BACHELORTHESIS

The influence of 'Mijn GezondheidsPlatform' on self-management and involvement.

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Abstract

Purpose: 'Mijn Gezondheidsplatform' is an eHealth intervention implemented for people suffering certain chronic diseases. The interventions aimed an improvement in self-management abilities. The purpose of this study was to examine if the intervention 'Mijn GezondheidsPlatform' has any influence on improving self-management abilities and the perception of involvement.

Method: To measure self-management and involvement, the Patient Activation Measure (PAM13) and the Personal Involvement Inventory (PII) were used respectively. For examining the effect of the intervention, an experimental group (MGP-group) as well as a control group were selected. Both groups had to fill in the PAM13 three times during the intervention. Furthermore the MGP-group had to fill in also the PII to measure their perception of involvement. The first measurement took place just before the intervention started (t0). The measurements were repeated after three months (t3) and after six months (t6). With several Mann-Whitney tests it is calculated if there are significant differences of self-management abilities (PAM13) within the MGP-group as well as significant differences between the groups. Furthermore the Mann-Whitney tests are used to examine if there are differences in the perception of involvement (PII) at all times of measurement. Finally, it will be examined, with a regression analysis, if there is a relation between self-management and involvement and also if internet use has any moderating effect on this relation.

Results: The results show no significant changes in self-management scores either in the MGP-group or in the control group. Between the groups a significant change is observable at the last time of measurement after six months (t6). In the self-management scores of the control group there is a significant decrease between t3 and t6. Also in the involvement scores of the MGP-group are no significant increases. The regression analysis shows no relation between self-management and involvement. It also shows that internet use has no effect on self-management as well as involvement.

Discussion: There are several limitations of this intervention regarding the structure and the design. Although persuasive elements are implemented they don't have the expected effects on the perception of involvement. Also, the structure how the intervention is build does not include formative evaluations in an iterative process. There are, however, positive results as the self-management does not decrease in the MGP-group as it was the case in the control group.

Abstract

Doel: 'Mijn Gezondheidsplatform' is een eHealth interventie geïmplementeerd voor mensen met bepaalde chronische ziektes. Het doel van de interventie was een verbetering in zelfmanagement vaardigheden. Deze studie was bedoelt om te onderzoeken of de interventie 'Mijn GezondheidsPlatform' invloed heeft op zelfmanagement-vaardigheden en betrokkenheid bij de interventie.

Methode: Ter meting van zelfmanagement en betrokkenheid werden de 'Patient Activation Measure' (PAM13) en de 'Personal Involvement Inventory' (PII) gebruikt. Om de effecten van de interventie te onderzoeken werd een experimentele groep (MGP-groep) en een controle groep geselecteerd. De participanten van beide groepen moesten de PAM13 verdeeld over drie metingen invullen. Verder moest de MGP-groep ook de PII invullen. De eerste meting vond direct voor het begin van de interventie plaats (t0). Deze metingen werden herhaald na zowel die maanden (t3) als zes maanden (t6). Met enige Mann-Whitney toetsen wordt berekend of er significante verschillen in zelfmanagement scores (PAM13) zijn zowel binnen de groepen als ook tussen de groepen. Verder wordt de Mann-Whitney test gebruikt om te onderzoeken of er verschillen zijn in de betrokkenheid (PII) over alle drie meetmomenten. Uiteindelijk wordt met een regressie analyse onderzocht of er een relatie bestaat tussen zelfmanagement en betrokkenheid en verder ook of internet gebruik een modererende effect heeft op dit relatie.

Resultaten: De resultaten laten geen significante veranderingen in zelfmanagement-scores zien noch in de MGP-groep noch in de controle groep. Er is wel een significant verschil tussen de groepen te observeren bij de laatste meting (t6). Binnen de zelfmanagement scores van de controle groep is een significante verslechtering te herkennen tussen de metingen t3 en t6. Ook in de betrokkenheidsscores van de MGP-groep zijn geen significante verbeteringen te herkennen. De regressieanalyse laat ook geen relatie tussen zelfmanagement en betrokkenheid herkennen. En de resultaten laten ook geen effect zien van internet gebruik op zelfmanagement of betrokkenheid.

Discussie: Hoewel de resultaten niet zo goed waren zoals verwacht kon er toch een effect van de MGP interventie herkend werden. Ofschoon er een significante verschil was tussen beide groepen in zelfmanagement scores bij het laatse meetmoment, werd dit veroorzaakt door een afname in zelfmanagement scores in de controle groep. In de MGP-groep bleven de zelfmanagement scores stabiel, wat als een effect van de interventie herkend kan worden. Maar desondanks zijn er verbeteringen nodig omdat de betrokkenheidsscores niet verbeterden en als er geen betrokkenheid is, ontstaat een tekort aan adherentie en daardoor missen gebruikers de kans hun zelfmanagement vaardigheden te verbeteren.

CONTENT INDEX

1. Introduction

Chronic diseases are diseases that lasts for more than three months with a specific course (Hoeymans et al., 2013). Most of the chronic diseases consists of acute periods and remissions, where patients have less symptoms (Hoeymans, Schellevis, van Oostrom, & Gijsen, 2013). Other chronic diseases have a progressive course of disease which means that the condition get worse over time. Characteristic of chronic diseases are long-lasting effects and impairments for the patients.

According to a study of Bodenheimer, Lorig, Holman, and Grumbach (2002), a higher prevalence of chronic diseases can be expected because of the obsolescence of the society. The 'Nationaalkompas' states that in the Netherlands the prevalence in 2011 of chronic diseases is 300.000 to 1.000.000 in absolute numbers (Gommer, & Poos, 2013). That means that, most of the patients suffering any disease, suffer a chronic disease. Three of the most occurring diseases are chronic obstructive pulmonary disease (COPD), coronary heart disease (CHD) and diabetes mellitus type 2 (DM2). Specifically, chronic obstructive pulmonary disease is a disease of the lungs, most of the time with lung inflammation that causes dyspnea (shortness of breath) and cough. The point prevalence in 2011 shows that 361.781 people are diagnosed with COPD and the incident is also especially high with 32.495 people. Coronary heart disease means the patient has a disturbed blood circulation that causes symptoms such as dyspnea, pain in the chest and a feeling of pressure on the patient's chest. The point prevalence in 2011 was up to 604.475 with an incidence up to 48.883. The disease diabetes mellitus type 2 causes insulin resistance. Insufficient insulin absorption causes symptoms such as fatigue, weakness, impaired vision and a higher risk of infections. At 2011 834.093 people were diagnosed with DM2 with and incidence of 52.737 (Gommer, & Poos, 2013).

