Summary

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Chapter 1 – General Introduction
Chapter 1 provides general information on type 2 diabetes that include risk factor for developing type 2 diabetes, the consequences of type 2 diabetes, and the global impact of diabetes. Furthermore, the chapter elaborates on the treatment and self-management of type 2 diabetes, and the emotional consequences of diabetes. Consequently, patient centeredness, patient centered care, and diabetes self-management educational programs and web-based diabetes self-management support is introduced. Finally, the aims of this thesis and thesis outline are provided.

Chapter 2 - Uncovering the Effects of Patients' Emotional Status on Self-care Activities and Glycemic Control in People with Type 2 Diabetes using Structural Equation Modelling.
In chapter 2, we aimed to test a hypothetical model where emotional well-being and diabetes-related distress exert a direct influence on glycemic control as well as an indirect effect via self-care behaviors, where these effects could be different for men and women. We used cross-sectional data of 880 Dutch type 2 diabetes patients routinely treated in primary care. Structural equation modeling (SEM) was applied for testing the proposed model, with emotional well-being (WHO-5), diabetes-related distress (PAID-5), diabetes self-care activities (SDSCA) and glycemic control (HbA1c) as key variables. We found a direct association between diabetes-related distress and worse glycemic control, and between 30 minutes of daily exercise and better glycemic control. We further found a significant indirect effect of emotional well-being on glycemic control, via self-care behaviors, and partial mediation effect by self-care behaviors for the association between diabetes-related distress and glycemic control. Post-hoc analyses revealed a direct association between emotional well-being and glycemic control for women only. In our findings, we report an influential role for diabetes-related distress and emotional well-being in linking patients' self-care with glycemic control, with apparent different effects for men and women. We recommend further research into the proposed model with improved self-care measurement tools and expanding it with cognitive factors.

Chapter 3 - Does Low Well-being Modify the Effects of PRISMA (Dutch DESMOND), a Structured Self-management-education Program for People with Type 2 Diabetes?
In the study described in chapter 3, we aimed to test whether low well-being modifies the effects of the PRISMA self-management education program (Dutch DESMOND). Diabetes self-management education improves behavioral and clinical outcomes in type 2 diabetes patients, however little is known about the modifying effects of well-being. This is relevant, given high prevalence of depression and distress among diabetes patients. For this study, 297 primary care patients with type 2 diabetes participated in the PRISMA observational study with a pre-post measurement design. Patients were grouped in low (n=63) and normal well-being (n=234). Low well-being was defined as either low mood (WHO-5<50) and/or high diabetes-distress (PAID-5>8). Outcome measures were: diabetes self-efficacy (CIDS), illness perception (IPQ) and diabetes self-care activities (SDSCA). Improvements were found in illness perception (b=1.586, p<.001), general diet (b=1.508, p=.001), foot care (b=.678, p=.037), weekly average diet (b=1.140, p=.001), creating action plan (b=.405, p=.007). Well-being interaction effects were found for general diet (p=.009), weekly average diet (p=.022), and creating an action plan (p=.002), in which the low well-being group seemed to improved more than the normal well-being group. Based on

114

the results of the study we concluded that the PRISMA self-management education program seems as effective for people with normal well-being as for people with low well-being. We advised further research to examine whether addressing mood and diabetes-distress as part of self-management education could reduce attrition and maintain or improve well-being among participants.

Chapter 4 - Use of Behavioral Change Techniques in Web-Based Self-Management Programs for Type 2 Diabetes Patients: Systematic Review.

Chapter 4 describes a systematic review on the specific behavioral change techniques that are used in web-based self-management programs for people with type 2 diabetes. Literature has shown that web-based self-management programs can successfully improve patient health behaviors and health-related outcomes. When developing a web-based self-management program for people with type 2 diabetes, it is important to match the program to a suitable theory and add specific behavioral change techniques to suit this theory. However, before behavioral change techniques are chosen, it is important to know which ones are effective. From previous reviews of online diabetes self-management programs, it appears that it is still unclear which behavioral change techniques (BCTs) are primarily used and are most effective when it comes to improving diabetes self-management behaviors and related health outcomes. Therefore, we set out to identify which BCTs are being applied in online self-management programs for T2DM and whether there is indication of their effectiveness in relation to predefined health outcomes. Articles were systematically searched and screened on the mentioned use of 40 BCTs, which were then linked to reported statistically significant improvements in study outcomes. We found 13 randomized controlled trials reporting on 8 online self-management interventions for T2DM. The BCTs most frequently used were; feedback on performance, providing information on consequences of behavior, barrier identification/problem solving, and self-monitoring of behavior. These same BCTs were also linked to positive outcomes for health behavior change, psychological well-being, or clinical parameters. We concluded that a relatively small number of theory-based online self-management support programs for T2DM have been reported using only a select number of BCTs.

