discussion

In this chapter, the results are used to answer the research questions. First, conclusions are drawn from the results and are related to the framework. Hereafter, the used methods are discussed. Subsequently, the limitations of this study are discussed, and the discussion section concludes with suggestions for future research.

Conclusions

Per research method, conclusions are drawn from the results. All conclusions are then applied to the framework that was presented in the introduction (Figure 1 and Figure 11). Consequently, relations between the frameworks' main aspects are made clear.

Questionnaires

No strong conclusions can be drawn from the questionnaire results since statistical tests could not be performed. However, the questionnaires show that education levels of persons receiving weight loss treatment are low to moderate, as was expected since the prevalence of obesity is higher among persons with lower education levels (Dotinga & Picavet, 2006). Education levels among WLC users are similar to those of non-users, which can imply that education level is no predictor of WLC use.

Different types of comorbidity are present among users and non-users, indicating that comorbidity is not necessarily a WLC exclusion criterion. However, the type syndrome clients have may matter: diabetics may require other or additional information on how to manage their disease, whereas persons with rheumatism receive the same diet or weight loss information from a dietician as persons without rheumatism.

Users score slightly worse than non-users on treatment related cognitions such as treatment satisfaction, motivation to finish treatment, target weight self efficacy, belief in helpfulness of the treatment and eating self efficacy. They express lower needs for more contact with the dietician. Thus, for clients who have a more negative treatment prospect regarding the above mentioned dimensions, may be more likely to opt for an online treatment supplement. The lower need for more contact can be explained by the WLC functionality of contact/interaction with dietician that was available to the users. A possible need for more contact (as non-users have) may have been fulfilled by the WLC. On the other hand, more positive treatment prospects would be expected among users, due to the WLC. Baseline measurements were not available, but an explanation can be that users may have even worse negative baseline treatment prospects, but they have improved somewhat due to using the WLC.

Needs for more support, extra motivation, liking to try new things are reasons to (want to) use the WLC. However when clients are satisfied with their treatment, cannot handle computers, and/or feel that online contact is impersonal, they are reluctant to add an online component to their treatment.

Expectations about WLC use concern mainly increases in motivation, involvement, insight and knowledge. This may imply that clients feel that an online program can fulfill their desire for more motivation and support.

For dieticians as well as clients, computer and internet access are necessary preconditions for eHealth use. In this study, internet access forms no barrier, since computer possession and internet access levels are high among all participants. Overall, in the Netherlands, internet access is high: 80% of Dutch households in 2008 had internet access (Eurostat, 2008).

Thus, computer skills and appreciation of eHealth form barriers to use, whereas low self efficacy levels, a need for extra motivation and support, and wanting to try new things are positive predictors of eHealth use. Differently put, clients with a more negative treatment prospect (low motivation, low satisfaction with treatment, and low self efficacy levels) expect to benefit from an online treatment supplement.

Usability tests

The usability test results show that the WLC was judged easy to use by most users. However, users do experience usage problems, especially in orientation, malfunctioning of the system and user friendliness. These problems can at least partially be explained by implementation issues, given the many remarks about experience, or the lack of experience of users. Thus, users need some time and practice to get to know the program well. Further, clients and dieticians claimed that WLC use becomes easier with increased experience. Clients' optimistic judgment of usability is underlined by the remarks about instructions; the program is easy to learn and requires few instructions. However, during the usability tests, the test leader often gave additional instruction on functions that users were unfamiliar with. Thus, even though good usability and clear structures make use easier, it does not eliminate the need for instructions.

The usefulness or appreciation of features was often based on usability levels; features that looked good and were clear were appreciated, and considered a useful addition to treatment. However, features that were hard to operate or resulted in system errors were considered not useful. A similar pattern is found regarding convenience. Thus, treatment malfunctioning and user friendliness influence user's usefulness and convenience perceptions. In addition, convenience also seems somewhat related to implementation issues; the WLC features are not imbedded well into clients' and dieticians usual (internet) activities or work methods, and are therefore considered inconvenient. An example is the inbox:

clients and dieticians receive no notifications of received mail in their regular (non-WLC) email inbox, and thus have to log in to check for new messages. This is considered inconvenient. Dieticians encounter more problems benefitting from the program than clients, possibly because fitting the program into their work routine is more complex, due to other (electronic) programs they use and time constraints.

User interviews

During the user interviews, quality of care aspects of WLC usage were discussed more intensively than during the usability tests. The results show that usability characteristics can and should be improved because it hinders optimal use, convenience, and thus, the quality of care. However, positive usability characteristics: the ease of use, clear structure and nice appearance are valued and render positive appreciations; it is fun and easy to work with the program. Also, clients claim to get more involved in treatment by the WLC because it is easy to open the program in between activities (at work or at home), it is fun to work with, and it offers extra guidance and contact. Thus, the ease of being able to consume care at any moment, at any place, and in a fun way helps persons to work on their treatment. For most clients, the WLC fits into their daily routine easily. However, in some cases, having to turn on the computer or enter the program was seen as a barrier to use.

Dieticians mention that offering treatment via an online program offers clients advantages because it is more fun and may appeal to their lifestyle better. Clients in different phases of treatment may benefit from the insights or awareness they gain from the information and assignments, the guidance and overview on progress they make, and the possibility to keep in touch with the dietician. Dieticians reckon that not every client will benefit in the same way from the program, depending on the type of problems the client has. Personalization and personalized feedback are mentioned as important criterions for e-Health use in different studies (Oenema et al., 2008; Kerr et al., 2006), and the current results thus show that dieticians too stress the importance of being able to alter the program's content to individual needs.