Compared with the data of the period between 1992 and 2010 the prevalence and incidence increased for COPD and DM2 (Boezen, Postma, & Poos, 2013 and Baan, & Poos, 2013). But the prevalence and incidence decreased for CHD (Dis, Poos, Engelfriet, & Deckers, 2014). The question that comes up is what the consequences are for patients as well as for the society.

Societal consequences are that health costs related to chronic diseases are very high (von Renteln-Kruse, 2001). In the Netherlands in 2011 COPD, CHD and DM2 belong to the most expensive diseases that caused average costs of 1.000 - 3.000 million euro for all patients in the healthcare. With 2,1 billion euro CHD was one of the most expensive diseases in 2011 which was 2,3% of all health-related costs (Poos, Deckers, Engelfriet, & van der

Noordt, 2014). DM2 cost 1,7 billion euro in healthcare, which was 1,9% of all costs for healthcare in the Netherlands. With 956 million euro, COPD caused 1,3% of the total healthcare costs (Poos, Baan, & Hamberg-van Reenen, 2014). But in the studies examining the costs, COPD also included asthma (Suikerbuik, Poos, Bijenhof, & Slobbe, 2013). Thus asthma was also included in these costs and therefore it can be expected that the costs for just COPD are a little less. These findings show that it is necessary to make healthcare more efficient to decrease costs and also to maintain good healthcare.

The consequences for patients self are especially problematic. The symptoms of these three chronic diseases cause people to perceive and actually have many impairments in their daily life. Patients with chronic diseases experience impacts in 'areas of work, finances and family structure' (Meenan, Yelin, Nevitt, & Epstein, 1981). First, the physical impairment can have a huge impact in handling daily routines. Because of possible symptoms such as pain and no power of endurance little things such as shopping, washing and other everyday activities cannot be done alone. Furthermore, the physical impairment can cause an inability to work, which causes financial losses. Also, the families are affected, because they often have to help patients handle impairments. Furthermore, they are often affected through depressive episodes that are often concomitant diseases of chronic diseases and arise because of undeveloped abilities to handle problems caused by impairments (Moussavi, Chatterji, Verdes, Tandon, Patel, & Ustun, 2007). Thus, most chronic diseases get worse over time causing people to have to adapt new strategies to handle the impairments and daily activities and also to maintain their perceived health related quality of life (Barlow, 2001). Rubin and Peyrot (1999) gave a precisely description of quality of life. "Quality of life is measured as physical and social functioning, an perceived physical and mental well-being." (Rubin, & Peyrot, 1999). As the set point theory states, people have a certain health related quality of life. Physical or psychological impairments, such as impairments caused by chronic diseases, can cause that people perceive a lower health related quality of life that can only restore to a normal level if people adapt new strategies handling these impairments (Harris, 1990). So an impact on daily life is gradually shown. Patients suffering chronic diseases must handle a lifestyle change and also manage psychological distress and constant communication with health professionals to maintain a good health related quality of life (Barlow, Bancroft, & Turner, 2005). Therefore patients need to take responsibility for their own health and develop a kind of disease persona (Morrison, Bennett, Helm, & Bruijn, 2010). The term disease persona means that they have an identification that contains the disease and the impairments.

This development requires that people adapt necessary characteristics to handle the problems and impairments that help to reach their normal set point of quality of life again. Abilities that are necessary to reach this point are self-management abilities that help patients to learn how to help themselves and therefore improve their own health status (Lorig et al., 2000). This helps '[...] bridging the gap between patients' needs and the capacity of health and social care services to meet those needs.' (Barlow, Wright, Sheasby, Turner, & Hainsworth, 2002).

As Barlow (2001) stated, self-management is the individual's ability to manage symptoms, treatment, physical and psychosocial consequences and life-style changes inherent in living with a chronic condition. It encompasses the ability to monitor one's condition and to affect the cognitive, behavioral and emotional responses necessary to maintain a satisfactory quality of life (Barlow, 2001). But self-management can be further subdivided. As Lorig and Holman (2003) mentioned, self-management can be distinguished in 'medical management', 'role management' and 'emotional management'. Medical management means that patients are able to take medicine to treat the symptoms successfully and minimize symptoms such as pain. Role management means to behave appropriately to their disease. This implies that people with pain still move to prevent other suffering that can occur through avoiding too much movement. Finally, emotional management means altering their own view to the future through developing a disease-persona as earlier mentioned. Patients need to replace negative emotions through emotions that give acceptance of the condition and makes clear that negative emotions are not helpful for psychological well-being. But to make this change, patients must develop certain skills. These are 'problem solving', 'decision making', 'resource utilization', 'formation of a patient-provider partnership', 'action planning', and finally 'self-tailoring' (Lorig, & Holman, 2003). All these skills aim for patients to be able to change their habits and their lifestyle to adapt to their physical condition through identifying harmful behavior (self-tailoring), learning to decide that a change in lifestyle is necessary (decision-making and action planning) and taking actions against harmful behavior (problem solving). Thus, the aim is to increase the responsibility of patients in their own health-care and to teach them how to act responsibly, because people often lack these self-management skills (Bayliss, Ellis, & Steiner, 2007). Improving self-management skills has the advantage that costs can be decreased because patients can help themselves handling their disease. And if patients have abilities to manage their own healthcare, they are more involved in their own healthcare, which leads to a better quality of health care.

Thus, it becomes clear that interventions that aim to advance self-management, and therefore also health related quality of life, are important in supporting the handling of chronic diseases and a change of undesired behavior. But many interventions fail to reach many people and are very expensive (Morrison, Bennett, Helm, & Bruijn, 2010).

Therefore, eHealth interventions are useful because patients only need to have internet access, interventions can save costs and also reach many patients and these patients can be involved over a long period of time (van Gemert-Pijnen, 2013). Eysenbach (2001) introduced the following definition. "E-Health is [...] health service and information delivered or enhanced through the Internet and related technologies. [...] to improve health care locally, regionally, and worldwide by using information and communication technology.". eHealth interventions include informal websites or interactive health communication applications that aim to be a supportive tool of healthcare that facilitates well-being (van Gemert-Pijnen et al., 2011). eHealth interventions can provide online support for gaining self-management abilities (Sieverink, Kelders, Braakman-Jansen, & van Gemert-Pijnen, 2014). And additionally they meet the desire of patients to assume more responsibility for their health care and to increase and fully arise the potential of the patients' self-management abilities (Eysenbach, & Diepgen, 2001). eHealth interventions can coach the patient's potential for self-help, such as finding solutions for any impairments that belongs to self-management abilities. Because eHealth is implemented as an interactive intervention, the support is continuous and always adapted to the special needs of each patient. And this interactive character makes it more efficient because patients participate in a more active way and are more involved in the intervention. Only if patients feel involved, can self-management abilities develop and improve, because otherwise patients do not participate carefully and cannot fully benefit from the intervention (Kelders, Kok, Ossebaard, & Van Gemert-Pijnen, 2012). Through a study of Flynn, Gregory, Makki, & Gabbay (2009), another advantage becomes clear. The participation of eHealth interventions gives the user more choice about when and what to use, so participants have more freedom which helps users exercise self-management skills.

