Interplay of personal control and health-related social control on diabetic adjustment among Singaporean late-middle-aged and older adults with type 2 diabetes

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INTERPLAY OF PERSONAL CONTROL AND HEALTH-RELATED SOCIAL CONTROL ON DIABETIC ADJUSTMENT AMONG SINGAPOREAN LATE-MIDDLE-AGED AND OLDER ADULTS WITH TYPE 2 DIABETES

YANG FANG 2014

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ABSTRACT

Chronic illness, like diabetes is an increasingly severe public health issue that merits more research in order to facilitate chronic illness adjustment and reduce the disease burden on the individual patients, their families and the health care system. While the majority of previous research examines personal characteristics and social environmental factors separately in the context of chronic illness, the current study aims to examine the interplay of a less studied social relationship mechanism—health-related social control from family members (both direct and indirect) and personal characteristics—patients' diabetes-related self-efficacy and internal health locus of control on diabetic adjustment in a sample of Singaporean late-middle-aged and older adults with Type 2 diabetes (*N*=199). I conceptualized better diabetic adjustment outcomes as better adherence to self-care activities, lower diabetes-related emotional distress and fewer depressive symptoms, and optimal glycemic control. Health-related social control operates in direct and indirect ways, such that direct health-related social control refers to family members' direct attempts to regulate, influence or constrain health behaviors, while indirect health-related social control refers to patients' internalized sense of responsibility or obligation to family members to stay healthy, which in turn encourages patients to maintain healthy behaviors.

Data were collected between February 2012 and July 2013 in Singapore. Participants answered a battery of scales, including direct and indirect health-related social control, self-efficacy and internal health locus of control, and diabetic adjustment outcomes. Results showed that both self-efficacy and internal health locus of control were beneficial to psychological diabetic adjustment, while self-efficacy had additional

behavior-facilitating effect. Direct health-related social control was positively related to diabetes-related emotional distress and self-care activities; and indirect health-related social control was negatively related to depressive symptoms, but positively related to self-care activities (bivariate correlation). Results also showed that the interaction between direct health-related social control and patients' self-efficacy was significant for diabetes-related emotional distress and depressive symptoms. Specifically, direct health-related social control demonstrated a positive association with diabetes-related emotional distress and depressive symptoms for those with higher self-efficacy, but a negative association with depressive symptoms for those with lower self-efficacy. The indirect effect of indirect health-related social control on diabetes-related emotional distress and depressive symptoms was significant via internal health locus of control, but not self-efficacy.

This study highlights the importance of promoting patients' self-efficacy and internal health locus of control in order to improve their diabetic adjustment. Moreover, the interaction results suggest that direct health-related social control may exert an interference effect for patients higher in self-efficacy, but a compensation effect for patients lower in self-efficacy. The mediation results elucidate the mechanism underlying indirect health-related social control and diabetic adjustment, and highlight the importance of fostering indirect health-related social control and internal health locus of control for better diabetic adjustment. Taken together, the present study represents a valuable attempt to integrate health-related social control received from family members with patients' personal control belief (self-efficacy and internal health locus of control) for understanding the interplay of social environmental and personal variables on diabetic adjustment.

CHAPTER ONE

INTRODUCTION

1.1 Statement of the Problem

Chronic illness refers to disease of long duration requiring lifetime management, and that usually does not have a cure; chronic illness is among the major causes of disability and death (WHO, 2013a). Diabetes Mellitus (referred to as diabetes hereafter) is one of the most prevalent chronic diseases globally. According to the World Health Organization (WHO, 2013b) in 2013, more than 347 million people worldwide suffer from diabetes, and the prevalence is still on the increase. For instance, in China, a national survey in 2010 showed that 11.6% adults were diagnosed with diabetes. More specifically, 17.6% of 50- to 59-year-old adults and 22.5% of 60- to 69-year-old adults suffered from diabetes (Xu et al., 2013). In the United States, the prevalence of diabetes among people aged 20 years or older is 11.3% in 2010 (Centers for Disease Control and Prevention, 2011). In Singapore, the national health survey in 2010 showed that 19.3% of 50- to 59-year-old adults and 29.1% of 60- to 69-year-old adults suffered from diabetes, and the prevalence increased from 8.2% in 2004 to 11.3% in 2010 (Ministry of Health, 2011). Type 2 diabetes affects more than 90% of diabetic patients (WHO, 2013b). Aging and unhealthy lifestyle are two major risk factors for Type 2 diabetes, which are quite common nowadays and make people more vulnerable to diabetes, especially for late-middle-aged and older adults. It seems that the late-middle-aged and older adult population in Singapore is facing a more severe situation compared to those in the US and China, and this merits more research.

Diabetes requires patients to follow a strict self-care plan, involving multiple behaviors. If not managed well, diabetes could cause micro- and macro-vascular complications, or even more severe consequences (e.g., blindness and amputation), which in turn impose great burden on individuals, families and the health care system (WHO, 2013b). Although adherence to self-care activities (e.g., diet and exercise) is crucial in glycemic control (an indicator of diabetic condition) and complication prevention (Kurtz, 1990), studies show that regimen adherence and glycemic control are often not optimal (Delamater, 2006; Lin et al., 2004; Vermeire, Heamshaw, VanRoyen, & Denekens, 2001). Because of the prevalence of diabetes and the difficulties associated with maintaining health-promotion and disease-management behaviors, it is imperative to examine personal, psychological, and contextual factors that could contribute to better adjustment to Type 2 diabetes.

A review of the literature shows that self-efficacy and internal health locus of control play a crucial role in health and chronic illness adjustment. Given both self-efficacy and internal health locus of control represent a sense of personal control, and in the current study the two were subsumed under personal control in order to contrast with an interpersonal mechanism—health-related social control. Chronic illness, like diabetes, requires consistent self-care activities, and patients' self-efficacy and internal health locus of control have received substantial research attention in the chronic illness adjustment literature (e.g., Bandura, 1986; Wallston, Stein, & Smith, 1994). Despite the significance of personal control, social relationships, such as those within the family could also play a crucial part in patients' chronic illness adjustment. For instance, WHO (2002) stated that "health care for chronic illness must be oriented around the patient and the family" (p.5).

In the particular case of diabetes, patients often report the importance of family involvement in their self-care regimen (Rosland, Heisler, Choi, Silveira, & Piette, 2010), but the literature places more emphasis on the role of personal factors like personal control than the role of the family (Piette, 2010). Among the studies examining the mechanisms underlying social relationship (e.g., family) and chronic illness adjustment, emerging evidence suggests that health-related social control, which represents the regulatory function of social relationships (Umberson, 1987), is an important factor to consider. Health-related social control operates in direct and indirect ways, such that direct health-related social control involves attempts to regulate, influence or constrain health-related behaviors, while indirect health-related social control refers to an internalized sense of responsibility to others to stay healthy, which in turn encourages individuals to maintain healthy behaviors (Umberson, 1987). Given that close relationships, like familial relationships, are major resources of health-related social control, the current study examines how health-related social control received from family members influences diabetic adjustment, which could provide a better understanding of how family members can get involved in patients' diabetes management and facilitate patients' diabetic adjustment.

Moreover, diabetes management involves a variety of self-care activities, ranging from adhering to complex eating patterns to monitoring blood glucose (Barlow, Wright, Sheasby, Turner, & Hainsworth, 2002). Family is a major context in which patients' diabetes management activities take place, and family members are the major providers of health-related social control in the social network (Franks et al., 2006). During the process that family members provide health-related social control, patients may have

differential responses to such family influence due to their personality, habits, and other individual differences. Given that both personal control and health-related social control could contribute to diabetic adjustment, it is important to consider patients' own characteristics when examining the effect of health-related social control from family members.

1.2   Significance of the Study

Despite a large body of research on chronic illness adjustment, there are still gaps in the literature. Compared to self-efficacy and internal health locus of control, the role of family in chronic illness adjustment is less emphasized. Emerging evidence suggests that health-related social control, including both direct and indirect ways, is an important mechanism underlying the link between social relationship and chronic illness adjustment. However, this mechanism has not been sufficiently and systematically studied. The majority of the existing studies focus on direct health-related social control, though with inconsistent findings, while fewer focus on indirect health-related social control. Family members are the social network members who mostly provide health-related social control for patients with chronic illness. However, the relationship between such family influence and chronic illness adjustment are mixed in the literature (see a detailed literature review in chapter two). Research that attempts to resolve the inconsistent results is needed. In addition, research on indirect health-related social control and chronic illness adjustment and the underlying mechanism is also needed.

The current study aims to address the above gaps in the literature in order to better elucidate the associations between personal control/health-related social control and chronic illness adjustment in a sample of Singaporean late-middle-aged and older adults

diagnosed with Type 2 diabetes. Direct and indirect health-related social control might exert differential effects on diabetic adjustment, as direct health-related social control involves explicit regulatory attempts from family members, while indirect health-related social control involves patients' internalized sense of responsibility to family members to stay healthy. Thus the current study examines both direct and indirect health-related social control. Theoretically, the study attempts to assist in explaining the inconsistent findings of direct health-related social control in the context of chronic illness by examining the potential moderating role of personal control. In addition, the study also aims to extend previous literature by examining the relationship between indirect health-related social control and diabetic adjustment and its underlying mechanisms. By doing so, this research could provide a more comprehensive picture of both direct and indirect health-related social control, and the interplay of both direct and indirect health-related social control and personal control on chronic illness adjustment—diabetic adjustment. Practically, given that Type 2 diabetes is an increasingly serious public health issue in Singapore, it is meaningful to investigate the factors that contribute to better adjustment to diabetes in order to inform current intervention practices. A better understanding could inform how family members could better get involved in patients' diabetes management by using effective and appropriate strategies, with the goal of preventing diabetes-related complications, improving adjustment to diabetes, and enhancing patients' quality of life. Moreover, this in turn would reduce the burden of diabetes on individual patients, family and the health care system. Overall, the current study aims to provide empirical evidence on the interplay of personal control and health-related social control on diabetic adjustment outcomes, and hopes to contribute to the theory and practical practice.

1.3 Research Questions

In this study, I focused on patients' personal control belief and health-related social control received from family members, and examined how the two types of control would influence the eventual diabetic adjustment outcomes. I conceptualized diabetic adjustment in terms of a combination of psychological, behavioral, and physiological outcomes, that is, diabetes-related emotional distress, depressive symptoms, overall self-care activities, and HbA1c. More specifically, the study examined the following questions:

(1) How does personal control (operationalized in this research as diabetes-related self-efficacy and internal health locus of control) influence diabetic adjustment outcomes?