As was noted during the usability tests, implementation issues can hinder the perceived usefulness and convenience; during the interviews dieticians claim that they benefit less from using the WLC than clients because it costs them more time and effort than the traditional treatment. This is ascribed to the ill fit into current working methods: the incompatibility with electronic registration systems and the lack of time to spend on the WLC (or reimbursement of time spent on the WLC). The possibility to guide clients and keep track of their proceedings in between appointments offers little advantage to dieticians, since they have insufficient time to do this. Dieticians appreciate the WLC because of the benefits it can offer clients. However, incompatibility with current working methods (an incomplete implementation) creates a practical barrier to use.

This incomplete implementation of the WLC is also shown by the sparse instructions clients receive, and dieticians give. Dieticians lack time to do this and even though clients and dieticians think learning to how to operate the system is easy, clients express that the usability test (and additional instructions during the test) really helps them to learn the programs' possibilities. Thus, for implementation and optimal usage, good instructions of some form (demo, face-to-face, help function, written texts) need to be provided.

Another implementation related barrier concerns the perceived target group: no clear guidelines on the WLC target group were available to the dieticians and they thus used their own rules of thumb. Dieticians excluded persons of high age and immigrants or persons of other ethnicity with poor Dutch language skills. These exclusions may be unjust, since higher age does not always imply a decrease in usage, although figures are not clear on this subject. (Nguyen et al. 2004). The Dutch social planning agency (Sociaal Cultureel Planbureau) does however estimate that the numbers of elderly persons using the internet is increasing and will continue to do so in the future (Duimen, 2007). For persons of foreign descend or migrants, language forms a barrier to internet and eHealth use that may be hard to overcome (Ono & Zavodny, 2008). However, excluding migrants on forehand from eHealth programs is unnecessary. Dieticians who disseminate the program to their clientele currently lack a clear view of the WLC's target group, which could cause them to exclude clients who would benefit from using it.

Regarding the WLC's influence of the client-dietician relationship, all users are positive. The extra opportunities to have contact and be able to ask questions are valued especially by clients who tend to feel insecure and need reassurance. Dieticians as well as clients feel it is important to know each other before starting to use the WLC. In addition, clients and dieticians state that face-to-face meetings remain indispensible throughout the treatment. Thus, the WLC is seen by clients and dieticians as a supplement but not as a replacement of the usual treatment. Once a relationship of trust exists, contact can be broadened to WLC use without a problem. Some clients mention they would use the WLC for small questions or superficial contact only, and save the real motivational problems for contact moments. As on client said: *"[For small things] this is a good supplement"*. Being able to ask (and answer) even a simple question in between treatment apparently gives clients the feeling they are more in contact with their dietician and as they say, it may cause involvement into their treatment.

In concordance to research by Oenema et al. (2008), credibility and reliability seem to play a minor role in the acceptance and use of the program. Users assume the reliability and credibility of the information is good, since it is offered by dieticians. Security concerns are a bit higher among clients, but the professional look, secured login, and dieticians' enthusiasm again break the security barrier. Thus, by introducing a program via the caregiver, concerns about reliability and security can be overcome.

Non-user interviews

Dieticians show interest in eHealth and all have some experience using the internet or email within treatment. Clients are becoming more active online and reaching out to them via an online program is considered a good idea: "*People like it. It is very relevant in these times, you just notice it. (...) it is increasing. It is becoming more normal that persons sign up via the website and also ask questions via email, change appointments via email. That's just normal*" (non-user dietician). Thus, even though implementing a program into the current practice may cost some effort, it holds advantages for client service and it appeals to clients' lifestyles.

Regarding implementation, dieticians have concerns about the WLC target group because many dieticians have a very heterogenic clientele. They specialize not only in treating obese persons, but also diabetics, underweight persons, children, sportsmen, persons with food intolerances, and so on. Therefore, dieticians need to know who they can offer the WLC to in terms of morbidity but also concerning other characteristics. Some dieticians mention that as long as there are no language problems, immigrants could benefit from eHealth, as one dietician said about one of her Dutch speaking migrant clients: "*The fact that you do not understand the language makes communicating difficult. And when communicating is difficult, it is also hard to explain things. That's the gap. (...)This [WLC] would be something for her, as long as she knows how the internet works*". A restricted target group can be a barrier to adaptation because being able to use the WLC on only a select group of clients would be too much of a hassle to start with it in the first place for dieticians.

Dieticians want to be able to use the program for different purposes or stages in treatment: giving information, insight, contact, and/or monitoring. Not every function is suitable for every client in every phase. Thus, being able to personalize the offered features is considered important. For example, when clients are under treatment for a longer period, the WLC might function as a follow up method to keep in touch regularly.

Another important implementation issue is the compatibility with current methods; the system needs to be linkable to electronic registration systems and other programs used within the dietician's practice. User friendliness is considered important too, it has to be easy to use and to learn, because technology should be convenient and make giving or receiving treatment simpler, not make it more complicated and time consuming. Since dieticians have little spare time during and in between consults, introduction and instruction cannot take up too much time. It has to be simple. However, agreements have to be made during the introduction of the program on how it will be used and how the dieticians are reimbursed for using the WLC.