There are already several eHealth interventions aiming to improve self-management abilities, but often they have not achieved as positive results as expected and desired (Elkjaer, 2012). Failing can be caused by the barriers eHealth interventions have. One barrier is that eHealth interventions cannot provide direct contact, which can cause a disruption of the doctor-patient relationship. As Eysenbach and Diepgen (2001) mentioned, eHealth results in less face-to-face contact. Face-to-face contact is useful to facilitate more trust in the

intervention and motivation of patients to participate responsibly and feel involved, because otherwise patients lack adherence. Thus the perception of involvement is especially important to benefit of interventions. Also, the available offer of coaches offered through the intervention can be too small. Some of the patients who participated in the study of Flynn et al. (2009) about expectations and experiences of eHealth in primary care, complained that the offer did not meet their desires and needs. Other interventions that are already implemented suggest that it is mainly important to provide a '[...] tool-kit from which they [the patients] confidently select the most appropriate 'tool' that meets their needs.' (Barlow, Bancroft, & Turner, 2005). These findings show that it is important how eHealth interventions are build and implemented because very often, there is no systematic structure and no formative evaluation after each step, which causes ineffective interventions (Van Germert-Pijnen, 2013). And such complaints are also caused because many interventions lack persuasive elements that '[...] motivate or engage users to stick around and complete the program.' (Van Gemert-Pijnen, 2013). And these persuasive elements are necessary to let the users feel involved which is in turn necessary to achieve improvements, because if users do not feel involved, they lack adherence and cannot benefit as much as they could.

Therefore, van Gemert-Pijnen et al. (2011) developed a roadmap that describes necessary stages in developing an eHealth intervention with persuasive elements. First, the contextual inquiry must be examined, thus it must be analyzed which needs must be adressed. The second step includes the value specification which described the desires and values patients holds that must be taken into account. The third step is the design of the intervention, thus how the intervention is build. The fourth step contains the operationalization to make the interventions practical and measurable. The last step is the summative evaluation that examines if the intervention achieved the desired effects (Germert-Pijnen van, Peters, & Ossebaard, 2013).

The third step, the design, is an especially important step because persuasive systems can be implemented. Persuasive elements are especially useful to involve participants and to support adherence. The more persuasive elements are implemented the more participants feel involved in the intervention (Van Gemert-Pijnen, 2013). Here, a persuasive system contains primary task support, dialogue support, system credibility support and social support (Oinas-Kukkonen, & Harjuma, 2009). Primary task support means that the design should make the users feel personally involved by offering personalized information. Dialogue support should involve the user through different applications and furthermore contain visual reinforcements.

The system credibility support should give the feeling of trustworthiness so that users are more optimistic about the profit of use. The social support aim is an exchange between users that suffer the same conditions. These factors are also important to predict the acceptance of an intervention which in turn increases involvement and adherence (Oinas-Kukkonen, & Harjuma, 2009). All these persuasive characteristics are necessary to involve the participant in the intervention and facilitate adherence. Otherwise, the intervention cannot change the undesired behavior because non-adherence means that participants can not benefit from the intervention as much as they could (Kelders, 2012).

To figure out if an intervention handles all the possible obstacles and can be effective, it is important to make summative evaluations of eHealth interventions which are often skipped. The summative evaluation is a necessary step after the implementation as the Roadmap of van Gemert-Pijnen et al. (2011) shows. If the effects are evaluated, it could be seen what needs to be improved to achieve the desired changes in behavior.

'Mijn GezondheidsPlatform' (MGP) is such an eHealth intervention with persuasive elements. These persuasive elements should involve the patients in using the tools of the intervention because it focuses on the support of patients with COPD, CHD or DM2 by enhancing self-management abilities. Higher involvement should be reached through an exchange of information, coaching to improve self-management skills through exercises, and monitoring the patient's developments.

After studying the importance of self-management skills and guidelines about how eHealth interventions should be designed to facilitate involvement, it is necessary to evaluate whether the intervention has the desired effect on improving self-management abilities and involvement of the participants as the Roadmap advises (van Gemert-Pijnen, 2011). This indicates the research question *Which influence has MGP on the patients' self-management abilities and their perceived involvement?*

The answer to this question is especially important because it do not only examines the effect of the intervention regarding self-management abilities. But it also examines if persuasive elements could facilitate the perception of involvement that supports adherence which in turn is necessary to be able to improve self-management abilities. Additionally, it can be useful to examine if the amount of internet use has any influence on the adherence. It is already known that young people use the internet more than older ones (McKay et al., 2001). Because chronic diseases are common in older ages it can be expected that the amount of internet use has an effect on the adherence and therefore on the effectiveness of the

intervention in improving self-management abilities (Bodenheimer et al., 2002). To give an answer to the research question, it will be expected that:

(1) There is a significant increase in self-management scores in the MGP-group at t6.
(2) During the intervention significant differences in self-management scores can be observed between the MGP-group and the control group at t3 and t6.
(3) There is a significant increase of the perception of involvement in the MGP-group between t0, t3 and t6.
(4) There is a positive regression between a change in self-management scores and the perception of involvement.
(5) There is a positive moderation effect of internet use on the relation between involvement and self-management.

2. Method

2.1 Research Setting

'Mijn GezondheidsPlatform' was designed by Medicinfo and implemented through the care group 'Praktijkondersteuning Zuidoost-Brabant' (PoZoB). The University of Twente was ordered to do the scientific research. It was implemented in the health care of general practitioners belonging to the care group PoZoB. In this study, the data gained from the MGP intervention of Medicinfo, PoZoB and the University of Twente was used.