(2) How do direct and indirect health-related social control influence diabetic adjustment outcomes?

(3) How do direct health-related social control and personal control (i.e., diabetes-related self-efficacy and internal health locus of control) jointly influence diabetic adjustment outcomes?

(4) How do indirect health-related social control and personal control (i.e., diabetes-related self-efficacy and internal health locus of control) jointly influence diabetic adjustment outcomes?

1.4 Outline of the Chapters

There are six chapters in the thesis. Chapter one introduces some background information for the research topic, followed by the discussion of the significance of the study as well as a brief summary of the research questions. In chapter two, relevant

literature is reviewed on chronic illness adjustment, personal control, health-related social control, and the interplay of personal control and health-related social control on chronic illness adjustment. The chapter ends with a summary of the research questions and hypotheses of the current study. Chapter three and four cover the research methods. Chapter three involves questionnaire translation and pretest. Chapter four describes the main study and its analytic methods. Chapter five provides the results of the main study. Chapter six contains a general discussion, and concludes with the contributions and limitations of the current study and future research directions.

CHAPTER TWO

LITERAURE REVIEW

In this chapter, I review the related literature on chronic illness adjustment with a particular emphasis on diabetic adjustment, personal control (self-efficacy and internal health locus of control) and diabetic adjustment, health-related social control, and the interplay of health-related social control and personal control (self-efficacy and internal health locus of control) on diabetic adjustment. Following the literature review, I state the hypotheses at the end of this chapter.

2.1 Chronic Illness Adjustment

When individuals are diagnosed with a chronic illness, they usually have to make persistent efforts in multiple domains in order to adapt to the chronic illness (de Ridder, Geenen, Kuijer, & van Middendorp, 2008; Taylor & Aspinwall, 1996). For instance, patients have to change their unhealthy lifestyles, follow the medical advice (e.g., take medications), and cope with their psychological distress following diagnosis. These efforts into disease management will inevitably pose some degree of interference with normal life. The extent to which patients adjust well to chronic illness and achieve a balance in their life is usually measured by a variety of adjustment indices. However, chronic illness adjustment is variously defined or operationalized in the literature. Elements that have been identified include but not limited to mastery of disease-related adaptive tasks, perceived quality of life in various life domains, absence of psychological disorder, and a well-controlled disease status (Maes, Leventhal, & de Ridder, 1996; Stanton, Collins, & Sworowski, 2001; Stanton, Revenson, & Tennen, 2007). A review of the related literature suggests that the diverse indices of chronic illness adjustment may

be categorized as three dimensions, including psychological, behavioral, and physiological (de Ridder et al., 2008). In order to capture a comprehensive picture of chronic illness adjustment, it is important to look at these different aspects, rather than just focus on one.

2.1.1 Diabetic Adjustment

In the same fashion, diabetes adjustment also involves multiple aspects. Following literature, this study specifically operationalized diabetic adjustment via three aspects: diabetes-related emotional distress and depressive symptoms (psychological adjustment), self-care activities adherence (behavioral adjustment), and glycemic control (physiological adjustment) (Gonder-Frederick, Cox, & Ritterband, 2002; Harvey & Lawson, 2009; Surwit et al., 2002).

Chronic illnesses like diabetes are major life events, which may inevitably cause psychological distress to the patients. They have to constantly engage in intensive self-care activities, which might interfere with their previous habitual life. Diagnosis might also lead to feelings of burden and distress, such as emotional distress and avoidance of social interaction, as well as impact on quality of life (de Ridder et al., 2008; Steed, Cooke, & Newman, 2003). For instance, diabetes management requires patients to strictly follow healthy eating patterns, and patients may have to give up on their favorite food. The sense of deprivation is one source of emotional distress for diabetic patients. Moreover, patients' health status may not be improved despite the engagement in multiple self-care tasks, and this lack of improvement could also lead to discouragement and emotional distress. A worse scenario is a wide range of complications, which could greatly increase their distress and threaten patients' psychological health. For instance,

depression is a significant problem among patients with diabetes, who suffer from greater prevalence compared to the general population (Anderson, Freedland, Clouse, & Lustman, 2001; Peyrot & Rubin, 1997). Moreover, research shows that depression has a pervasive impact on patients with diabetes, such as poorer medical regimen adherence, functioning impairment, and higher health care cost (Ciechanowski, Katon, & Russo, 2000). From a clinical perspective, it provides great opportunities to screen depressive symptoms in the primary care settings. Further evaluations and referral may be needed for those with high scores on the scale. Given the psychological distress due to diabetes and the prevalence of depression among patients with diabetes, the current study aims to examine how psychosocial factors influence the two crucial psychological indicators of how well patients adjust to diabetes.

Behavioral adherence to self-care activities is also crucial in glycemic control and complication prevention. Diabetes self-management involves medication use, sugar monitoring, insulin injection, foot care, and lifestyle changes, such as physical activity and healthy diet (Barlow et al., 2002). Such complex regimen might be difficult to adhere to due to several reasons. Patients usually spend 60 minutes per day on self-care activities (Safford, Russell, Suh, Roman, & Pogach, 2005). The large amount of time and efforts required daily to manage diabetes increases the burden (Weijman et al., 2005). In addition, despite the engagement in daily self-care activities, patients may not experience the immediate benefits of time and efforts input in terms of the improvement of glycemic control and quality of life (Jaarsma et al., 2000). Without reinforcement, it is quite difficult to sustain the behavioral adherence. Instead, patients might be discouraged and lack the motivation to continue with self-care activities. Moreover, some lifestyle habits

(e.g., diet and exercise) take form since childhood and are difficult to change in later life

stage (Umberson, Crosnoe, & Reczek, 2010). Insulin injection and blood sugar

monitoring are relatively uncommon tasks, and patients may find it difficult to adapt.

Furthermore, patients with diabetes may face greater challenge if they experience

complex comorbid medical problems (e.g., heart disease) and functional status decline

(Chau & Edelman, 2001). Given the importance of multiple self-care activities, it is

crucial to adhere to all of these tasks, rather than omit some individual tasks. Safford et al.

(2005) found that one third to one half of diabetic patients neglected important elements

of self-care. More importantly, their study indicated that patients who omitted important

elements were more likely to suffer from complications. For instance, among patients

with severe foot neuropathy symptoms, one fourth reported spending no time on foot care.

Overcoming these obstacles to optimal self-care activities may contribute to better

diabetic adjustment.

The third element to determining whether patients with diabetes manage their

disease well is glycemic control, which is often measured by hemoglobin A1c (i.e.,

HbA1c) in clinical studies (Qaseem et al., 2007). HbA1c measures the average blood

glucose level during the past 2-3 months, with higher HbA1c level denoting poorer

glycemic control. Achieving an optimal HbA1c level could considerably reduce the risk

of complications, like micro- and macro-vascular diseases (Ohkubo et al., 1995; Stratton

et al., 2000; U. K. Prospective Diabetes Study Group, 1998). For instance, Stratton et al.

(2000) found that each 1% decline in the mean HbA1c reduced the risk of myocardial

infarction by 14%, microvascular complications by 37%, and even diabetes-related death

by 21%. In this regard, HbA1c is also an indicator of risk for diabetes-related

complications. Maintaining a good glycemic control or HbA1c can be regarded as the physiological aspect of diabetic adjustment.

Taken together, diabetic adjustment is a multi-domain concept, involving psychological, behavioral, and physiological aspects. In particular, in this research, diabetic adjustment is conceptualized as diabetes-related emotional distress and depressive symptoms, adherence to self-care activities, and HbA1c.

2.2   Self-Efficacy & Internal Health Locus of Control

There is well-documented research evidence showing that self-efficacy and internal health locus of control are two important factors contributing to chronic illness adjustment (e.g., DeVellis & DeVellis, 2001; Knappe & Pinquart, 2009). Self-efficacy is the perception of one's ability to carry out a certain behavior (Bandura, 1986). It could impact human functioning through four major processes: cognitive, motivational, emotional, and choice process (Bandura, 1999). From a cognitive perspective, people with high self-efficacy visualize success scenarios and show strategic flexibility, enabling them to further assure their self-efficacy. Moreover, highly self-efficacious people tend to be more motivated to make effort and to figure out better ways to achieve motivating goals they set for themselves. Self-efficacy also affects how much stress, anxiety and depression people experience when facing difficult situations. Additionally, self-efficacy enables people to create beneficial environments and exercise control over such environments or choices. In sum, highly self-efficacious people tend to have a positive self-evaluation, strive for their aspirational goals and lower their distress by creating a beneficial environment.

Internal health locus of control originates from the concept of locus of control. Locus of control refers to the generalized expectancies people develop about outcomes according to their beliefs in the sources of control over events/outcomes (Rotter, 1966). There are two beliefs about the sources of control, internal and external. Individuals holding an internal locus of control belief perceive that the outcomes of a situation depend on their own behaviors, while individuals holding an external locus of control belief view the outcomes as dependent on external forces, like powerful others, luck or chance (Rotter, 1966). Locus of control is usually domain specific, and it has been expanded to other areas later. When applying this construct to the health domain, health locus of control refers to the extent to which internal or external factors, or one's own behaviors or forces external to oneself, determine their health. Wallston, Wallston, and DeVellis (1978) expanded health locus of control into three dimensions: internal, powerful others and chance. Internal health locus of control (IHLC) refers to the degree to which individuals attribute one's own health to internal factors, like their own behaviors. Powerful others health locus of control (PHLC) measures the extent to which one views that health is largely dependent on powerful others, such as physicians, family members or other significant others. Chance health locus of control (CHLC) is the belief that health is a matter of luck or chance. In the current study, I focused on internal health locus of control as it is classified as one belief within personal control, while PHLC and CHLC are beliefs out of personal control due to their external source of control.

Both self-efficacy and internal health locus of control represent personal control beliefs, either a sense of confidence in one's ability to perform certain behaviors, or one's health depends on one's own behaviors. However, I want to emphasize that self-efficacy

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and internal health locus of control were subsumed under personal control in the current

study just to contrast with the interpersonal mechanism—health-related social control

(Please see below for detailed discussion).