Concerning reliability and security feel that offering an online program has advantages; even though 100% security is not possible, at least it gives dieticians a means of providing trustworthy information to their clients as opposed to (commercial) websites that lack professional or scientific support.

Keeping in contact via an online program and offering extra information is considered helpful within treatment. However, face-to-face consults cannot be replaced by it, and the client and dietician need to know each other before an online program can be added to the treatment. Even though written text or emails are sometimes harder to interpret, online contact is not seen as a treat to the relationship. Thus, as long as dieticians can keep a face-to-face eye on their clients, extra online contact is useful and convenient.

With their eHealth experiences and ideas about eHealth, dieticians value the possibilities eHealth applications offer in terms of usefulness and convenience. In different phases, an online program can be a good method to deliver treatment components, guide clients, or keep in contact. Regarding the systems' functionalities and the way it should be implemented, dieticians seem to know what they want: a program that is compatible with current working/registration methods, easy to use, can be used as a valid treatment method (including insurance reimbursements). It should offer information (insight), a means for monitoring, client-dietician communication, and logistical functions (a doing tests online, making assignments). Many applications (with different functions) exist; it now needs to be brought together in a way that is compatible to current work methods so that dieticians and clients can benefit from the advantages eHealth offers.

Log files

The log files show that WLC use is low and decreases as time increases. Also, assignment activity and email activity decrease over time. Continuous or long term use is a challenge. It might be that the program is interesting at first, but in time this interest decreases and use declines. This is a common problem in online programs (Brouwer et al., 2008). Different reasons may cause this decline. For clients, when information does not change, a revisit is less likely to occur. Thus, reminder emails, changing content, and messages about what can be expected during the next visit can help to ensure users revisit the website (Brouwer et al., 2008). Dieticians expressed that using the WLC costs them time which may decrease use motivation. Also, low client activity causes dieticians to use the WLC less often; when clients do not hand in assignments or do not respond to email, dieticians have little need to be active, even though they continue to hand out assignments.

Further, the log files show that sent emails show many references to WLC use, and where motivational messages were sent (coded as progress), they usually consist of a dietician simply wishing

the client good luck. No requests for more emotional support or extensive motivational messages were sent. It thus seems that the WLC email function is used to exchange practical information so that clients can continue to work on their treatment independently. These practical messages may be important: when a client finishes an assignment, a direct acknowledgement of his/her activity, even if it is brief, can keep clients involved. Also, when questions arise about a certain topic or assignment, being able to get an answer quickly can help to stay involved and be able to make progress. Further, knowing that the dietician can be reached easily may offer clients a sense of (emotional) support, without actually using it. It must be noted however that since overall activity was low, email activity was also low and these conclusions are thus based on users' limited email use.

Framework

When applying the conclusions to the framework presented in the introduction, conclusions can be grouped according to the framework's main features; target group, system, implementation, and quality of care. Also, underlying relations are described in this paragraph (see Figure 11).

Concerning **target group** (see Figure 11), the first research question, this study shows that computer access, (at least basic) computer skills and an interest in/positive attitude towards using an online program are main target group characteristics for an online treatment supplement as the WLC. Because additional face-to-face guidance continues and the programs' content is easy to grasp and clear, literacy levels form no barrier to use. Online programs may be less suitable for clients with complex problems, low treatment motivation, low eating and treatment self efficacy levels, and very specific comorbidity. Still, subparts can very well be relevant to these users when they are offered in a personalized way, for example when diabetics receive tips of their dietician adjusted to specific diabetes needs, or when exercise goals are lowered to rheumatic users' abilities. Concerning dietician characteristics, computer access within their practice is a prerequisite, as well as average computer skills, because dieticians have to be able to understand how to operate the program and give clients at least initial instructions. Given their pre-education, literacy levels form no barrier. Then, only motivation to use eHealth programs and beliefs in their effect may be barriers. The results further show that a clear understanding of the intended target group is important to determine which characteristics the system should have (See Figure 11, **1**), and how it can be implemented (See Figure 11, **2**). Not al WLC features are equally relevant for every client. Thus, in developing a new program, developers should know which features are universally important, or differ among target group members. Being able to personalize the program to specific users by offering features relevant to them in an easy way is an important caregiver prerequisite.

The second research question focused on user experiences, the way the **system characteristics** (see Figure 11) are used and valued by users. Overall, clients are positive about the WLC features and functionalities, for as far as they have had experience using them. Especially WLC functions aimed at giving information, communication and logistics are considered useful. Usability is judged positively even though users encounter multiple problems during the usability tests. Dieticians are more critical of program functioning, possibly because they have been involved in the developmental phase of the program and thus looked with a different eye, a developer's eye. They had expectations about the program; it should be easy to use, look good and give overview, offer something extra in terms of convenience. For clients it should be a more pleasurable, fun way of treatment compared to the usual program. Improvements are proposed by users on user friendliness (the way data is entered), structure or overview, and technical functioning (errors and system response). Remarkably, not all functionalities are used extensively: log files show that few assignments are handed out or returned, emails are not sent frequently, and user tests show that dieticians do not often give feedback or tips via the program. Thus, logistics and communication seem to be used sparsely, even though clients and dieticians say they appreciate these functions highly. A proposed reason could be the limited instructions dieticians and clients received which hindered them from learning and using all program functions, thereby proposing an influence of implementation on (experienced) system characteristics (Figure 11, **3**)

When **implementing** an online treatment supplement, it is crucial that this program fits well into the caregivers' (in this case dieticians') practice. This is the main answer to research question 3: compatibility with current work methods and programs is a barrier to use. Further, a program cannot be too time-consuming in use and reimbursements must be arranged, during the introduction period and in daily use. Closely related to implementation requirements are the system characteristics and the intended target group (Figure 11, **2** and **3**); a program will be implemented and accepted with difficulty, or not at all, when it can be used with only few of the caregivers' clients, and offers limited functions that are difficult to learn and hard to operate.