MGP offers several tools for patients with chronic diseases to support the development and improving of self-management abilities. Therefore several coaches are implemented in the intervention. Users can chose between a coach for physical activity, for a balanced diet and to quit smoking. Therefore, users have to fill in data about their actual behavior and get information what behavior needs to be changed and how this change can be achieved. At the beginning, users can also insert personal data like weight, information about lifestyle, like smoking, alcohol use and physical activity, and personal information. Users can then complete their data with their disease and allergies, their aims in improving their health and lifestyle, their actual weight, medication history and current use and finally their attending doctor. These tools give the users an overview of their development and monitor to what extent they reached their personal goals. Additionally, MGP offers an exchange with a health-

care professional and further information about diseases, living with diseases, healthy lifestyles and general information about medications and treatments.

2.2 Respondents

The design is a non-randomized pragmatic cluster trial. This means that patients are attached to an experimental or a control group in a real-life setting. Thus, patients from practices that are chosen to take part could participate in the MGP intervention. Patients of other practices belonging to PoZoB get care as usual. To ensure that only patients with chronic diseases are asked to participate in both groups, they are selected from the database Care2u where patients with chronic diseases (COPD, CHD, DM2) are registered. After giving informed consent the respondents attached to the experimental group get their log-in data and several questionnaires to fill in before starting the MGP intervention. This is the first time of measurement (t0). After three (t3) and six (t6) months, these questionnaires are filled in again. Beside these times of measurements wherefore users have to fill in the questionnaires it is their choice when to use the intervention and also if they use the intervention at all.

At the first time of measurement (t0), thus before users started the intervention, 67 respondents participated in the MGP-group and 150 respondents in the control group. Of these participants, 23 are male and 13 female in the MGP-group and 74 male and 47 female in the control group (Table 1). Of the other 34 participants in the MGP-group and the other 29 participants in the control group is no information about the gender available (Table 1). At the second time of measurement (t3), there are 40 measurements of participants of the MGP-group and 106 measurements of participants of the control group. So there is a drop-out rate of 27 measurements (40.30%) in the MGP-group and 44 measurements in the control group (29.33%). At the last measurement (t6), 37 measurements are gained from the MGP-group and 102 of the control group. That shows a drop-out rate of 3 measurements (7.5%) in the MGP-group and 4 in the control group (3.77%). Information about the drop-outs of patients is not available because it cannot be reconstructed which measures belong to which respondent or if the respondents at t3 or t6 are the same as the respondents at the previous measurement. At the end, there are 144 measures of the MGP group and 358 from the control group from t0, t3 and t6 combined, which are anonymous and therefore not attachable to the participants respectively. The participants range in age from 34 to 78 years in the MGP-group (M=61.62; SD=8.20) and 23 to 80 years in the control group at t0 (M=61.92; SD=9.70) at t0 (Table 1). From the other measurements are no ages available.

Inclusion criteria are that patients suffer COPD, CHD or DM2. Furthermore participants need to be over 18 years, give their informed consent and have access to internet in their home. Exclusion criteria are life-threatening (co)morbidity and a short expectation of life, cognitive impairment, insufficient Dutch and participation in other studies that could fall foul of MGP.

Table 1
Demographic characteristics of participants at t0

	N (%)			
	MGP-group (N=67)		Control group (N=150)	
Gender				
Male	23	(34.33%)	74	(49.33%)
Female	13	(19.40%)	47	(31.33%)
Unknown	31	(46.27%)	29	(19.33%)
Age				
$\bar{x}$(SD)	61.62	(8.20)	61.92	(9.70)
Family status				
Married	44	(65.67%)	123	(82.00%)
Divorced	10	(14.93%)	13	(8.67%)
Unmarried / never been married	2	(2.99%)	10	(6.67%)
Widowed	1	(1.49%)	4	(2.67%)
Unknown	10	(14.93%)	0	(0%)
Living situation				
Living alone	9	(13.43%)	18	(12.00%)
Living with family or friends	1	(1.49%)	6	(4.00%)
Living alone with partner and/or children	47	(70.15%)	126	(84.00%)
Unknown	10	(14.93%)	0	(0%)
Education				
Low	5	(7.46%)	25	(16.67%)
Middle	20	(29.85%)	56	(37.33%)
High	32	(47.76%)	67	(44.67%)
Unknown	10	(14.93%)	2	(1.33%)
Employment				
Unable to work	4	(5.97%)	12	(8.00%)
Housewife, Househusband	1	(1.49%)	10	(6.67%)
Pension	27	(40.30%)	60	(40.00%)
Unemployment	2	(2.99%)	5	(3.33%)
Self-employed/ Entrepeneur	3	(4.48%)	8	(5.33%)
Employed	18	(26.87%)	51	(34.00%)
Different	2	(2.99%)	4	(2.67%)
Unknown	10	(14.93%)	0	(0%)
Internet use				
High	16	(23.88%)	24	(16%)
Average	20	(29.85%)	53	(35.33%)
Low	16	(23.88%)	61	(40.67%)
Unknown	15	(22.39%)	12	(8%)
Total	67	(100%)	150	(100%)

2.3 Materials

To measure self-management, the already existing Patient Activation Measure (PAM13) is used (Rademakers et al., 2012; Appendix 1). This questionnaire contains a 13 phrases Likert scale where users have to rate their own self-management abilities. They can rate each phrase with 'strongly disagree', 'disagree', 'agree', 'strongly agree', and 'neither agree nor disagree'. The scoring of each item is from 1 to 5 points, where a high score would indicate high self-management abilities. The total score can range from 13 to 65. There are not any items that need to be converted. The reliability in this study is with a Cronbach's alpha of α=.88 very good and there are not any items that could increase it if deleted (Appendix 2).

The involvement of the MGP-group is measured with the already existing Personal Involvement Inventory (PII) which contains ten scales where users can rate how involved they feel in the intervention (Zaichkowsky, 1994; Appendix 3). The scoring requires rating each of the seven grades of the scale with a certain number of points. The positive valued items have a rating from 1 ('important') 7 ('not important'). The negative valued items need to be converted thus 'boring' would mean 7 points and 'interesting' 1 point. Items that need to be converted are the items 2, 5, 8, and 10. The total score can range from 10 to 70 points. The reliability in this study is with a Cronbach's alpha of α=.95 very good and there are not any items that could increase it if deleted (Appendix 4).

The internet use of both groups is measured with a self-constructed questionnaire through the researchers of the MGP intervention (Appendix 5). The respondents can rate ten internet elements like search engines, e-mail, online shopping, online banking, online communities, photo and video sites, blogs, chats, radio and music sites and online courses. The possible ratings cover 'never', 'rarely', 'now and then', 'few times a week' and 'daily'. The scoring of each item is, like the PAM13 from 1 to 5 points, where a high score indicates high internet use. The total score can range from 10 to 50. The reliability in this study is with a Cronbach's alpha of α=.79 good and there are not any items that could increase the reliability if deleted (Appendix 6).