2.2.1   Self-Efficacy & Diabetic Adjustment

In the context of chronic illness, people with higher self-efficacy are able to better

cope with the stress due to the chronic illness, and are strongly motivated to get engaged

in self-care activities, thus leading to better adjustment (DeVellis & DeVellis, 2001;

Mancuso, Rincon, McCulloch, & Charlson, 2001; Stretcher, De Villis, Becker, &

Rosenstock, 1986). Literature has suggested that self-efficacy is crucial across different

types of chronic illnesses. For instance, self-efficacy was positively related to physical

functioning in patients with chronic obstructive pulmonary disease and chronic heart

failure (Arnold et al., 2005). Breast cancer patients with higher self-efficacy tended to

have less functional impairment and higher self-esteem (Manne et al., 2006). In a sample

of kidney transplant recipients, self-efficacy was found to be negatively correlated with

depression (Weng, Dai, Wang, Huang, & Chiang, 2008). Moreover, self-efficacy was

strongly related to exercise in patients with cardiovascular disease (Rodgers, Murray,

Selzler, & Norman, 2013). On the other hand, low self-efficacious people might lose

confidence and give up on certain behaviors, thus cannot get desirable results. For

example, patients with lower self-efficacy generally had poorer self-management

(Gallagher, Donoghue, Chenoweth, & Stein-Parbury, 2008) and anxiety and other

psychological distress (Bourbeau, Nault, & Dang-Tan, 2004). Similarly, Sarkar, Ali, and

Whooley (2007) found that lower self-efficacy was related to greater symptom burden

and physical limitations, and worse well-being and overall health in a sample of patients

with coronary heart disease, and this effect was independent of disease severity and depression.

Self-efficacy is also crucial for patients with diabetes. Diabetic patients with higher self-efficacy are less likely to suffer from depression (Cherrington, Wallston, & Rothman, 2010; Sacco et al., 2005), whereas patients with lower self-efficacy are more likely to experience diabetes-related distress (Law, Walsh, Queralt, & Nouwen, 2013). In addition, self-efficacy could facilitate self-care activities across ethnic groups and health literacy (Bean, Cundy, & Petrie, 2007; Sarkar, Fisher, & Schillinger, 2006). Moreover, self-efficacy facilitates patients' daily foot-exam practice (Chin, Huang, & Hsu, 2013) and physical activity (Dutton et al., 2009). These findings suggest that self-efficacy is beneficial for psychological and behavioral aspects of diabetic adjustment. With respect to HbA1c, the literature shows inconsistent findings. For instance, Cherrington, Wallston, and Rothman (2010) found that self-efficacy was negatively related to HbA1c. Venkataraman et al. (2012) also found that self-efficacy was a strong predictor of lower HbA1c. Additionally, Infurna and Gerstorf (2014) found that people perceiving more control had lower cardio-metabolic risk, including lower HbA1c. These studies suggest that self-efficacy is a protective factor, such that patients with higher self-efficacy achieve better glycemic control. However, other studies showed no evidence on the relationship between self-efficacy and HbA1c (e.g., Bean, Cundy, & Petrie, 2007). Nonetheless, the majority of previous studies suggest that self-efficacy enables patients to actively engage in self-care activities, better cope with the distress due to the disease, and obtain better glycemic control (lower HbA1c).

2.2.2　Internal Health Locus of Control & Diabetic Adjustment

Internal health locus of control generally is reflected by greater resources and opportunities of personal coping abilities (Landau, 1995). Higher internal health locus of control individuals are more likely to engage in health behaviors, better deal with stress and achieve better well-being. A large body of research has shown that internal health locus of control is positively related to healthy behaviors. For instance, individuals with higher internal health locus of control scored higher on a "lifestyle" indicator measured by a composite score of smoking, alcohol consumption, exercise and diet (Norman, Bennett, Smith, & Murphy, 1998). Moreover, internal health locus of control was positively correlated with positive affect in patients with internal diseases (Knappe & Pinquart, 2009). In addition to its beneficial effect on behavior and well-being, internal health locus of control could also predict physical health and longevity. For instance, internal health locus of control was strongly related to physical functioning in an elderly sample (Wallhagen, Strawbridge, Kaplan, & Cohen, 1994), and survival time in a sample of patients after lung transplant when adjusting for the effect of age and medical diagnosis (Burker, Evon, Galanko, & Egan, 2005).

Internal health locus of control, however, is not always beneficial for chronic illness adjustment. For instance, for more advanced or life-threatening diseases like AIDS or cancer, higher internal health locus of control may not be adaptive (e.g., Burish et al., 1984; Ruffin, Ironson, Fletcher, Balbin, & Schneiderman, 2012). Advanced-stage or life-threatening diseases may indeed be out of patients' control, high internal health locus of control, however, may make patients feel discouraged and stressed due to the discrepancy or incongruence between their high internal health locus of control belief and the reality

of their health status. Whereas for patients with diabetes, higher internal health locus of control may be more adaptive, as diabetes requires patients' responsibility and efforts, and what they do can actually affect the disease symptoms and prognosis. Research showed that internal health locus of control was positively related to diabetes self-care activities (Schlenk & Hart, 1984), and attendance of diabetic nutritional care clinics (Spikmans et al., 2003). Additionally, internal health locus of control was also positively related to psychological adjustment (Peyrot & Rubin, 1994; Rubin & Peyrot, 1999). With regards to HbA1c, internal health locus of control was found to be positively related to better glycemic control (Nabors, McGrady, & Kichler, 2010; Ulf, Anders, Per-Olof, & Olof, 1998). However, some studies found that internal health locus of control was not significantly related to HbA1c (Auerbach et al., 2002). Nonetheless, the literature suggests the potential beneficial effect of internal health locus of control in terms of behavioral, psychological and physiological aspects of diabetic adjustment.

2.2.3 Self-Efficacy vs. Internal Health Locus of Control

Self-efficacy and internal health locus of control are similar in that these represent beliefs about personal control. Self-efficacy and internal health locus of control are positively related to each other (O'Hea et al., 2008). Literature also suggests that the two have similar effects on promoting health behaviors and buffering stress. As discussed above, self-efficacy and internal health locus of control could enable people to better cope with stress, more actively engage in health behaviors, and achieve better physical and psychological health (DeVellis & DeVellis, 2001; Mancuso et al., 2001).

Despite their similarity, self-efficacy is distinct from internal health locus of control. Self-efficacy refers to the belief that one has the confidence in one's abilities to

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perform certain behaviors (Bandura, 1986), while internal health locus of control is a belief that one's health is determined by one's own behaviors (Rotter, 1966; Wallston, Wallston, & Devellis, 1978). It is possible that individuals with high self-efficacy may not have high internal health locus of control, or people who are confident in engaging health behaviors may not think that their own behaviors determine their own health. Or people who believe that their behaviors determine their own health may not have the confidence in their abilities to perform health behaviors.

Given the similarity and distinction between self-efficacy and internal health locus of control, it is reasonable to infer that self-efficacy and internal health locus of control may have similar as well as differential associations with diabetic adjustment. In the current study, I examined how self-efficacy and internal health locus of control would be related to patients' diabetic adjustment, and how they operated on diabetic adjustment jointly with the social influence from family members.

2.3   The Role of Family in Chronic Illness Adjustment

In addition to the significance of self-efficacy and internal health locus of control, family is also an important social environmental factor that could influence chronic illness adjustment. Research shows that the number of social relationships decreases and the size of social network narrows gradually with age (Lang, 2001; Lang & Carstensen, 1998). However, emotional ties with family members are relatively stable till middle-aged and older adulthood, thus relationships with family members are crucial for this population. In addition, Clark (2003) stated that one gap in chronic illness adjustment literature is the neglect of social environmental or context factors compared to patients' personal factors. Patterson and Garwick (1994) also claimed that "chronic illness happens

to a family, not just an individual" (p. 131). This suggests that a focus on individual personal factors may not be adequate, and highlights the need to consider the influence from family as well. Especially for people at their late stage, the family plays an even more significant role in disease management, as late-middle-aged and older adults usually experience a decline in resources, like physical or cognitive (Martire & Schulz, 2007). In sum, research on chronic illness management should not be isolated from the social context, such as family.

Family has the potential to influence the health and well-being of late-middle-aged and older adults. For instance, in Singapore, 92.1% of the senior citizens reported that they turned to their family for support when they are ill, and 91.4% turned to their family when they need to talk to someone (Ministry of Community Development, Youth and Sports, 2005). As a major resource of help, family could greatly influence patients' diabetic adjustment, either facilitate or impede (Rosland & Piette, 2010). First, family members could shape the environment in which self-care activities take place for patients, impacting the ultimate adjustment (Gallant, Spitze, & Prohaska, 2007). For instance, family members often decide what food to buy and store. The storage of unhealthy food in the pantry might tempt patients and make them fail to follow diet restrictions. In addition to the physical environment, family's attitudes toward health also influence where health fits in the hierarchy of family priorities. If health is the first priority in the family, patients will be encouraged to engage in a series of healthy activities. Second, family members could shape patients' lifestyle and directly impact their daily activities (Rosland et al., 2010; White, Smith, Hevey, & O'Dowd, 2009). For example, family members exercise with patients and offer hands-on help with blood sugar testing. Third,

family members could also provide affection, emotional support and sometimes criticism to patients (Rosland, 2009). Moreover, the overall family environment could influence diabetic adjustment. Families less in conflict are associated with better glycemic control (Edelstein & Linn, 1985).

With the established importance of family relationship, studies have been directed to examining the underlying mechanisms on how family relationship exerts its influence on health behaviors and chronic illness adjustment. Health-related social control is an emerging mechanism underlying social relationships and health (Berkman, Glass, Brissette, & Seeman, 2000; Hughes & Gove, 1981; Umberson, 1987). Moreover, studies have shown that family is a major social context that health-related social control occurs (Franks et al., 2006). Thus it has merits to examine health-related social control in the family context and explore its association with chronic illness adjustment, like diabetes.

2.4   Health-Related Social Control

Social control is a construct that originates from sociology, and it generally refers to the regulation of individual or group behaviors through societal or political process in order to maintain the compliance to a given society (Janowitz, 1975). It operates in two forms, informal and formal. Informal social control is internalization of norms and values via socialization, whereas formal social control refers to external sanctions enforced by government. Later, social control theory began to be studied in criminology. The theory proposed that the inclination to engage in delinquent behaviors (e.g., antisocial) can be reduced by self-control instilled via socialization and social learning (Nye, 1958). Two forms of social control included direct and indirect one. More specifically, direct social control refers to punishments for wrongful behavior, and rewards for compliant behaviors.