Care providers' and care receivers' perceptions on **quality of care** of online delivered treatment supplements, as was the focus of research question 4, include the understanding that motivation must come from within the client and is not increased by an online program. An online treatment supplement can function as a means of offering of consuming care, it cannot motivate or stimulate. Nevertheless, online programs appeal to clients' lifestyles, fit into their daily routine and thus offer convenience. Contact and data exchange are facilitated. When relationships of trust are established, online communication forms no threat to this relation, even though interpreting online (asynchronous) communication can be difficult. Also, as long as regular face-to-face consults continue, online program

supplements can increase involvement in treatment because more contact in between consults is possible. These positive effects an online treatment supplement has are however dependent from the system characteristics and the way it is implemented (Figure 11, **4** and **5**). When programs contain the wrong or irrelevant functionalities or cannot be used easily; use will be hindered and no positive effects on quality of care are present. Similarly, an incomplete or unsuccessful implementation hinders users to experience the positive effects on quality of care because the program is used wrongly or offers little convenience because it fits ill into daily or working practice.
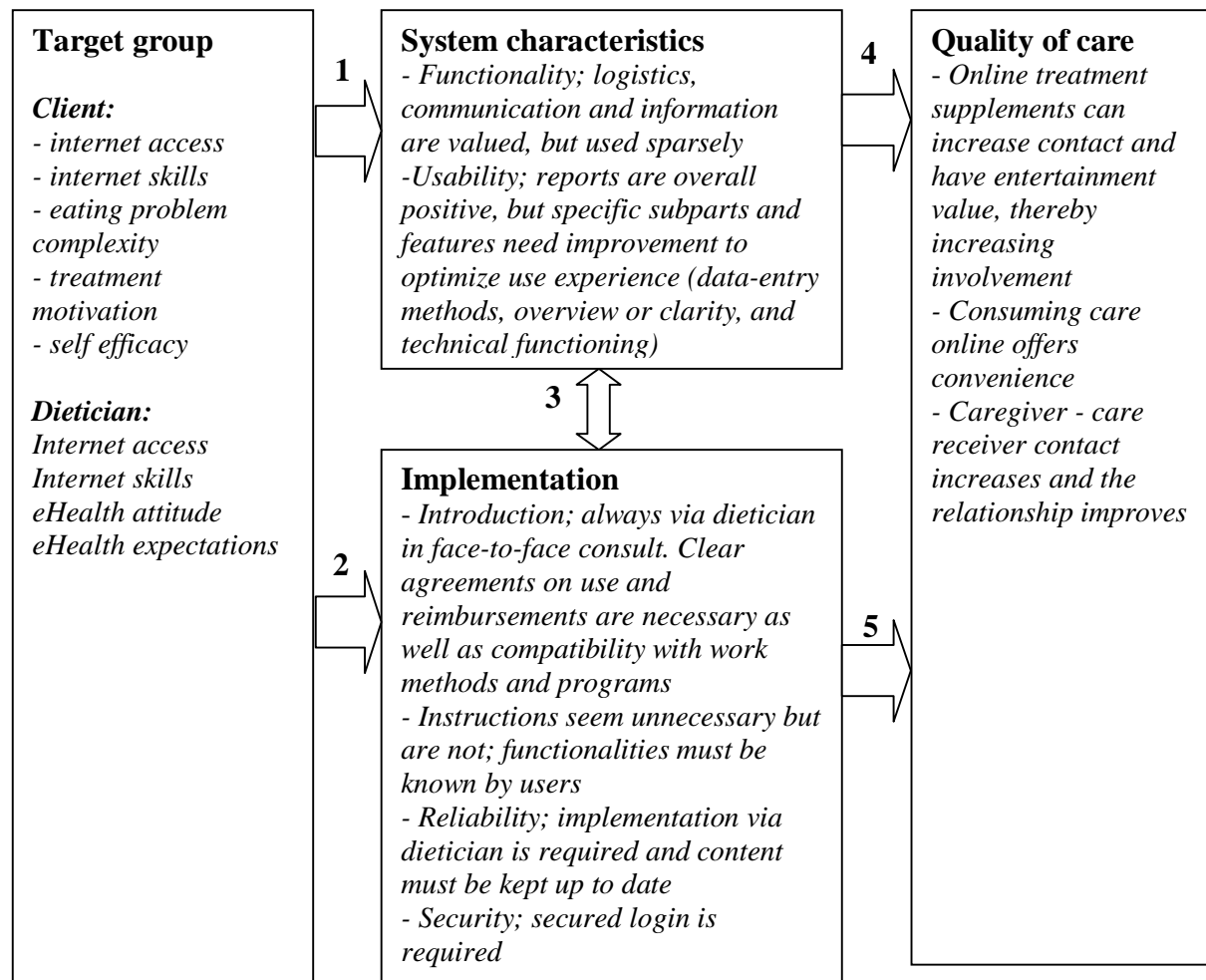
Target group ***Client:*** *- internet access* *- internet skills* *- eating problem complexity* *- treatment motivation* *- self efficacy* ***Dietician:*** *Internet access* *Internet skills* *eHealth attitude* *eHealth expectations*	**System characteristics** *- Functionality; logistics, communication and information are valued, but used sparsely* *-Usability; reports are overall positive, but specific subparts and features need improvement to optimize use experience (data-entry methods, overview or clarity, and technical functioning)* **Implementation** *- Introduction; always via dietician in face-to-face consult. Clear agreements on use and reimbursements are necessary as well as compatibility with work methods and programs* *- Instructions seem unnecessary but are not; functionalities must be known by users* *- Reliability; implementation via dietician is required and content must be kept up to date* *- Security; secured login is required*	**Quality of care** *- Online treatment supplements can increase contact and have entertainment value, thereby increasing involvement* *- Consuming care online offers convenience* *- Caregiver - care receiver contact increases and the relationship improves*