2.4 Procedure

After giving their informed consent, every patient from the MGP-group as well as the control group had to fill in the PAM13(Appendix 4). Additionally, users of MGP needed to fill the PII (Appendix 5). At the first measurement users were asked to specify their amount of internet use by answering several questions (Appendix 6).

These questionnaires give insight in to how good their self-management abilities are and how they rate their involvement. These measures are gained at the beginning of the intervention (t0), after three months (t3) and after six months (t6). The control group also filled in the self-management questionnaire online at the same times of measurement. The other questionnaires are not required for this research.

2.5 Data analysis

Through the use of SPSS .21 it will be first examined if there is a normal distribution or a non-normal distribution, because this determines if parametric tests or non-parametric tests should be used. The results show that non-parametric tests should be used for all of the calculations because Skewness (M=-.34; SD=.11) and Kurtosis (M=-.36; SD=.22) as well as Kolmogorov-Smirnov (K-S (486)=.09; p<.05) show a non-normal distribution for the total score of the Pam13. For the total score of the PII Skewness (M=.11; SD=.21) and Kurtosis (M=.84; SD=.42) show a non-normal distribution. This is supported by Kolmogorov-Smirnov (K-S(129)= .10; p<.05). Similarly, as for the total score of PAM13 and PII, also here Skewness and Kurtosis show a non-normal distribution with M=-.13; SD=.17 and M=.45; SD=.34 respectively for the total score of internet use. These results are also supported by Kolmogorov-Smirnov (K-$S(205)$=.06; p<.05). Thus, all of the calculations should be done with non-parametric tests.

With a non-parametric test like the MANN-Whitney U test it should be determined if there are significant changes in self-management scores between t0 and t3, t3 and t6, and t0 and t6 in the MGP-group and the control group by comparing the total PAM13-scores of each measurement with each other. Results should give insight in to whether MGP has influenced on gaining better self-management abilities.

To find out if the scores of self-management at t0 are on average the same, the MGP-group and the control group are compared through splitting the data for the measurements and using a non-parametric test like the MANN-Whitney U to compare the scores of both groups at t0. If the hypothesis that there are no differences can be confirmed, then it is useful to examine the differences in self-management scores at t3 and t6 to find out if there are significant differences between the MGP-group and the control group. Therefore, the Mann-Whitney U test can be used after selecting the PAM13-scores of t3 and t6.

Then it is examined if the perception of involvement increases over the period of t0 and t3, t3 and t6, and also between t0 and t6. The Mann-Whitney U test gives information about whether there are significant differences between the measurements.

To determine if there is a relation between an improvement in self-management and involvement, it is also calculated if there is a regression between PAM13-scores and the PII-scores of involvement. Therefore, a linear regression analysis needs to be done with the difference scores of the PAM13 from t6-t0 and the PII-scores of t6.

Additionally, it is determined if internet use influences the results of the calculations mentioned previously. Thus, it is examined through a moderation analysis if internet use has an effect on the relation between involvement and self-management. The analysis necessary is a linear regression analysis that shows if there is an interaction.

3. Results

With a Mann-Whitney U test it was assessed if there were any changes within the MGP-group as well as the control group at t0, t3 and t6. Thereby it can be tested if there is the expected increase in self-management scores (PAM13) in the MGP-group (Table 2).

Table 2

M and SD of PAM13 for MGP-group and Control group of t0,t3 and t6.

	MGP-Group			Control Group		
Measurement	*N*	*M*	*SD*	*N*	*M*	*SD*
t0	53	54.68	5.47	150	52.57	6.93
t3	39	51.74	8.35	106	51.34	6.93
t6	37	52.73	6.04	101	41.41	5.18

Note. *M= Mean; SD= Standard Deviation*

The results show no significant differences between the PAM13-scores of t0-t3 ($U(92)=825.50$, $p=.10$), t3-t6 ($U(76)=707.50$, $p=.89$) and t0-t6 ($U(90)=808.50$, $p=.19$) (Figure 1, broken line).

In the control group there are also no significant differences in PAM13-scores between t0-t3 ($U(256)=7180.00$, $p=.19$). But between t3-t6, a significant decrease of the PAM13-scores can be observed ($U(207)=1371.00$, $p<.05$). And also between t0-t6 the difference is statistically significant ($U(251)=1605.500$, $p<.05$) (Figure 1, solid line).

To test the second hypothesis, it is also calculated if there are any differences in self-management scores (PAM13) between the groups at the first measurement (t0) to eliminate the possibility that differences in self-management scores can be caused because they existed already before the intervention started (Table 3). Then it is examined if there are any significant differences in the PAM13 scores between the groups and between the measurements t3 and t6.

Table 3

M and SD of PAM13 of MGP-group and Control group at t0.

Group	*M*	*SD*
MGP-group	52.57	6.93
Control group	54.68	5.47

Note. *M=Mean; SD= Standard Deviation*

A Mann-Whitney test show a $U(203)=3312.50$, $p=.07$. Thus, there is no significant differences in the PAM13 scores at t0, before the intervention started, although it is very near to a significant difference. At the second measurement t3 there is also no significant difference between the PAM13-scores of both groups ($U(145)=1908.00$, $p=.48$). But at t6 there is a significant difference between the PAM13-scores of the MGP-group and the control group ($U(138)=310$, $p<.05$) (Figure 1).