Indirect social control refers to identification with significant others, which may reduce delinquent behaviors. Social control can guide individuals to engage in conventional behaviors, and to prevent deviant behaviors, like violence (Gibbs, 1981; Hirschi, 1969). Overall, research suggests that social control may function in two ways, either explicit (or direct) or implicit (or indirect), and social norms seem to play a pivotal role in the process.

When applying social control in the health domain, health or absence of illness is a normative state. Engaging in healthy behaviors and disengaging from unhealthy behaviors are health-related social norms, whereas disengagement from healthy behaviors or engagement in unhealthy behaviors violates the norms. When individuals are not complying with the norms, people in their social network may exert health-related social control, attempting to encourage healthy behaviors and deter unhealthy behaviors (Umberson, 1987). Following the tradition of social control research, health-related social control, reflecting the regulatory function of social relationships, operates in direct and indirect ways (Rook, Thuras, & Lewis, 1990; Umberson, 1987). Direct health-related social control is defined as social network members' attempts to regulate, influence and constrain health behaviors, with the aim to prevent health-damaging behaviors (Umberson, 1987). The aim has been later extended to include increasing health-enhancing behaviors (Lewis & Rook, 1999). Indirect health-related social control refers to an internalized sense of responsibility or obligation to others to stay healthy, which in turn encourages individuals to maintain healthy behaviors (Umberson, 1987). Overall, health-related social control focuses on how normative health-related behaviors (reducing health-compromising behaviors and increasing health-enhancing behaviors) are enforced through individuals' involvement in social relationships.

Given the significance of family members, this study focused on health-related social control in the family context. Research often conceptualizes the involvement of family members in health-related behaviors as direct health-related social control, and individuals' internalized sense of responsibility to family members as indirect health-related social control (e.g., Lewis & Rook, 1999; Tucker, Elliott, & Klein, 2006). In order to be specific to diabetes context, direct health-related social control refers to the attempts of family members to regulate or influence diabetes-related behaviors, and indirect health-related social control refers to patients' internalized obligation to family members to stay healthy in the current study.

2.4.1   Direct Health-Related Social Control

Studies on health-related social control are emerging in the field of psychology. Until now, studies have mainly focused on direct health-related social control in close relationships like parents, spouses or dating partners in the general population (e.g., Lewis & Butterfield, 2005; Lewis, Butterfield, Darbes, & Johnston-Brooks, 2004; Umberson, 1992). Hughes and Gove (1981), in their classic study on social relationships and health, found that adults living with others reported less drug and alcohol use, but higher psychological distress than those living alone. Their data imply a dual effects model for direct health-related social control. That is, direct health-related social control could reduce health-compromising behaviors, but at the expense of psychological well-being. The model has received partial support (e.g., Lewis & Rook, 1999). Later, other studies further explored the underlying mechanisms between direct health-related social control and outcome variables (e.g., behavioral change and psychological distress). For

instance, affective response to direct health-related social control has been found to function as a mediator (Tucker, Orlando, Elliott, & Klein, 2006).

As mentioned above, direct health-related social control reflects a regulatory function of social relationship, with a specific focus on health behaviors. A literature review on direct health-related social control in non-clinical populations suggests that it generally benefits health behaviors. For instance, in a sample of daily smokers, Westmaas, Wild, and Ferrence (2002) found that the regulation of spouse predicted reductions in daily smoking level, and the effect differed by gender, with a larger effect for men than women. Moreover, Lewis and Butterfield (2007) found that more spousal direct health-related social control predicted more health-enhancing behaviors of the partner, with couples as the unit of analysis. Utilizing a daily diary method, Novak and Webster (2011) found that spousal direct health-related social control was positively related to dietary behaviors during a weight loss program. However, studies on the effect of direct health-related social control on psychological aspect have not revealed consistent findings. For instance, Lewis and Rook (1999) found that direct health-related social control increased psychological distress among a representative sample of elderly residents when analyzing the direct health-related social control attempts from a specific network member. However, Rook, Thuras, and Lewis (1990) failed to find such evidence. Unexpectedly, they found that direct health-related social control was related to less psychological distress (measured as depression, loneliness and self-esteem) and greater interpersonal satisfaction. It is possible that the majority of participants in their study rated their health to be good and had pretty good health practice, and they may perceive the social control attempts to be caring and thus appreciated the social control effort, which reduced the

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loneliness level. In sum, studies on direct health-related social control in non-clinical populations generally demonstrate beneficial relationship with health behaviors, but the findings on psychological health are mixed.

A review of literature on direct health-related social control in the chronic illness context reveals a much more complex picture. Compared to non-clinical populations, direct health-related social control might be more prevalent for populations with chronic illness due to the failure of strict adherence to the medical recommendations. Given the complexity of self-care regimen and potential obstacles, patients may skip medications, or not adhere to dietary regimen. Accordingly, family members would attempt to regulate or influence patients' health behaviors, with the aim of encouraging better self-care activities. The literature usually conceptualized direct health-related social control as regulatory influence with a focus on disease-related behaviors. For instance, in a sample of osteoarthritis patients after orthopedic surgery, Stephens et al. (2009) measured direct health-related social control by asking patients to report how often their spouse tried to influence their adherence to any of the five postsurgery medical recommendations, including daily physical therapy exercises, increased physical activity, elevating the leg, icing the wound, and taking pain medications. In addition to examining the behavioral consequences of direct health-related social control, research has also been extended to examine other consequences, like psychological or physiological aspects.

Direct health-related social control has been examined in different types of chronic diseases, such as diabetes, cardiovascular diseases, cancer, or osteoarthritis. Within the literature, diabetes is most frequently studied. For instance, Grzywacz et al. (2012) found that direct health-related social control received from their social network

was related to diabetic patients' poor self-management measured with an objective indicator—HbA1c. Similarly, in a sample of patients with Type 2 diabetes using electronic dairy method, Khan, Stephens, Franks, Rook, and Salem (2013) found that spousal direct health-related social control was unrelated or negatively related to physical activity. Studies have also been conducted in patients with other types of chronic illness, like cardiovascular disease, prostate cancer, and osteoarthritis. For instance, in a sample of patients participating in cardiac rehabilitation programs, Franks et al. (2006) found that spousal direct health-related social control was unrelated to health behaviors and mental health cross-sectionally, but it predicted decreased health behaviors and mental health longitudinally. In a sample of prostate cancer patients, Helgeson, Novak, Lepore, and Eton (2004) found no evidence that direct health-related social control was effective in producing positive changes in health behaviors. However, direct health-related social control seems to be effective for osteoarthritis patients who received knee surgery (Stephens et al., 2009). Stephens et al. (2009) found that spousal direct health-related social control, either by persuasion or pressure, was positively related to desired behavioral responses, whereas the effect of direct health-related social control on emotional responses largely depended on the strategies their spouse used. Overall, there are mixed findings on the consequences of direct health-related social control across different types of chronic illnesses.

In light of the inconsistent findings in the literature, there are studies attempting to explore the possible reasons for the inconsistency. Some scholars have argued that the effect of direct health-related social control may depend on the specific strategies used and they distinguished between positive (e.g., persuasion) and negative (e.g., pressure)

health-related social control (e.g., Tucker & Anders, 2001). Another line of research has been directed to examining potential moderators. First, studies suggest that direct health-related social control may exert differential effects by gender. For instance, Westmaas, Wild, and Ferrence (2002) found that partners' direct health-related social control was more effective for men to reduce smoking but less effective for women. August and Sorkin (2010) found that women reported more appreciation in response to more frequent direct health-related social control than men. Second, another potential moderator is relationship satisfaction. Elderly with more experience of direct health-related social control reported higher frequency of hiding unhealthy behaviors and more negative affect if they had lower relationship satisfaction, but lower frequency of hiding unhealthy behaviors and less negative affect if they had higher relationship satisfaction (Tucker, 2002). In addition, in a sample of adults with Type 2 diabetes, August and Sorkin (2011) found direct health-related social control was related to good dietary behaviors for Mexican Americans, but not for non-Hispanic Whites, which suggests that there might be racial differences. Moreover, Rook, August, Stephens and Franks (2011) also examined the role of patients' expectations of spousal involvement in their diabetes management. They found that direct health-related social control had greater beneficial effect only when patients have greater expectations of spousal involvement.

Overall, studies examining the potential moderators seem to attempt to find the possible factors that influence social control recipients' subjective perceptions of direct health-related social control, either in a favorable way or in an adverse way. For instance, in Rook et al.'s study (2011), patients with greater expectations of spousal involvement may respond to direct health-related social control in a more positive way, and thus

achieve better diabetic adjustment than those with lower expectations. In other words, potential moderators could attenuate or accentuate the relevance or the importance of direct health-related social control to social control recipients, thus leading to differential consequences. Despite this evidence, it is likely that many such moderators remain undiscovered.

2.4.2 Interplay of Direct Health-Related Social Control and Personal Control on Diabetic Adjustment

As discussed above, the existing studies on direct health-related social control and chronic illness adjustment have produced inconsistent findings. Indeed there are studies on a wide range of moderators trying to explain the inconsistencies. However, one such potential moderator might be neglected in the literature. The inconsistent findings across different types of chronic illnesses suggest a possibility that certain shared characteristics of the diseases which affect the relevant samples lead to differential effects of direct health-related social control on health behaviors and mental health. Patients with different types of chronic illnesses may experience different levels of personal control, and this might be useful in explaining why patients with different types of chronic illnesses respond to direct health-related social control in different ways, leading to varying effects of direct health-related social control. Previous research has shown that the severity of chronic disease might influence patients' self-efficacy level, with more severe disease predicting lower self-efficacy (Parker et al., 1993; Somers et al., 2010). In addition, research also shows a negative correlation between internal health locus of control and severity of disease. Budd and Pugh (1995) found that tinnitus patients with a lower level of disease severity had higher internal health locus of control. Moreover, Penninx et al.

(1996) found that patients with diabetes or cardiovascular disease were more likely to have stronger personal control belief and experience less psychological distress than patients with arthritis. It is possible that arthritis greatly limits patients' daily activity due to functional impairment and pain, which might decrease patients' self-efficacy or internal health locus of control level. The inconsistent effects of direct health-related social control among patients with arthritics, cardiovascular diseases and diabetes in the literature and the potential varying personal control levels across these chronic diseases may naturally lead to such questions: what is the role of personal control (self-efficacy and internal health locus of control) in the process of direct health-related social control? Would personal control (self-efficacy and internal health locus of control) serve as such a moderator that could assist in explaining the inconsistent findings of direct health-related social control in the literature?