Figure 11. schematic overview of factors related to implementation and acceptation

Discussion of used methods

Questionnaires

Because privacy or shame may play a role in reluctance to participate in research when obesity is concerned, client characteristics (user and non-user) were surveyed with questionnaires. Also, questionnaires offer a means to reach bigger groups and thus research group characteristics and possibly, generalize findings. However, in this study insufficient questionnaires were collected to be able to draw definite conclusions. Further, one of the used scales, the EHEALS (Norman & Skinner, 2006b) looked promising in measuring participants' level of eHealth literacy; but the results showed little differences between individuals. Of course, this can be due to a homogenic research group, but another explanation may also be valid: Van Deursen & Van Dijk (in press) argue that self report may not be a good means of measuring internet skills (thus, also eHealth literacy). Further, attention should be paid to information skills: the way information is interpreted and understood (Van Deursen & Van Dijk, in press). According to these researchers, internet information skills are dependent from education, not from training or experience. Further, internet skills are best measures by performance tasks, not via self report (Van Deursen & Van Dijk, in press). Concerning the WLC situation, high information skills or eHealth literacy may be unnecessary in a weight loss treatment supplement because the care giver closely monitors and guides the client.

Applying questionnaires to gain insight into clients' overall interest in an online treatment supplement is useful, but questionnaire response remains a challenge. Nevertheless, the survey may have served as an implementation tool; clients who became interested in using the WLC were referred to their dietician but were also warned that the WLC was not yet fully available.

Usability tests

In this study, the usability tests rendered great insights into user problems and usability levels of the WLC. Participants were encouraged to express their thoughts and opinion during the test, which they usually did. Since experience levels were sometimes low and users were unaware of all WLC functionalities, the usability tests provided an opportunity for the researcher to give personal instructions. This was valued by the participants; so in this sense, the usability tests became a part of the implementation process.

During the tests it became clear that when user-experience is low, even the simplest task can become time-consuming. Therefore, the results' accent lies on experiences and problems encountered, not on task completion. Besides conclusions about necessary usability levels, usability tests have rendered many cues for refinement of the program, useful for program developers.

Interviews

The interviews following usability tests have proven to be useful because they gave the researcher a possibility to explore interesting usability test events or questionnaire responses. Also, in determining non-users opinion about eHealth and user demands interviews were a good method because the addressed topics were very specific and responses depended from dieticians' personal experience and opinion which are easily overlooked in questionnaires. However, more structured non-user interviews would have increased comparability. The interviews were considered explorative, and resulted in a broad array of experiences and opinions. Structuring questions more could force respondents to convert their opinion/experience to more practical answers or recommendations.

To analyze the interview data, codebooks were used. A second coder coded 10% of the transcripts to determine inter rater reliability. This was not done successfully; κ values were computed by Nvivo for the coding categories of three interview transcripts (one user client, one user dietician, and one non-user). These values were computed by the program based on the percentage of selected text coded by both coders and so, minor differences in text selection between both coders (coding only a subject's answer or including the question creates a difference in percentage coded text) may lowered the κ values. The κ values for the coded interview categories ranged so much that they were considered not useful. Inter rater agreement was established by discussing differences in coding based on content, not on percentage coded. In order to be able to determine the inter rater reliability of the coded interviews; units of analyses should first be determined. Also, agreements on coding in more than one category need to be made.

Log files

Using log files to determine actual program use has proven to be indispensible given the results. Even though usability tests and interviews showed how enthusiastic clients and non-users were about the possibilities of the online program, this enthusiasm cannot be seen in actual use frequency. Thus, between being enthusiastic and valuing eHealth possibilities, other factors may obstruct use. Without insight into actual use frequencies, these obstructions may have remained unknown and could have prevented the program from being successfully implemented on a larger scale. In this study, logged email content gave additional information in the system's communication function and logged assignment activity provided insight into the system's logistics function. By logging other functionalities as well, frequency of use of those functions, for example the accessing of information pages, can be obtained and can give insight.