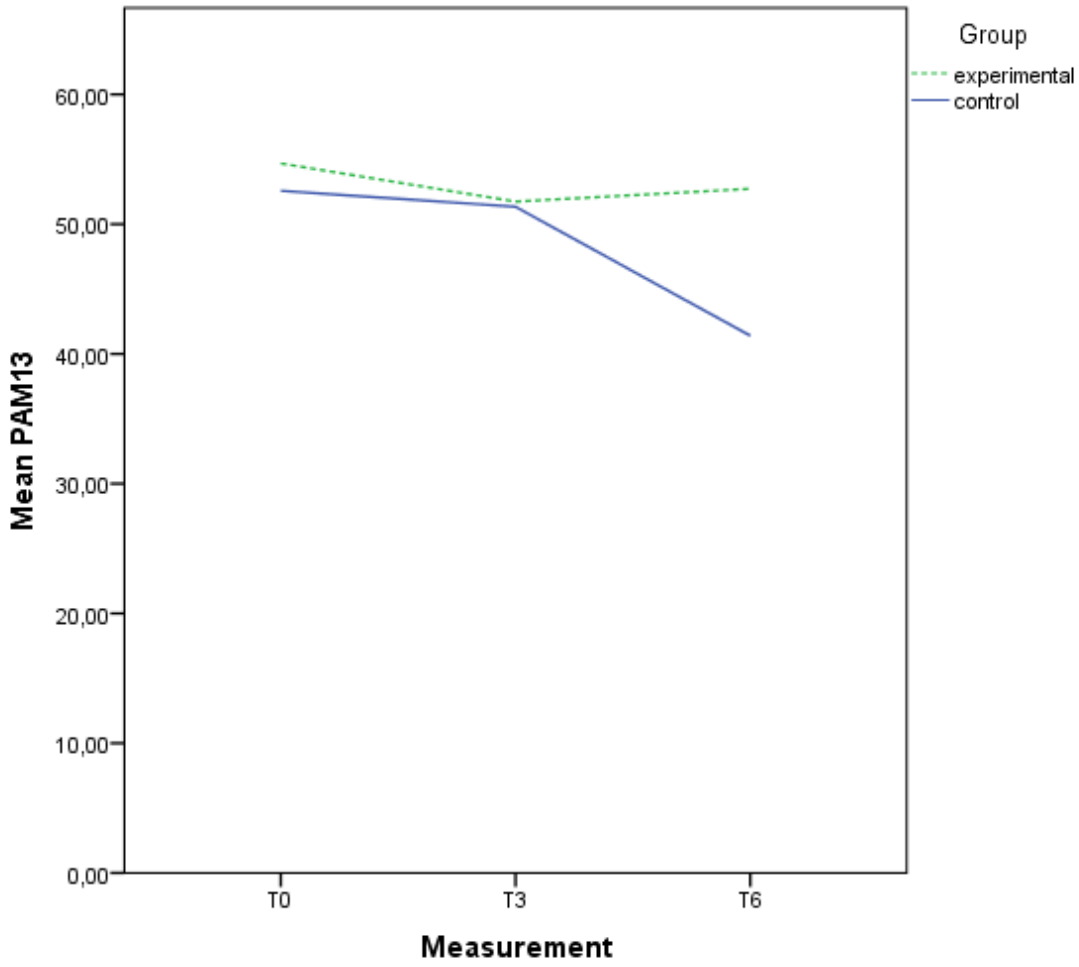

Figure 1. Trend of Pam13 scores at t0, t3 and t6 of MGP-group and control group

To find out if the third hypothesis can be confirmed, it is calculated if there is an increase of the perception of involvement (PII) of the MGP-group between t0, t3 and t6. The score of involvement (PII) is compared between t0-t3, t3-t6 and t0-t6 (Table 4).

Table 4

M and SD of PII of the MGP-group at t0, t3 and t6

Measure	*M*	*SD*
t0	36.40	10.56
t3	34.53	12.91
t6	35.30	10.74

Note. *M= Mean; SD= Standard Deviation*

Between t0-t3 no significant differences could be observed ($U(92)=972.50$, $p=.60$), as well as between t3-t6 ($U(77)=738.00$, $p=.98$) and between t0-t6 ($U(89)=899.50$, $p=.60$).

Additionally, it should be examined if there is an association between a change in self-management scores (PAM13), calculated with the differential score of t6-t0, and the perception of involvement (PII) at t6, as the fourth hypothesis predicts. This can be done with a regression analysis to find out if self-management abilities increase the perception of involvement. The results show that there is no significant interaction ($F(1,115)= .66$, $p= .42$).

To figure out if internet-use can be an explanation for these results, it is examined if the amount of internet use has any moderating effect on the relation between a change of involvement and a change of self-management in the MGP-group to test the last hypothesis (Table 5).

Table 5

M and SD of PAM13, PII and Internet use of the MGP-group

Questionnaires	*N*	*M*	*SD*
PAM13	53	54.68	5.47
PII	52	36.40	10.56
Internet use	56	26.59	5.49

Note. *M= Mean; SD= Standard Deviation*

The regression analysis showed that there is no significant moderation of internet use on the relation between a change in involvement and a change in self-management ($F(3,32)=.60$, $p=.62$).

4. Discussion

The results show that there are no significant changes or increases in the self-management scores (PAM13) in the MGP-group. And also in the control group there are at the beginning, thus between t0 and t3, no significant changes. But between the last two measurements, t3 and t6, there is after all a decrease of self-management scores (PAM13) in the control group. This caused a significant difference at t6 between both groups. Thus, MGP does not improve self-management abilities but nevertheless, MGP has however an effect, because self-management abilities stay stable in the MGP-group and the MGP-group has finally higher PAM13-scores compared with the control group.

Studying the results of the involvement scores (PII), the results show that there is also no significant improvement. Looking for a relation between a change in self-management (PAM13) and involvement (PII), it seems that there is no observable relation and furthermore, no moderating effect of internet use on this relation. Thus, nearly all hypotheses cannot be completely confirmed but the stabilizing of self-management scores in the MGP-group can be valued as a positive effect.

But through examining the hypotheses, it is possible to answer the research question about how far MGP influences the factors of self-management and involvement. The intervention do not have the expected positive effects on improving self-management abilities or on the perceived involvement of participants, but it has an effect concerning stabilizing the self-management scores of the MGP-group.

To examine if biases contribute to these results, it is necessary to check the internal validity of the MGP intervention, because this could have negative implications for this study. A possible bias could have been the non-random selection of participants and the allocation to the MGP- and control group. But through the calculations, differences in the variable self-management could have been eliminated, thus there were not any differences in self-management scores at t0. A non-random pragmatic cluster trial was also the only possibility, because of the inclusion criteria that limited the sampling to certain diseases and members of certain practices. Because there is no information available about the drop-out rate, thus how many participants fell out during the study, it could be that there was a selection based on patients who continued using the intervention. Stopping with the intervention could have happened because these patients already perceived improvements of self-management abilities and did not see the need to continue. If only patients, that have gone ahead because they did not perceive desired improvements, are taken into account, then this selection can cause negative results. If during sampling the data participants would have gotten the same respondent numbers at each time of measurement, it could have been detected if certain respondents quit after the first measurement or the second. Because this information is not available, it is not known if a selection took place. It is also possible that a reaction to the measurements influenced the following measurement because patients pay more attention to their self-management abilities or were more reflective after the first measurement. This could be an explanation for decreasing self-management scores in the control group, because they see that there are more problems they never thought about before. But because the intervention was implemented as an eHealth intervention other biases could have been

avoided as the 'Rosenthal-effect' that can be caused by face-to-face contact. This effect is caused through the testers' expectations or behaviors that influence the patients' behavior. Patients then try to conform as the self-fulfilling prophecy states, that people try to behave like it is expected (Biggs, 2009).