There are several reasons to consider patients' personal control (self-efficacy and internal health locus of control) as a moderator in the process of direct health-related social control. First, according to the person-environment fit model, the degree of fit between social environment and individual characteristics determines psychosocial adjustment (French, Rodgers, & Cobb, 1974; Parmelee & Lawton, 1990). When applying this model to the context of chronic illness, similarly, the influence from the social environment (e.g., direct health-related social control from family members) should fit in with individual characteristics (e.g., self-efficacy and internal health locus of control), which in turn leads to better adjustment. Otherwise, patients might react negatively to such influence derived from social relationships. For instance, Martire, Stephens, Druley, and Wojno (2002) found that patients with osteoarthritis reported fewer negative

reactions to spousal instrumental support when there was a fit between the amount of support received and the patients' need for independence. Patients are more likely to feel powerless when they receive higher spousal support, particularly if it is important for them to conduct behaviors on their own. Moreover, adolescents' perceived supportiveness moderated the effect of parental direct health-related social control on behavioral change, such that those perceived higher supportiveness tend to have better behavioral change than those perceived lower supportiveness (Wilson & Spink, 2010). These findings highlight the importance of considering recipients' individual difference variables (e.g., self-efficacy and internal health locus of control) when examining the relationship between direct health-related social control and chronic illness adjustment.

Second, previous studies in populations with chronic illness have shown that people may vary in terms of the extent to which they respond to social influence. Indeed, evidence shows that self-efficacy could moderate the effect of external influence on adjustment outcomes (Dagan et al., 2011; Hinnen, Ranchor, Baas, Sanderman, & Hagedoorn, 2009). In a recent review regarding the psychological moderators of psychosocial intervention in oncology, Tamagawa, Garlan, Vaska, and Carlson (2012) found that patients with lower self-efficacy benefited more from interventions than those with higher self-efficacy. Similarly, patients with lower self-efficacy also demonstrated greater improvement in health-related quality of life compared to patients with higher self-efficacy in both lay-led chronic disease self-management courses and psychoeducational interventions (Helgeson, Lepore, & Eton, 2006). In contrast, those with higher self-efficacy benefited less from external influence like psychological interventions (Helgeson, Lepore, & Eton, 2006), possibly because these external

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influences threatened their sense of autonomy, thus exerting a non-significant or even negative effect on adjustment outcomes. Actually, Warner et al.'s study (2011) supports such argument. They found that the elderly with multiple chronic illnesses and who had lower self-efficacy benefited more in terms of autonomy from social support than fellow patients with higher self-efficacy. These findings suggest that patients with lower self-efficacy could benefit more from interventions in terms of their chronic illness adjustment outcomes. Compared to the moderator role of self-efficacy, there is less evidence on the moderating effect of internal health locus of control. However, Kolb and Aiello (1996) found that individuals with higher locus of control experienced more stress when their work was electronically monitored. Perhaps the monitoring imposes a threat to the autonomy or sense of control to those with higher internal locus of control. Similarly, the associations between the regulation of health-related behaviors from family and patients' diabetic adjustment may vary with patients' internal health locus of control level.

Taken together, the literature suggests that patients' personal control belief (self-efficacy and internal health locus of control) might influence their subjective perceptions of or responses to external influence, such as direct health-related social control, which in turn lead to differential diabetic adjustment outcomes. The degree of self-efficacy and internal health locus of control resulting from exposure to chronic illness may be useful for explaining the inconsistencies regarding the effect of direct health-related social control. It is expected that self-efficacy and internal health locus of control would serve as a moderator between direct health-related social control and diabetic adjustment outcomes.

2.4.3 Indirect Health-Related Social Control

Compared to direct health-related social control, less is known about the relationship between indirect health-related social control and health behaviors and psychological outcomes, especially the mechanism underlying the process. Social control often used to be studied using occupancy in social roles, such as marital or parental status. They are treated as proxy measures of both direct and indirect health-related social control. Umberson (1987) found that marital and parental status could deter health-compromising behaviors, such as smoking and drinking. This research approach using occupancy in certain social roles indicates expectations from others and responsibilities to others, as well as the direct influence or regulation from others. In other words, it incorporates both direct and indirect health-related social control. In light of the emerging studies on direct health-related social control, research is needed to address the gap about indirect health-related social control and chronic illness adjustment. By doing so, it will provide a comprehensive picture of health-related social control, both direct and indirect.

Indirect health-related social control has potential influence on health behaviors and psychological health. Umberson (1987) suggested that marital and parental statuses entailed a sense of responsibility to either spouses or children to stay healthy, and the sense of obligation could facilitate health-enhancing behaviors. Conscientiousness has been found to be positively related to health-enhancing behaviors (e.g., exercise and healthy eating) and better psychological health, and negatively related to health-compromising behaviors (e.g., smoking and drinking; see Bogg & Roberts, 2004, for a review). The health-enhancing effect of conscientiousness is commonly known to be due to either self-discipline or self-control facet. However, conscientious individuals also

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think about their health in relation to significant others. For instance, conscientious individuals are more likely to experience a stronger internalized belief of responsibility and obligations to others to stay healthy (Tucker, Elliott, & Klein, 2006), which in turn leads to healthy behaviors and better psychological health. Moreover, Tucker (2002) found that elderly who experienced more indirect health-related social control reported more frequent attempts to engage in healthy behaviors and more positive affect. Late-middle-aged and older adults with diabetes have to engage in a variety of behaviors on a daily basis and cope with possible psychological distress in order to achieve optimal illness adjustment. Thus it is expected that indirect health-related social control is positively related to diabetic adjustment outcomes.

2.4.4 Interplay of Indirect Health-Related Social Control and Personal Control on Diabetic Adjustment

The sense of responsibility to family members to stay healthy could engender a sense of control and motivate people to engage in healthy behaviors (Mirowsky & Ross, 2003). Patients experiencing stronger indirect health-related social control feel a greater sense of obligation to family members to stay healthy, and this could promote their control perceptions that they can control health outcomes through their own actions (Umberson, Crosnoe, & Reczek, 2010). More specifically, indirect health-related social control can instill individuals with a belief that they have the confidence to engage in disease management, and they are in charge of their own health by adhering to medical regimens or by being positive, thus fulfilling their responsibility to family members. Research also shows that sense of responsibility to others in general is positively related to greater confidence in dealing with daily stressors (Gartland, O'Connor, & Lawton,

2012). It is reasonable to infer that responsibility to family members to stay healthy may promote self-efficacy in health-related behaviors. In addition, internal health locus of control refers to the extent to which people believe that internal factors are responsible for their health (Wallston et al., 1987), and internals tend to take responsibility for their own health and more actively engage in health-enhancing behaviors (AbuSabha & Achterberg, 1997). Usually for people with a stronger sense of responsibility to family members to stay healthy, if they can maintain their health by their own behaviors or at least endorse such a belief, this would be a great reinforcement, or this is the best way to fulfill their responsibility to family members. Given the promoting effect of indirect health-related social control on self-efficacy and internal health locus of control, and the health-facilitating effects of both self-efficacy and internal health locus of control, it is expected that self-efficacy and internal health locus of control could mediate the relationship between indirect health-related social control and diabetic adjustment. More specifically, indirect health-related social control is related to higher self-efficacy and internal health locus of control, which in turn are positively related to better diabetic adjustment.

2.4.5   Interplay of Health-Related Social Control and Personal Control

Despite the unique importance of health-related social control and personal control, less is known about their joint relationships with chronic illness adjustment. This study aims to examine the interplay of health-related social control (i.e., direct and indirect) and personal control (i.e., self-efficacy and internal health locus of control) on diabetic adjustment. First, direct health-related social control, representing regulatory function of social relationship targeting diabetes-related behaviors, is expected to have

differential relationships with diabetic adjustment outcomes for patients with different levels of personal control. Second, indirect health-related social control, representing an internalized sense of responsibility and obligation to family members to stay healthy, could foster personal control, leading to better diabetic adjustment. As two important dimensions of personal control, both self-efficacy and internal health locus of control are hypothesized to serve as mediators underlying the link between indirect health-related social control and diabetic adjustment. In sum, self-efficacy and internal health locus of control are expected to moderate the relationship between direct health-related social control and diabetic adjustment outcomes, and to mediate the relationship between indirect health-related social control and diabetic adjustment outcomes.

2.5 Exploration on the Role of Relationship Satisfaction and Age & Gender Differences

When patients interact with their family members, they may develop a sense of responsibility to family members to stay healthy. Specifically, patients relate themselves to significant others when they think about their own health. Patients believe that their family members expect them to take good care of themselves and stay healthy, otherwise their family members may be disappointed with them. Being in a familial relationship, patients may experience changes in the self-concept (e.g., Aron, Aron, Tudor, & Nelson, 1991). For instance, patients may include family members as part of their selves, and the overlap between patients and their family members becomes larger gradually. Moreover, research shows that the overlap between one and others is correlated with subjective feelings of closeness (Aron & Fraley, 1999). According to the self-expansion theory, a close relationship enables individuals to self-expand, and integrate others' resources,

perspective and characteristics into the self, which in turn leads to an increase in abilities

and competence (Aron & Aron, 1986, 1996). Additionally, Lewandowski Jr., Nardonea,

and Raines (2010) found that inclusion of others in the self was positively related to

relationship satisfaction. It seems that relationship satisfaction plays an important role in

the process of indirect health-related social control.

Previous research shows that self-efficacy and internal health locus of control

may vary by age. As suggested by research, personal control seems to demonstrate a

decline with age (e.g., Bailis, Segall, & Chipperfield, 2010; Ross & Mirowsky, 2002).

For instance, Bailis, Segall, and Chipperfield (2010) found that age is negatively related

to internal health locus of control. Ross and Mirowsky (2002) found that personal

control among participants aged 55 or younger was higher than those over 55 years old.

With age, people may experience a loss of resources, like biological or psychosocial, and

thus suffer from more constraints for goal attainment (e.g., health). The available

resources could enable people to better cope with health-related issues. Based on the

evidence, the two groups in the current study (late-middle-aged and older adults) may

differ in terms of the resources, either functional or cognitive, such that late-middle-aged

adults have more resources that they can use to cope with chronic illness (e.g., diabetes)

than older adults. Acknowledging the significance of personal control, the available

resources are also important to strengthen the effect of personal control on chronic illness

adjustment. Thus it is expected that personal control may have a stronger effect on

diabetic adjustment for late-middle-aged adults than for older adults in the current study.