Limitations

Among the main limitations of this study are the limited amount of participants in the pilot (3 dieticians and 10 active clients) and the low questionnaire response. Usability test participation was not obligatory, and three clients refused to participate. Thus, a sample bias may have occurred regarding severity of (emotional) problems/co-morbidity and user experiences. A similar bias may exist in the questionnaire responses; clients who did not want to use the WLC and have no interest in eHealth can be less likely to fill in and return the questionnaire. The introduction letter explicitly asked every client to fill in the questionnaire, regardless of background or interest. In addition, since the pilot started before the research started, no baseline measurement could be made regarding motivation, expectations, etc. Knowing users' expectations, motivations and severity of morbidity prior to the program's implementation gives better insight into the target group's characteristics and progress during the pilot.

Another limitation that may have influenced the outcomes somewhat is the numerous errors and malfunctioning of the WLC during the pilot. Even though one of the aims of the pilot was to detect possible errors and generate suggestions for improvement, several users were unable to use the WLC properly because some main features did not function correctly such as the demo and the nutrition diary. In addition, the program's informational content was not up kept up to date and dieticians claimed the program lacked automatic feedback features. Some of the biggest problems were resolved during the pilot, but may still have caused some clients and dieticians to become less motivated to use the program. Even though an effect of usability or system functioning on perceived quality of care became clear, it is hard to predict future use.

Because the log files became available after all usability tests and interviews were held, clients and dieticians could not be asked about reasons for the decline in use. Since long-term effects are important, especially in chronic care or e-disease management eHealth programs, conducting follow up interviews with clients after they finished their treatment or when they have stopped WLC use can render information on why clients use the WLC less frequent over time, and explain the discrepancy between clients' enthusiasm about the program and the low usage numbers.

Regarding the non-user dietician interviews, all interviewed dieticians were approached via telephone and email, and a possible response bias may exist because the dieticians possibly had some interest in eHealth. None of the dieticians was overtly negative about eHealth and using the internet, even though they ascertained that many of their colleagues are. Thus, the opinions expressed in this research may have been somewhat one-sided due to the lack participation from eHealth disliking dieticians.

In addition, because all non-user dieticians were part of a (semi) independent practice, unlike the dieticians of Thebe who worked for a large healthcare organization, the results regarding implementation may not apply to other healthcare organizations but represent independent dieticians' opinion.

Future research

Even though patients and care providers are positive about the possibilities eHealth offers, challenges lie in designing programs that can be used by a broad target group, and fit well into care providers' practices.

Since some user problems and possible subsequent decrease in use were likely caused by poor implementation and in clients' case poor instructions, research could focus on testing which instruction methods are best fit to inform new users. Excellent user friendliness may prevent user problems; it does however not stimulate to explore program features. Also, clients and dieticians are ambiguous about their preferred instruction method; exploring it yourself works fine, but after receiving the researcher's instructions during the usability tests, users claim to be better equipped to use the program. Furthermore, demos and (printed) guidelines should be present but may not be used. Thus, comparing instruction methods by testing their effects on correct program use and motivation and use intention should be done. In addition, this study shows how use declines over time while better instructions may result in more consistent use patterns. Whether the decrease in usage over time can be explained by lack of instruction, or possible other factors can be investigated by conducting follow up interviews with users, after they have some months of experience with an online program, or when they have stopped using the program.

In order to find out to what extent people with different syndromes benefit from online weight loss support, research can be done to compare the experiences these different groups have. This may render suggestions for extensions to the program tested in this study, to make it better fit, and appeal more to clients with diabetes, high blood pressure, rheumatism, depression, or other diseases.

Another target group research topic may be the applicability of eHealth among migrant groups. Dieticians mention they have difficulties communicating with (and thus treating) clients of non-Dutch origin. Offering online treatment support, possibly with adjusted language, may give dieticians a tool to reach these clients outside the practitioners' office, without relying on interpreters.

Finally, in this research UCD principles were applied; end-users were involved in the evaluation of the program. However, finding enough clients and dieticians that had experience with the WLC, and were willing to participate was not easy. The clients did not have much experience using the WLC at the moment of the usability tests, and some users declined to participate. By involving 8 to 10 subjects, up to 80% of the usability problems can be identified (Kurushnik & Patel, 2004). In this study, 7 clients and 3 dieticians participated in the usability tests. Possibly, more subjects per group would have yielded

stronger results. However, finding enough subjects that can and will participate among the end-users may be difficult. Therefore, usability testing could also be performed with subject who resemble the end-user but not necessarily are the intended end-user. Privacy issues that may play a role in the decline to participate become less relevant barriers. In this way, the actual end-users' needs can still be studied, and remain of importance during design and implementation processes, but testing program usability can be done using subjects who resemble the end-users. Clearness on this topic and a good view of when end-users should be involved in UCD methods can facilitate the evaluation process.

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Appendix 1. Questionnaires

The questionnaires contain the following subsections or scales: computer/internet, treatment (only for clients), WLC experience and background.

Computer/internet

Computer and internet experience were measured by two items:
- '*Do you use the internet*? (yes/no)
   '*If so, how often*?'
- '*Do you have a computer with internet access at your home?* (yes/no)
   '*If not, do you use the internet elsewhere*?' (yes/no)
   '*If so, where?*'

To gain insight into subjects' ability to search and use health related information on the internet, or subjects' *eHealth literacy*, a translated version of the eHealth Literacy Scale (EHEALS) was used (Norman & Skinner, 2006). All items were measured with 5-point Likert scales.