The findings in this study partly supports findings of other studies that eHealth interventions, aiming to improve self-management, are beneficial. As Barlow et al. (2002) describe, self-management approaches provide benefits when compared to no intervention. These findings can be supported by the results of this research because decreases in the self-management scores of the control group cannot be observed in the MGP-group. The benefit of a self-management intervention can thus also be seen in this study, although they are not as high as in the study of Barlow et al. (2002). Normal et al. (2007) also describe that in a review of 47 interventions most interventions are beneficial compared with interventions that are not implemented as eHealth interventions. Thus, even though they are not as positive as expected, the results found in this study are not contradicting because in this research no worsening is found in the MGP-group which can be valued as a success.

An explanation for the results and that these are not as positive as expected can be found in the study of Elkjaer (2012). This review shows that self-management interventions are clinically beneficial, but the authors also state that elements of the intervention that are responsible for these benefits cannot be determined from the existing data. An explanation for missing as much positive results as expected is already given through Flynn et al. (2009) because the offer of exercises do not meet the needs of the users. An inappropriate offer could explain the low involvement in the MGP intervention because the offer contains not enough persuasive elements. This would explain that the involvements scores during all times of measurement were quiet low although they were like the self-management scores stable.

Limitations of this study were missing information about gender or which chronic disease each patient has. This knowledge could have been useful to examine if there are any covariance variables that had influence on the results such as the drop-out of certain users. Furthermore, as Barlow et al. (2002) states, it is also important to examine the differences between the needs of several chronic diseases. Self-management interventions like the MGP-intervention are approaches to several different chronic diseases, but this could impair meeting the needs that are typical for each disease, therefore interventions should be tailored to different diseases. Also for summative evaluations is this useful because the disease can have influences on how good patients response to the offer of the intervention. This

information could also give an explanation for the involvement scores. If patients of a certain chronic disease felt less involved they probably lacked adherence. This in turn would explain why self-management scores did not improve. With this knowledge researchers would know that the needs of this patients are not covered with the used tools offered. Finally, missing information made it difficult to find explanations for the results. It would have been useful to have information about the Log-Data to be able to examine how much the intervention was used and if this can give explanations for the low involvement scores. With more information covariance analyzes could give more insight in the reasons for the results found.

But this study had also benefits. The summative evaluation showed that there were no differences between the groups at t0, thus they had the same levels of self-management at the baseline. This equality was important because changes between the groups at t3 and t6 were the results of the intervention. An explanation for stagnating self-management scores in the MGP-group can a possible sampling be caused trough a drop-out of patients that already improved self-management abilities. But also the level of self-management of participants can be an explanation. Compared with the range of the total score it can be seen that the level of self-management is already high. So it can also be possible that there was no increase in self-management scores because they were already pretty high and there was nothing that needs to be improved. But it seems more probable that the difference at t6 was caused by the intervention because it avoided a decrease and stabilized self-management abilities in the MGP-group by offering coaches, useful information and a monitoring of the users development. Another advantage is that during the intervention three measurements times were implemented. Constant measuring is especially important to be able to retrace changes over the time. Barlow et al. (2002) describes in their meta-analysis also that there is a need to "[...] enable change on key outcome measures to be detected.". If measures were just over long periods or just before and after an intervention took place, such changes would not became apparent. And these changes are necessary to be able to give explanations for significant changes.

To improve the intervention, first it would be necessary to include interviews via telephone, because this is the easiest way and maintains that users really answers. That gives users space to tell what are possible reasons for a lack of involvement and a failure to improve self-management abilities. The opinion of the user should be taken into account in evaluating and implementing the intervention because it could contain important information where changes are necessary. Such an user-centered design is useful because they know the best how

involved they feel and how useful the intervention is. In the intervention there was no iterative process implemented to come to an improved version of the intervention. Such an iterative process should be implemented and then repeated to remove all barriers that caused negative results (Bannan-Ritland, 2003). An example could be that with an iterative process missing information about gender becomes obvious. This could have been useful in explaining differences within as well as between the groups and their self-management scores. Such an iterative process is also part of the Roadmap of Gemert-Pijnen et al. (2011). Furthermore there seems to be no broad examination of the contextual inquiry because the intervention was built out of a diabetes coach and for the MGP intervention only more functions were added. The fact that the interventions was built out of an intervention for diabetes patients states the question if the demands of COPD-patients and CHD-patients are taken into account as much as the demands of DM2-patients. Thus, probably not all problems and needs are taken into account what causes that users did not feel as much involved as they could. And if users do not feel involved it cause that they lack adherence and adherence is necessary that users can benefit from the offer of the intervention and have the chance to improve their self-management skills. Furthermore, it would be essential to find out the value specification, that is, patients' values, and address which needs must addressed. Addressing the participants' values is necessary to support the perception of involvement and adherence. Generally, after all steps of building the intervention, there needs to be formative evaluations that are crucial to estimate the usefulness and effectiveness of the intervention (van Gemert-Pijnen, 2013). It seems that the formative evaluations did not show all problems occurring, because the perception of involvement was not as much as it should be and the offer of exercises need to be adapted to the special needs of the MGP-group. Thus, there are still weak points that should be corrected to enhance involvement, adherence and thereby improving self-management abilities.

This study gives insight into the strong and weak points of this study as well as the MGP intervention. But the fact that there are many elements that can be improved, supports the development of more effective eHealth interventions, because using eHealth interventions is still explorative given that it is still developing. And experiences such as these are essential to examine how to do it next time in a more effective way to involve patients as much as it could. Although interventions might not improve self-management abilities, as in the case of the MGP intervention, they do stabilize them which enhances the well-being of patients

(Barlow et al., 2002). But it turns out that involvement is the first step that needs to be taken to maintain an improvement in self-management.

4.1 Conclusion

This research shows that the MGP interventions is not effective as it was expected. There was neither improvement of self-management abilities nor of the perception of involvement. Also, a relation between a change in self-management abilities and involvement cannot be found as well as any influence of internet use on them. Nevertheless, it seems that the intervention had after all an effect, as there was a decrease of self-management abilities in the control group but not in the MGP-group. Therefore, it seems that the intervention is effective regarding the support of self-management to avoid a worsening of self-management abilities and stabilizing them.