There is also evidence on age differences in health-related social control experience. For

instance, Tucker, Klein, and Elliott (2004) found that older adults reported less direct

health-related social control than middle-aged adults in a probability sample of household residents. Compared to older adults, late-middle-aged adults may be more susceptible to social expectation and influence to act in certain ways (Ryff & Singer, 1996), and the interaction between direct health-related social control and personal control may operate differentially in the two age groups. Moreover, middle-aged adults occupy more social roles than older adults and have to fulfill financial and familial obligations (Tucker, Klein, & Elliott, 2004), thus they may instill a stronger sense of responsibility to family members to stay healthy.

Personal control and health-related social control have been shown to differ by gender. For instance, females' sense of control is lower than their male counterparts (Ross & Mirowsky, 2002; Specht, Egloff, & Schmukle, 2013). Women reported less ability to cope with diabetes than men (Undén et al., 2008). Given the difference in gender role expectations (Eagly & Wood, 1991), perhaps males are more likely to be expected to stay healthy on their own, thus accentuating the importance of personal control for males compared to females. In addition, research suggests that there are gender differences in health-related social control experience. In a sample of diabetic patients, August and Sorkin (2011) found that married men received more direct health-related social control than married women. Westmaas et al. (2002) found that partners' direct health-related social control was more effective in reducing smoking for men than for women. Moreover, females are more likely to experience indirect health-related social control than males (Tucker, Elliott, & Klein, 2006).

Given the age and gender difference in personal control (self-efficacy and internal health locus of control) and health-related social control, it is possible that the association

between health-related social control and chronic illness adjustment may also differ by age or gender. In order to explore such possibilities, I examined the age and gender differences in the role of personal control, health-related social control, the moderation model of direct health-related social control, and the mediation model of indirect health-related social control in diabetic adjustment.

2.6 The Proposed Study

The overall purpose of this study is to examine how psychosocial factors influence diabetic adjustment. Specifically, the study focused on patients' personal characteristics (i.e., personal control: self-efficacy and internal health locus of control), social environmental factor (i.e., health-related social control received from family members: direct and indirect), and the interplay of the two on chronic illness adjustment in a sample of Singaporean late-middle-aged and older adults with Type 2 diabetes. The research questions and hypotheses are summarized as follows:

1. How does personal control (i.e., self-efficacy and internal health locus of control) influence diabetic adjustment outcomes?

   Hypothesis 1: Personal control is positively related to diabetic adjustment.

2. How do direct and indirect health-related social control influence diabetic adjustment outcomes?

   Hypothesis 2a: Direct health-related social control exerts dual effects on diabetic adjustment, so that direct health-related social control is related to better self-care activities and greater diabetes-related emotional distress.

   Hypothesis 2b: Indirect health-related social control is positively related to better diabetic adjustment.

3. How do direct health-related social control and personal control (i.e., self-efficacy and internal health locus of control) jointly influence diabetic adjustment outcomes?

   Hypothesis 3: Self-efficacy and internal health locus of control moderate the relationship between direct health-related social control and diabetic adjustment, such that patients with lower self-efficacy and internal health locus of control benefit more from direct health-related social control than those with higher self-efficacy and internal health locus of control.

4. How do indirect health-related social control and personal control (i.e., self-efficacy and internal health locus of control) jointly influence diabetic adjustment outcomes?

   Hypothesis 4: Self-efficacy and internal health locus of control mediate the effect of indirect health-related social control on diabetic adjustment, such that indirect health-related social control is positively related to self-efficacy and internal health locus of control, which in turn lead to better diabetic adjustment.

In addition to the main research questions, I also explored the possible role of age and gender in the above relationships to see whether the relationships would differ by age or gender. The role of relationship satisfaction as a mediator in the process of indirect health-related social control was also examined.

CHAPTER THREE

QUESTIONNAIRE TRANSLATION & PRETEST

This cross-sectional research examined the effects of patients' personal control beliefs, health-related social control from family members, and the interplay between health-related social control from family members on one hand and patients' personal control beliefs on the other, on multiple diabetic adjustment outcomes. All methods and procedures of the study were approved by the Institutional Review Board of Nanyang Technological University. Data were collected from February 2012 through July 2013. This study consisted of two phases: questionnaire translation and pretest (Phase 1) and survey administration (Phase 2). In Phase 1, the forward-backward approach was utilized for the translation of three questionnaires, followed by interviewing of 9 participants to finalize the questionnaires and a quantitative pretest in 100 more participants using both the English and Chinese versions of the complete questionnaires. In Phase 2, the full battery of questionnaires was administered to 105 more participants. I present Phase 1 in chapter three and Phase 2 in chapter four.

The demographics of Singapore reveal that a majority of citizens are of Chinese descent. Within this group, the language preference of late-middle-aged and older adults tends to be Mandarin, Chinese. It is important to administer the survey in participants' language of choice. This makes it necessary to use two versions of the survey, an English version and a Chinese version, for this study. The majority of the measures used in this study were originally constructed and validated with Western English-speaking participants, but most were later translated and validated with Chinese participants with the exception of three scales. The three scales included: direct health-related social

control, indirect health-related social control, and Multidimensional Health Locus of Control-Form C. I first translated the three questionnaires in order to obtain Chinese versions of these scales, and then conducted a pretest with the whole set of survey questionnaires in order to test them in the Singapore context.

3.1   Participants

3.1.1   Inclusion Criteria

Participants were eligible for inclusion at time of recruitment, if they met the following criteria: (a) diagnosed with Type 2 diabetes for 1 year or longer; (b) 50 years of age or older; (c) Mandarin or English speaking Chinese Singaporeans; and (d) no major complications or other severe diseases that would interfere with patients' self-care activities. Patients with Type 2 diabetes for at least 1 year were recruited in order to ensure that they had enough time to reflect their experience of health-related social control from family members and their self-care activities.

3.1.2   Participant Recruitment

Participants were recruited through the use of flyers and key community contacts, including Diabetic Society of Singapore (DSS) and community clubs. For example, participants were approached in the DSS centers and DSS mobile clinics. This included times when they were waiting for their appointment, after attending support group activities, or during breaks between outreach talks. Participants were first screened for eligibility based on the aforementioned inclusion criteria. Meanwhile, participants' cognitive abilities were also screened during the recruitment conversation by trained research assistants to ensure the participants had adequate cognitive abilities to be interviewed on the questions or to fill out the survey. If they met the inclusion criteria

with good cognitive abilities and showed interest in the study, they were given a brief

introduction about the study and then the consent form. After signing on the consent form,

participants received the interview or filled out the survey. It took each participant about

30 minutes to complete the interview and each participant was compensated with a S$ 10

voucher for their time. In the quantitative pretest, it took each participant 20-30 minutes

to finish the survey and they got a compensation of a S$ 10 voucher as well. Research

assistants were available to assist the participants in filling out the survey.

3.2   Measures

The measures for the study included a battery of scales: general information,

direct health-related social control, indirect health-related social control, diabetes-related

self-efficacy, multidimensional health locus of control, adherence to self-care activities,

diabetes-related emotional distress, depressive symptoms, and glycemic control.

General Information. General information was collected, including

demographics (age, gender, education, race, employment, marital status, and household

status), diabetes characteristics (duration of diabetes and treatment), medical insurance,

other chronic diseases, and relationship satisfaction with family members.

Direct Health-Related Social Control. Utilizing the procedure used by Lewis

and Rook (1999), participants were asked how often their family members reminded

them to observe diabetes-related behaviors (e.g., eat healthy, exercise, monitor blood

sugar, and check feet). For example, participants were asked: how often did your family

members remind you to eat healthy? Each item was measured on a 4-point Likert scale

ranging from 1 (*never*) through 4 (*often*). Responses to these items, capturing the

frequency of family members' health-related social control attempts, were averaged and

used to measure the experience of direct health-related social control. The scale has good internal consistency with α larger than .80 (Tucker, 2002; Tucker, Elliott, & Klein, 2006). The scale has been found to be positively correlated with health behavior change (β = .38), irritation (β = .27), and sadness (β = .28; Lewis & Rook, 1999).

Indirect Health-Related Social Control. Participants also reported their experience of indirect health-related social control on an adapted four-item scale developed in a study on health-related social control in an older adult population (Tucker, 2002). The four items were: How much do you feel responsible to your family to try to stay healthy? How important is it to your family that you try to be healthy? How much do your family expect you to stay healthy? And how much would your family be disappointed if you did not make an effort to be healthy? Each item was rated on a 4-point Likert scale ranging from 1 (*strongly disagree*) through 4 (*strongly agree*). Responses to the four items were averaged and the average scores indicated the experience of indirect health-related social control, with higher scores denoting stronger indirect health-related social control. The scale has demonstrated good internal consistency with α no less than .80 (Tucker, 2002; Tucker, Elliott, & Klein, 2006). The scale has been found to be positively related to the attempt to engage in healthy behavior (β = .36) and positive affect (β = .60; Tucker, 2002).

Diabetes Self-Efficacy. Diabetes self-efficacy was measured by the subscale of the Multidimensional Diabetes Questionnaire (MDQ; Talbot, Nouwen, Gingras, Gosselin, & Audet, 1997). The self-efficacy subscale comprises of seven items measuring patients' confidence level in their ability to perform diabetes-specific self-care activities (e.g., diet, exercise, medication, and blood glucose monitoring). Responses were based on a scale of

0 (*not at all confident*) to 100 (*very confident*). The average of all the responses was used

to indicate the level of self-efficacy in diabetes management. The self-efficacy subscale

has good internal consistency (α = .89), and it is positively related to self-reported self-

care behaviors, such as diet (r = .58) and exercise (r = .48), whereas negatively related to

HbA1c level (r = -.28; Talbot et al., 1997). The Chinese version of self-efficacy from

MDQ is available and has good reliability with Cronbach's α = .79 (Lee & Lin, 2009). In

Lee and Lin's study (2009) on a sample of diabetic patients, self-efficacy was found to be

positively correlated with regimen adherence (β = .77), physical and mental health

quality of life (β = .20 and β = .34 respectively).