Chapter 5 - Web-based Self-management With and Without Coaching for Type 2 Diabetes Patients in Primary Care: Design of a Randomized Controlled Trial.

Chapter 5 describes the development and protocol of a randomized controlled trial, with which it is tested if the addition of online coaching to an online self-management support program could improve patient motivation and reduce program attrition. In the study protocol, we hypothesized that a web-based self-management program with coaching will prove more effective on improving patient self-management behavior and clinical outcome measures, compared to a web-based self-management support program without coaching. In this chapter, we have planned that during the study period we would include 220 people in one year time and randomize them into 2 groups. Both groups would have access to a patient health platform with self-management support program. However, the intervention group would get access to additional coaching, where the control group would not. All participants would be followed for one year, with 3 measurement points at baseline, 6 and 12 months. From the offered self-management support program, it was expected to have beneficial effects on self-care activities, well-being and clinical outcomes.

When proven effective, this self-management support program could be offered to other health care groups and their type 2 diabetes patients in the Netherlands.

Chapter 6 - Uptake and Effects of the e-Vita Personal Health Record with Self-management Support and Coaching, for Type 2 Diabetes Patients Treated in Primary Care.

In chapter 6, we set out to study the use, uptake and effects of e-Vita, a Personal Health Record with self-management support and personalized asynchronized coaching, for type 2 diabetes patients treated in primary care. Web-based patient support offers opportunities for optimizing treatment outcomes in diabetes and reduces the burden on health care. For this study, patients with type 2 diabetes were invited by their practice nurse to join the study aimed to test use and effects of a Personal Health Record, e-Vita. Patients were followed for 6 months. Uptake and usage were monitored using log-data. Outcomes were self-reported diabetes self-care, diabetes-related distress, and emotional well-being. Patients' health status was collected from their medical chart. The results showed that a total of 132 patients agreed to participate in the study of which less than half (46.1%) did not return to the Personal Health Record after 1st log-in. Only 5 patients used the self-management support program within the Personal Health Record, 3 of whom asked a coach for feedback. Low use of the personal health record was registered. No statistical significant differences on any of the outcome measures were found between baseline and 6 months follow-up. The study showed minimal impact of implementing a Personal Health Record including self-management support, in primary diabetes care. In this chapter, we conclude that in line with previous experiences, successful adoption of a web-based platforms, in the context of ongoing patient-centered care, is hard to achieve without additional strategies aimed at enhancing patient motivation and engaging professionals.

Chapter 7 - PRISMA-Online: Development and Pilot-Testing of an Internet-based Self-management Maintenance Program Complementing the PRISMA Self-management Course (Dutch DESMOND) for People with Type 2 Diabetes.

The paper discussed in chapter 7 reports on the development, pilot-implementation, and initial user patterns of a newly developed online maintenance program, PRISMA-Online, as addition to the existing group-based PRISMA-course. For the creation of PRISMA-Online, a multi-module online program was developed, guided by the Health Action Process Approach model, and supported by behavioral change techniques. To test feasibility, the online program was integrated and evaluated in primary and tertiary diabetes care. Professionals' attitudes towards the program were gathered. Anonymous meta-log-data of the participants were analyzed. The online program was successfully developed and made available for use in primary and tertiary care. Diabetes professionals were enthusiastic and eager to work with the online program. From all participants, 40% used the online program. The most used components were diary, information on T2DM and depression screener. Goal setting, goal evaluation and consultation preparation were not used. This study showed that the program PRISMA-Online is feasible, and accepted by participants and care providers. The log-data showed that small tweaks are necessary, to stimulate participants to keep using the online program. In this chapter, we conclude that continued support from care professionals appears vital for sustained program use by participants. We further concluded that this study laid the foundation for further implementation and research of the PRISMA-Online program.

Chapter 8 – General Discussion

This chapter provides a general conclusion in which the content of the previous chapter are put into perspective with each other. This chapter further provides a discussion and reflection on main findings of this thesis, in which the importance and complexity of emotional status in relation to self-care, glycemic control, and self-management is discussed. It further addresses the difficulties of telehealth and web-based self-management support programs. Next, reflection on research methods and theory are made, which may have influenced the study outcomes and conclusions. Finally, final remarks and future perspective are provided, considering the emotional status, such as emotional well-being and diabetes-related distress, and concerning the development, use, and implementation of online and web-based solutions for the treatment of people with type 2 diabetes.