A. How **useful** do you feel the Internet is in helping you in making decisions about your health
B. **important** is it for you to be able to access health resources on the Internet
1. I know **what** health resources are available on the Internet
2. I know **where** to find helpful health resources on the Internet
3. I know **how** to find helpful health resources on the Internet
4. I know **how to use** the Internet to answer my questions about health
5. I know how to use **the health information** I find on the Internet to help me
6. I have the skills I need to **evaluate** the health resources I find on the Internet
7. I can tell **high quality** health resources from **low quality** health resources on the Internet
8. I feel **confident** in using information from the Internet to make health decisions

Treatment

Information about the clients' treatment was asked by different questions:
- '*Since when are you receiving treatment*'
- '*What is your current weight*'
- '*What is your target weight*'
- '*Do you have other diseases or ailments?*' (yes/no)
   '*If yes, which?*

Treatment satisfaction was measured on a 5-point Likert scale by one item:
- '*I am satisfied with my treatment*'

Desire for more contact with the dietician was measured on a five point Likert scale by two items:
- '*I want to see my dietician more often*'
- '*I want more contact with my dietician*'

Motivation to finish the treatment was measured on a five point Likert scale by one item:
- '*I am motivated to finish my treatment*'

Eating behavior self efficacy was measured with three items based on the Eating Behavior Self Efficacy Scale: 'being able to control eating habits', 'feeling helpless about eating behavior', en 'being able to master eating behavior' (Wamsteker, Geenen, Lestra, Larsen & Zelissen, 2005). Following statements were measured on a five point Likert scale:
- '*I am able to control my eating habits*'
- *I feel helpless about my eating behavior*'
- '*I am able to master my eating behavior*'

Further, two statements were added to measure the target weight self efficacy and the perceived helpfulness of the treatment to reach this, measured on five point Likert scales:
- '*I am capable to reach my target weight*'
- '*My current treatment helps me to reach my target weight*'

Weight Loss Coach

<u>Non-users</u>

Non-users were given a short explanation of the WLC program and were asked if their Dietician had invited them to use the WLC:
- '*Has your dietician offered you to start using the WLC?*' (yes/no)

Non-users were asked how interested they are to use the WLC:
- '*How interested are you to start using the WLC?*' on a five point scale: *not interested at all - very interested*

Non-users were asked about their motives for wanting or not wanting to use the WLC:
- *What is/are the main reason(s) what you are interested or not interested in using the WLC?* Multiple choice: '*my dietician's enthusiasm regarding the WLC, I wanted to try something new, the convenience of an online program, I needed additional support during my treatment, positive remarks of other users, no specific reason, I do not have access to a computer with internet, I have low computer skills, I have little confidence in online programs' security, I think online contact with my dietician is impersonal, I am satisfied with my treatment the way it is,* and *other; namely...*'.

Also, non-users were asked about their expectations about the WLC and their treatment:
- '*Which expectations do you have about the WLC and your treatment?*' multiple choice: '*more contact with my dietician, more knowledge about nutrition and losing weight, greater motivation to engage in my treatment, to engage in my treatment more often in between appointments, greater motivation continue with my treatment, receiving a more pleasurable treatment, better insight into my progress during treatment, a faster treatment (reaching goals quicker), less motivation to engage in my treatment, less motivation continue with my treatment, no added value to my treatment, no expectations,* and *other; namely...*'.

Finally, non-users were asked if they had any remarks or suggestions regarding the WLC:
- '*Do you have any remarks or suggestions regarding the WLC?*'

<u>Users (clients)</u>

User experience with the WLC was measured by the following items:
- '*Since when do you use the WLC?*'
- '*How often per month do you log in on the WLC?*'
- '*How were you introduced to the WLC? (*Multiple choice: *personal training by my dietician, watching the demo clip, using the help-option, letting someone close to me help me, or other; namely....*
- '*Did this [introduction] method help to enable you to use the WLC?*' measured on a five point scale*: did not help me at all – helped me very well*

Users were asked about their motives for use (...):
- '*What was/were the main reason(s) to agree upon your dietician's proposition to start using the WLC?*' multiple choice: '*my dietician's enthusiasm regarding the WLC, I wanted to try something new, the convenience of an online program, I needed additional support during my treatment, positive remarks of other users, no specific reason,* and *other; namely....*'.

Users were asked about their expectations about the WLC and their treatment:
- '*Which expectations did you have about the WLC and your treatment when you started using the WLC?*'

Multiple choice: '*more contact with my dietician, more knowledge about nutrition and losing weight, becoming more motivated to engage in my treatment, to engage in my treatment more often in between consults, more motivation to keep up with my treatment, receiving a more pleasurable treatment, more insight into my progress during treatment, a faster treatment (reaching goals quicker),* and *other; namely…'*.