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Appendix

Appendix 1 - Patient Activation Measure (PAM13)

10. Zelfmanagement (PAM 13)

Hieronder staan enkele uitspraken die mensen soms doen over hun gezondheid. Geef voor elke uitspraak aan, in hoeverre u het ermee eens of oneens bent. Doe dit door het antwoord te omcirkelen dat het meest op uw persoonlijke situatie van toepassing is. *We willen dus weten wat u zelf vindt en niet wat u denkt dat de dokter of onderzoeker wil horen.*

	helemaal niet mee eens	niet mee eens	mee eens	helemaal mee eens	nvt
Uiteindelijk ben ik zelf verantwoordelijk voor mijn gezondheid.	O	O	O	O	O
Een actieve rol op me nemen in de zorg voor mijn gezondheid, heeft de meeste invloed op mijn gezondheid.	O	O	O	O	O
Ik heb er vertrouwen in dat ik kan bijdragen aan het voorkomen of verminderen van problemen met mijn gezondheid.	O	O	O	O	O
Ik weet wat elk van mijn voorgeschreven medicijnen doet.	O	O	O	O	O
Ik heb er vertrouwen in dat ik kan beoordelen of ik naar de dokter moet gaan of dat ik een gezondheidsprobleem zelf kan aanpakken.	O	O	O	O	O
Ik heb er vertrouwen in dat ik een dokter mijn zorgen durf te vertellen, zelfs als hij of zij daar niet naar vraagt.	O	O	O	O	O
Ik heb er vertrouwen in dat het mij lukt om medische behandelingen die ik thuis moet doen uit te voeren.	O	O	O	O	O
Ik begrijp mijn gezondheidsproblemen en wat de oorzaken ervan zijn.	O	O	O	O	O
Ik weet welke behandelingen er zijn voor mijn gezondheidsproblemen.	O	O	O	O	O
Ik heb veranderingen in mijn leefstijl (zoals gezond eten of bewegen) kunnen volhouden.	O	O	O	O	O
Ik weet hoe ik gezondheidsproblemen kan voorkomen.	O	O	O	O	O
Ik heb er vertrouwen in dat ik zelf oplossingen kan bedenken voor nieuwe problemen met mijn gezondheid.	O	O	O	O	O
Ik heb er vertrouwen in dat ik veranderingen in mijn leefstijl (zoals gezond eten en bewegen) kan volhouden, zelfs in tijden van stress.	O	O	O	O	O

Appendix 2 - Cronbach's alpha PAM13

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
,882	,886	13

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
PAM-13_1	46,06	53,623	,562	,397	,874
PAM-13_2	46,15	55,053	,503	,416	,877
PAM-13_3	46,09	55,074	,606	,481	,872
PAM-13_4	46,35	54,058	,522	,373	,876
PAM-13_5	46,13	55,162	,588	,405	,873
PAM-13_6	45,93	55,112	,617	,455	,872
PAM-13_7	46,07	54,696	,599	,409	,872
PAM-13_8	46,18	53,639	,642	,574	,870
PAM-13_9	46,39	52,407	,668	,589	,868
PAM-13_10	46,44	54,589	,516	,528	,876
PAM-13_11	46,45	54,240	,597	,421	,872
PAM-13_12	47,00	54,194	,508	,363	,877
PAM-13_13	46,67	53,805	,504	,526	,878

Appendix 3 - Personal Involvement Inventory (PII)

5. Betrokkenheid

Het MGP is voor mij:

belangrijk	O	O	O	O	O	O	O	niet belangrijk
saai	O	O	O	O	O	O	O	interessant
relevant	O	O	O	O	O	O	O	niet relevant
enthousiasmerend	O	O	O	O	O	O	O	niet enthousiasmerend
betekenisloos	O	O	O	O	O	O	O	betekenisvol
aansprekend	O	O	O	O	O	O	O	niet aansprekend
fascinerend	O	O	O	O	O	O	O	alledaags
waardeloos	O	O	O	O	O	O	O	waardevol
betrokken	O	O	O	O	O	O	O	niet betrokken
niet nodig	O	O	O	O	O	O	O	nodig

Appendix 4 - Cronbach's alpha PII

Reliability Statistics

Cronbach's Alpha	N of Items
,945	10

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
INV1_10	31,64	97,858	,785	,940
INV2_10	32,26	106,477	,753	,940
INV3_10	31,83	103,502	,768	,939
INV4_10	31,70	104,166	,830	,937
INV5_10	32,20	103,850	,828	,937
INV6_10	31,95	103,427	,823	,937
INV7_10	31,50	109,033	,687	,943
INV8_10	32,41	106,072	,826	,937
INV9_10	32,06	108,543	,676	,943
INV10_10	31,98	102,015	,781	,939

Appendix 5 - Internet use

2. Internetgebruik

Hoeveel uur gebruikt u gemiddeld per dag het internet?
_____uur per dag

Maakt u wel eens gebruik van de volgende web toepassingen?

	dagelijks	meerdere keren per week	af en toe	zelden	nooit
zoekmachines (b.v. Google, Yahoo)	☐	☐	☐	☐	☐
e-mail (b.v. Hotmail, Gmail)	☐	☐	☐	☐	☐
online winkelen (b.v. Wehkamp.nl, Bol.com, Expedia.nl)	☐	☐	☐	☐	☐
online bankieren (b.v. Ing.nl, Abnamro.nl)	☐	☐	☐	☐	☐
online communities (b.v. Hyves, Facebook, MySpace, LinkedIn)	☐	☐	☐	☐	☐
foto en videosites (bv. YouTube, Flickr, Uitzending gemist)	☐	☐	☐	☐	☐
(micro)blogs (bv. Geenstijl, VK blog, Twitter)	☐	☐	☐	☐	☐
chat (b.v. MSN)	☐	☐	☐	☐	☐
radio of muzieksites (bv. Nederland.fm, Lastfm)	☐	☐	☐	☐	☐
online cursussen					

Appendix 6 - Crochbach's alpha Internet use

Reliability Statistics

Cronbach's Alpha	N of Items
,787	10

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
IntGebr_1_hc	21,2488	30,756	,576	,753
IntGebr_2_hc	20,9317	31,338	,568	,755
IntGebr_3_hc	23,1366	33,471	,511	,765
IntGebr_4_hc	22,0341	32,229	,429	,772
IntGebr_5_hc	22,8634	29,491	,406	,787
IntGebr_6_hc	23,0829	30,900	,588	,752
IntGebr_7_hc	24,0537	33,894	,464	,770
IntGebr_8_hc	23,7805	33,045	,405	,775
IntGebr_9_hc	23,6244	33,363	,341	,783
IntGebr_10_hc	24,0634	34,971	,448	,774