  Multidimensional Health Locus of Control. The Multidimensional Health

Locus of Control Scale (MHLC) has been used with different patient samples and has

satisfactory internal consistency. There are three forms of the MHLC. Forms A and B

assess the general health locus of control (Wallston, Wallston, & DeVellis, 1978), which

is often examined among healthy individuals. The two "equivalent" forms consist of

three 6-item subscales: internality, powerful others externality, and chance externality.

For instance, the item "If I get sick, it is my own behavior which determines how soon I

get well again" in Form A and the one "If I become sick, I have the power to make

myself well again" in Form B are used to measure internality. Form C of the scale is

often used among individuals with specific medical problems (Wallston, Stein, & Smith,

1994). Therefore, Form C is designed to be condition-specific, and the "condition" was

replaced with "diabetes" in this study, which measured diabetes-specific internal health

locus of control. For the internality subscale, its Cronbach's alpha values are .85 and .87

respectively in two samples (Wallston, Stein, & Smith, 1994). It has been shown to be

negatively related to HbA1c (r = -.20; O'Hea et al., 2008). Example of items is "If my diabetes worsens, it is my own behavior which determines how soon I will feel better again". Each item was assessed on a 6-point Likert scale ranging from 1 (*strongly disagree*) through 6 (*strongly agree*). The sum of values of the 6 items measuring internality indicated the level of internal health locus of control, with higher scores denoting high level of internal health locus of control.

Self-Care Activities. Self-care activities were measured by the Summary of Diabetes Self-Care Activities (SDSCA; Toobert, Hampson, & Glasgow, 2000). The scale is a multidimensional measure of diabetes self-management with well-established reliability and validity (Eigenmann, Colagiuri, Skinner, & Trevena, 2009; Nouwen et al., 2011; Toobert, Hampson, & Glasgow, 2000). The revised version of SDSCA with 11 items assesses the following five aspects: diet, exercise, blood glucose testing, foot care, and smoking (Toobert, Hampson, & Glasgow, 2000). The Chinese version of SDSCA has good psychometric properties with Cronbach's α = .96 and test-retest reliability = .79 (Wu et al., 2007). In this study, the revised version of SDSCA was used to estimate the adherence to the following areas (diet, exercise, blood-glucose testing, and foot care), and smoking status over the previous seven days. Each item was rated on an 8-point scale ranging from 0 days through 7 days a week, and smoking was measured by the item "Have you smoked a cigarette-even one puff-during the past seven days?" Average scores for each domain were created first, and then the average scores for each domain were standardized and added up to form a composite score with higher scores indicating better adherence to overall self-care activities.

Diabetes-Related Emotional Distress. The Problem Areas in Diabetes Scale-1 (PAID-1) assesses psychosocial adjustment specific to diabetes (Polonsky et al., 1995). The PAID-1 contains 20 items assessing a range of indicators of diabetes-specific distress, such as worries about complications and feelings of burden. PAID-1 has been found to be associated with a variety of constructs, such as diabetes self-care activities (Welch, Weinger, Anderson, & Polonsky, 2003). Participants were asked to what extent they experienced diabetes-related problems, such as "feeling overwhelmed by your diabetes". Each item was assessed on a 5-point Likert scale ranging from 0 (*not a problem*) to 4 (*serious problem*). High internal reliability (Cronbach's α = .90) and sound 2-month test-retest reliability (γ = .83) were established (Resource Centers for Minority Aging Research, 2006). The sum of the 20 items was multiplied by 1.25 to yield a final score between 0 and100 with higher score denoting higher diabetes-related emotional distress. The Chinese version of the Problem Areas in Diabetes (PAID-C) Scale (Huang, Courtney, Edwards, & McDowell, 2010) has been shown to be a reliable and valid measure in Chinese patients with Type 2 diabetes. The 4-week test-retest reliability of the scale is satisfactory (γ = .83).

Depressive Symptoms. Depression is a prevalent mental health problem among patients with diabetes. Patient Health Questionnaire-9 (PHQ-9; Spitzer, Kroenke, & Williams, 1999) was used to measure depressive symptoms in this study. The PHQ-9 is a reliable and valid screening measure of depression (Kroenke, Spitzer, & Williams, 2001). The PHQ-9 consists of nine items which are directly based on the nine diagnostic criteria for major depression disorder in the DSM-IV. Each item was assessed on a 4-point Likert scale ranging from 0 (*not at all*) through 3 (*nearly every day*). It has been shown to be

reliable and effective in geriatric Chinese population (Cronbach's α = .83, one-week test-retest reliability = .93; Xu, Wu, & Xu, 2007). Responses to the nine items were added up to yield an index of depressive symptomology (Lamers et al., 2008; Sacco & Bykowski, 2010).

Glycemic Control. Glycemic control was measured by patients' self-reported most recent HbA1c (%), or hemoglobin A1c (Snoek, Pouwer, Welch, & Polonsky, 2000). Higher level of HbA1c indicates worse glycemic control.

3.3   Translation & Pretest

Considering the language context in Singapore, a Chinese version and an English version of the survey were used for this study. However, there are three scales without available Chinese versions, including direct health-related social control, indirect health-related social control, and Multidimensional Health Locus of Control-Form C. In order to obtain Chinese versions, the forward-backward method (Harkness, Pennell, & Schoua-Glusberg, 2004) was utilized to translate these scales from English to Chinese. More importantly, cognitive interviewing was conducted to ensure participants understood the items on the scales in order to identify possible problems of the translation procedure (Conrad & Blair, 2004). Participants were asked to answer the items of the scales and respond to the probes, which were used to capture participants' cognitive process and detect possible translation issues. Necessary revisions were made based on the results of cognitive interviewing. Meanwhile, much has been written about the potential bias in cross-cultural assessment (see van de Vijver & Tanzer, 2004, for a review). Thus, it is important to pretest all the measures used in this study using a quantitative approach with a local Singaporean population. In sum, the measurement issues require the study to

translate questionnaires and pretest them. By doing so, the quality of translation as translation (e.g., "whether the substantial content of a source question is captured in the translation", p. 467) and the performance of translation as instruments (e.g., "how well translated questions work for the target population", p. 467) were assessed (Harkness, Pennell, & Schoua-Glusberg, 2004).

3.3.1 Translation

The forward-backward approach (Harkness, Pennell, & Schoua-Glusberg, 2004) was utilized to translate the following three scales: direct health-related social control (Lewis & Rook, 1999), indirect health-related social control (Tucker, 2002) and Multidimensional Health Locus of Control-Form C (Wallston, Stein, & Smith, 1994). First, two bilingual/bicultural psychology Ph.D. students did the parallel translation from English to Chinese. Another bilingual/bicultural psychology Ph.D. student engaged in the reconciliation meeting and agreed on a final forward-translated Chinese version. After that, two bilingual/bicultural linguistics Ph.D. students did the backward-translation based on the forward-translated Chinese version. Similarly, another bilingual/bicultural psychology Ph.D. student was involved in the reconciliation meeting and agreed on a final backward-translated English version. At another reconciliation meeting, translators and reviewers compared the backward-translated English version and the resource version, discussed and agreed on the final version.

The translation aimed to make sure the equivalence of the English- and Chinese-version of the survey from the language perspective. But only based on the translation itself, it is not sufficient to make sure the target population understands the questions in the way desired. Thus I used a qualitative approach—cognitive interviewing with the

verbal probing technique in order to identify possible problems and finalize the translation.

3.3.2   Finalization of the Translation

3.3.2.1 Cognitive Interviewing

The cognitive interviewing approach is widely used to evaluate survey questions (Willis, 2004). Its primary purpose is to evaluate target survey questions and detect potential sources of response errors associated with target questions, which in turn could assist in repairing or modifying the questions. It explicitly focuses on respondents' cognitive processes that they use to answer questions (Willis, 2004). In particular, there are two ways of conducting the cognitive interviewing: think-aloud and verbal probing. Think-aloud is usually more effective for tasks involving strong problem-solving features (e.g., retrieval strategy), while verbal probing is preferable for studying question term comprehension (Willis, 2004). Given the purpose of pretesting translated questionnaires and assessing question term comprehension, the technique of verbal probing, which has been increasingly used by researchers (Willis, DeMaio, & Harris-Kojetin, 1999) was chosen. During the interview, the interviewer first asks each participant the tested survey questions. After participants provide an answer to the target questions, the interviewer asks probe questions in order to further clarify participants' thinking (Willis, 1999, 2004). For instance, cognitive interviewing enables researchers to know whether participants understand the content of a certain question by asking "what do you believe the question to be asking" or meaning of a certain term in the question by asking "what does this specific phrase in the question mean to you". This is especially useful to evaluate whether

the translated version of a survey could get the desired answers from participants of the target population.

3.3.2.2 Procedure

Nine participants were recruited in this phase for the cognitive interviewing. They were informed about the study purpose and procedures and then they signed the consent form. During the cognitive interviewing, I used three probes to assess participants' understanding of the questions: 1, can you repeat the question in your own words? (to test how well participants comprehend the question as intended); 2, how do you interpret this specific term "influence" and "影响"? (to test the comprehension of a particular term in the question); and 3, is it difficult to answer this question (to test whether participants have difficulty in understanding and answering the question)? By using these probe questions, I wanted to know whether participants understood the survey questions and the key term, and whether they felt difficult to answer the questions. Particularly, I asked participants how they interpreted "influence" and "影响", as there were different ways of asking participants about direct health-related social control in the literature, and equivalent terms in different languages may not refer to exactly the same thing (Harkness, Pennell, & Schoua-Glusberg, 2004). I also wanted to know how target participants of the study (Singaporean late-middle-aged and older adults with diabetes) interpreted "influence" and "影响", in order to select a most appropriate way to measure direct health-related social control in the target population.

3.3.2.3 Results of the Cognitive Interviewing

Overall, the interview results showed that participants could understand the questions and interpret them as intended, and it was not difficult for them to answer the

questions generally. However, the interview results showed that participants had different ways of interpreting the word "影响". By interviewing participants preferring to speak Mandarin, I found that they interpreted "影响" as "negatively impact", which doesn't capture what direct health-related social control actually measures.

Some participants interpreted "影响" as "tempt" or "interfere with", and the examples are given below.

"When my family eat unhealthy food, not good for diabetes management, they would ask me to have the food and say 'it doesn't matter, have this just for this time……'".

"My wife always prepares healthy food, so my wife does not influence my diet".

However, only one participant interpreted "影响" in a behavior-corrective way, as the direct health-related social control indicates.