Users where then asked:
- '*Did the WLC fulfil your expectations?'* (yes/no)*, If not, why?*

The influence of the WLC on the treatment and motivation is measured with six items on a five point scale:
- '*The WLC helps me to continue my treatment*'
- '*Because of the WLC I am focusing on my treatment in between consults more often'*
- '*The WLC made me more motivated to accomplish my treatment goals'*
- '*By using the WLC I think I am better able to reach my target weight'*
- '*I am motivated to continue using the WLC throughout my treatment',*
- '*I think the WLC is a good supplement to my regular treatment'*

Users (dieticians and clients)
Users were asked about the usefulness and satisfaction regarding the functionalities of the WLC on 5-point scales (Nijland et al., 2005):
- '*How useful do you think the following parts of the WLC are?'*
  Mood, tips, news, facts and fables, demo, help, my page, nutrition diary, physical exercise plan, other assignments, progress overview, email, calendar
- '*How satisfied are you with the following parts of the WLC?'*
  Mood, tips, news, facts and fables, demo, help, my page, nutrition diary, physical exercise plan, other assignments, progress overview, email, calendar

Satisfaction about the reliability of the information, the navigation, appearance/aesthetics, comprehensibility of the information, quality of the pictures, readability of the texts, usability, opportunities to contact the dietician/client, technical functioning, and security and privacy was measured on 5-point scales:
- '*How satisfied are you with the following characteristics of the WLC?'*
  Reliability of the information, the navigation, appearance/aesthetics, comprehensibility of the information, quality of the pictures, readability of the texts, usability, opportunities to contact the dietician/client, technical functioning, and security and privacy

Users were subsequently asked if they would recommend the WLC to others
- '*Would you recommend the WLC to others?'* (y*es/no)*
  If yes, why?
- '*What grade would you give the WLC on a 1-10 scale?'*
  Why?

Background

All respondents received questions about their background: date of birth, gender, nationality, highest level of (completed) education, and work/life occupation
(Based on Nijland et al., 2005)

Appendix 2. Interview topics and scenarios – dieticians non-users

Setup
Background information
Development of the WLC by Medicinfo; The WLC is an internet application which supports the usual treatment given by a dietician for persons who are overweight or obese. The program was developed with dieticians of healthcare organization Thebe and it contains assignment similar to those used in the regular (paper) treatment version. «The website and its functionalities can be demonstrated shortly with printed screenshots».

Research
To be able to develop good eHealth programs, it is of great importance to focus on the abilities, demands and wishes of future users. Thus, not only content is important. This research is focused on questions such as 'How do clients want to use this program?' and 'How can clients use this program?' Implementation forms another focus area of this research. Medicinfo and the University of Twente cooperate in doing research in this area.

Goal
The goal of this interview is to gain an insight into the main aspects that are important to dieticians when they form an opinion or make a decision about working with the WLC. Positive and negative aspects are taken into account, not only about the programs content but also implementation issues.

Procedure
The interview will be semi-structured. I will ask global questions and there are certain topics I would like to address. But please talk freely about the topics that come up. Your responses and everything that is said during this interview is confidential, nothing you say can be later traced back to you. To be able to process the information that will come up, I would like to audiotape this interview. Are you ok with that? Lastly, I would like to ask you to fill out this short, anonymous questionnaire.

Topics
Generic questions
- Short description of practice and work methods
- Are you interested in new developments or techniques? What do you know about eHealth?
Scenarios
More and more possibilities arise to offer health by means of technology. I will give you several scenarios which display different techniques. I would like to hear from you what you think is good and bad about each scenario and why. Also I would like to know whether you think a certain application could be supplement to the treatment or support your practice.
1. A website where persons can login to get information about healthy food and weight loss. The website offers a possibility to **ask** a weight loss specialist (dietician) **questions** via email. No actual **treatment** is given.
2. A computer program which allows persons to do assignments to increase their knowledge about healthy food and increases comprehension into their eating behaviour, for example by keeping an eating diary. The program functions **offline**, there is thus no possibility for interaction with others (such as a dietician or peers). The program does offer **automatic feedback**, for example, by inserting weight, height, and waist measurement, the program gives advice about a healthy weight and possible actions to accomplish it.
3. A website where dieticians and clients can login and exchange information about the treatment. They can send messages, ask questions and clients can receive feedback.

4. A website where clients can login to **check** the **progress** they have made in their treatment, which gives **access to** their **electronic patient files**, where they can read the **suggestions of their dietician** and where they can talk to peers on a **forum**.
5. An application which allows dieticians to send their clients messages through email or sms, to encourage their motivation and activity within the treatment, or send **reminders** for appointments or assignments that need to be done.

(Tate, Wing, & Winett, 2001; Yoon & Kim, 2008; De WLC, Medicinfo; De Gezond Gewicht Assistent, Voedingscentrum; Tate & Zabinski, 2004)

eHealth questions
- Which aspects are of importance for you to want or not to want to work with the WLC?
- Imagine, you are enthusiastic about an internet program, which requirements have to be met for you to be able to actually work with it?
- How would you decide whether you would offer such a program to a client? Who would decide this? You?
  - At what moment?
  - Together with the client?
- How would your client have to be introduced? By whom? When?

The following aspects need to be addressed during the interview (either by the above questions or later on):
1. Ease of use/ usability
2. User's ability
   - o adequate introduction
   - o training
   - o support
3. added value, advantage, clinical advantage
4. trust, security
5. inpasbaarheid in huidige werkwijze (kosten in tijd/moeite)/compatability
6. social norm: colleagues (opinion and observability)
7. incentives (pressure/ rewards from management)
8. financial possibilities (expenses)
9. development and content (information, expectations)
10. implementation

(Richards et al., 2005; Whitten and Mackart, 2005; Gallant, Irizarry, Boone; Cain & Mittman, 2002; Epping-Jordan, Pruitt, Bengoa, & Wagner, 2004; Anderson, 2007)