"If I don't follow the doctor's advice, then my family will influence my behaviors. But I know healthy behaviors are very important to manage diabetes, and I follow doctor's suggestions".

The interview results suggest that "影响" may not be appropriate to measure direct health-related social control in the target population. In order to further investigate the issue, I interviewed participants whose language preference was English with the use of English version of the survey. Interview results revealed that they interpreted "influence" as "negatively impact". To obtain an appropriate term, I asked for participants' suggestions. "Remind" and "提醒" were recommended. I used the revised versions of survey, both Chinese and English, to interview participants. They understood the questions and answered the questions in the desired way. Thus "influence" was

changed to "remind" in the English version and "影响" was changed to "提醒" in the Chinese version. A review of the literature showed that "remind" has been used in previous studies (Franks et al., 2006; Khan et al., 2013). For instance, Khan et al. (2013) used "reminded the patient to exercise" as one of the items to measure direct health-related social control in a sample of diabetic patients.

3.3.3 Quantitative Pretest

Using the revised English- and Chinese-version of the survey based on the feedback of cognitive interviewing, I further conducted a quantitative pretest using the whole battery of the scales in 100 more participants. The purpose of the quantitative pretest was to examine the psychometric properties of the scales in the target population.

3.3.3.1 Preliminary Results of the Quantitative Pretest

One hundred participants were recruited for the quantitative pretest, with 50 participants filling out the Chinese version of the survey and 50 participants filling out the English version of the survey. Among participants filling out Chinese version of the survey (72% female), M_{age} = 66 years old, SD = 8.8, and the mean duration of diabetes was 11.7 years, SD = 8.8. Among participants filling out English version of the survey (42% female), M_{age} = 63.7 years old, SD = 9.6, and the mean duration of diabetes was 12.3 years, SD = 9.6.

In terms of the items measuring direct health-related social control provided by family members, the majority of participants did not smoke and the sixth item was not applicable to them, thus the item was eliminated from the scale when assessing the reliability and calculating the average scores of direct health-related social control. With respect to the Summary of Diabetes Self-Care Activities scale, due to the low inter-item

correlations for specific diet, the two items were excluded. Moreover, the majority of participants did not smoke, thus item 11 was also excluded. Among the rest of the items, the average scores for each domain were created first, and then the average scores for each domain were standardized and added up to form a composite score with higher scores indicating better adherence to overall self-care activities. For both Chinese- and English-version of the survey, the reliability statistics for all the scales were acceptable. The reliability statistics with Cronbach's alpha are shown in Table 1.

Table 1

Reliability Statistics for the Scales in the Quantitative Pretest

Scale	Chinese version (*N*=50)	English version (*N*=50)
Direct social control (5 items)	.88	.90
Indirect social control (4 items)	.81	.68
Self-efficacy (7 items)	.92	.86
Internal health locus of control (6 items)	.91	.71
Diabetes-related emotional distress (20 items)	.95	.95
Depressive symptoms (9 items)	.84	.89
Self-care activity (8 items)	.74	.62

3.4 **Summary**

This chapter mainly described questionnaire translation and pretest in Phase 1. This phase involved the translation of the three scales from English to Chinese: direct health-related social control, indirect health-related social control and Multidimensional Health Locus of Control-Form C. Cognitive interviewing with verbal probing technique was used to detect the potential problems with the translation and finalize the translation. Necessary revisions were made to both English- and Chinese-version of the survey based on cognitive interviewing results. Furthermore, both English- and Chinese-version of the whole battery of the survey were pretested using a quantitative approach in 100 more participants. Results revealed that reliability statistics of the scales were acceptable. In sum, the quality of translation as translation and as instruments was acceptable and the whole battery of the scales was used in the target population.

CHAPTER FOUR

SURVEY ADMINISTRATION

The pretest of the survey in Phase 1 showed that the scales had acceptable reliability. In Phase 2, the full battery of questionnaires was administered to 105 more participants.

4.1   Participants

4.1.1   Inclusion Criteria

Participants were eligible for inclusion at time of recruitment, if they met the following criteria: (a) diagnosed with Type 2 diabetes for 1 year or longer; (b) 50 years of age or older; (c) Mandarin or English speaking Chinese Singaporeans; and (d) no major complications or other severe diseases that would interfere with patients' self-care activities. Patients with Type 2 diabetes for at least 1 year were recruited in order to ensure that they have enough time to reflect their experience of diabetes health-related social control from family members and their self-care activities. The inclusion criteria are the same as Phase 1.

4.1.2   Participant Recruitment

In this phase, participants were approached in the same way as Phase 1. Similarly, participants were briefed about the general purpose of the study and the voluntary participation. They were also explicitly told that they could refuse or discontinue the study at any time without penalty, and the survey was anonymous and personal information would not be disclosed. After they signed the consent form, they filled out the survey with research assistants available to help. Each participant was compensated with a S$ 10 voucher for their time.

4.2   Measures

The measures used in this phase are the same with Phase 1, including a battery of scales: general information, direct and indirect health-related social control, self-efficacy, multidimensional health locus of control, adherence to self-care activities, diabetes-related emotional distress, depressive symptoms, and glycemic control. English-version ($N = 60$) and Chinese-version ($N = 45$) of the survey were provided to fit participants' language preference.

4.3   Method of Analysis

IBM SPSS 21 was used to perform all the analyses. Prior to the data analyses, the normality assumption of the data was checked by examining skewness and kurtosis values. In addition, univariate and multivariate outliers were examined. In the data analyses, firstly, descriptive statistics were performed about the sample characteristics. Secondly, a series of independent sample t-test and one-way ANOVA analyses were conducted to examine the differences in the variables of interest by age, gender, marital status, living condition, and employment. Thirdly, separate groups of hierarchical regression analyses were run to examine the independent effects of two personal control variables and the independent effects of two health-related social control variables on the diabetic adjustment outcome variables, specifically diabetes-related emotional distress, depressive symptoms, self-care activities and HbA1c. For instance, significant covariates of each outcome were entered first, and then self-efficacy was entered, followed by internal health locus of control, in order to see the independent effects of these two personal control beliefs. The same method was used to examine the independent effects of direct and indirect health-related social control. Fourthly, hierarchical regression

analyses were used to investigate the interaction between direct health-related social control and self-efficacy/internal health locus of control on the diabetic adjustment outcomes. In particular, continuous variables were mean-centered in order to avoid the multicollinearity issue (Cohen, Cohen, West, & Aiken, 2003). A cross-product of mean-centered values was then created to indicate the interaction term, such as direct health-related social control x self-efficacy. Lastly, the mediation role of self-efficacy/internal health locus of control variables underlying the link between indirect health-related social control and diabetic adjustment outcomes was also tested using bootstrap approach with Preacher and Hayes' (2008) INDIRECT macro, instead of the traditional method to test mediation effect developed by Baron and Kenny (1986). The bootstrap is more advantageous as it does not require the assumption of normal distribution and is more powerful in controlling Type 1 error. More importantly, the INDIRECT macro is a more appropriate method to test multiple mediator model.

CHAPTER FIVE

RESULTS

In this chapter, I report the results of a series of statistical analyses. As the reliability values of the scales in Phase 1 were acceptable, I combined the data collected in Phase 1 and those in Phase 2 for a total of 205 participants. Based on the combined data, a series of analyses were conducted to test the hypotheses.

5.1   Data Cleaning

Among the 205 participants, one case was discarded due to the extreme score on internal health locus of control, and five cases were ineligible for inclusion as they were below 50 years of age at the time of recruitment. Then I used standardized score test and Mahalanobis distance test to detect univariate and multivariate outliers respectively. Firstly, the scores of eight key variables were converted to standardized scores. If a case with the standardized score on a certain variable is ± 3.00 beyond, then it is considered as a univariate outlier. Based on this criterion, 16 potential univariate outliers were detected on the key variables. Moreover, Mahalanobis distance test was used to detect multivariate outliers (Kline, 2011). If the p value is below .001, then the case is considered as a multivariate outlier. With the use of this criterion, no multivariate outliers were detected. Considering the results above, the 16 participants' responses (potential univariate outliers) were examined individually, and these responses deemed to be reasonable and valid. I also compared the normality, correlations, and the analysis results with and without these 16 cases, and results showed that the conclusions were not influenced by these cases. To avoid loss of observations due to deleting data, the 16 cases were retained in the sample. Missing values on internal health locus of control (1 case), diabetes-related emotional

distress (2 cases), and depressive symptoms (2 cases) were replaced by series means. Thus a sample of 199 participants was included in the final quantitative analyses.

In addition, I also examined skewness and kurtosis for the key variables, and found that all the variables were within acceptable limits in the present sample (Kline, 2011). Additionally, the largest *VIF* value was less than 2. Serious problems of multicollinearity are considered to be present when *VIF*s are 10 or above (Cohen et al., 2003). Hence, there was no alarming multicollinearity problem in the present study.

5.2   Univariate Analysis

A total of 199 patients were included in the final analyses. Of these participants, there were 96 males and 103 females. The mean age of the sample was 63.34 years old (*SD* = 8.46) and the mean time since diagnosis was about 12 years (*SD* = 9.25). In the sample, the majority of the participants were married, lived with spouse and/or children, and had medical insurance, and took hypoglycemia pills (Table 2). Regarding the comorbid medical conditions, 115 had hypertension, 64 had hyperlipidemia, 13 had heart disease, 5 had cancer, and 4 had others which were not specified.

Table 2

Demographic Information and Diabetes-Related Variables

	Mean	Std deviation
Age	63.34	8.46
Duration of Diabetes	11.98	9.25
Relationship Satisfaction	5.80	1.60
Gender	(%)	
Male	48.2	
Female	51.8	
Employment		
Retired	37.7	
Unemployed/homemaker	15.1	
Full-time	36.2	
Part-time	11.1	
Marital Status		
Married	74.7	
Others	25.3	
Living Arrangement		
Live with spouse and/or children	85.4	
Live alone	11.6	
Live with others	3.0	
Highest Education Level		
Non-educated	8.6	
Primary	22.2	
Secondary	42.9	
JC/polytechnic	14.1	
Bachelor	9.1	
Master	3.0	
Medical Insurance		
Yes	67.2	
No	32.8	
Treatment		
Lifestyle modification	7.7	
Insulin	7.7	
Pills	73.5	
Insulin & pills	11.2	
Number of Illness		
0	28.6	
1	43.4	
2	25.0	
3	2.6	
4	0.5	

The reliability statistics for the scales used in the study with Cronbach's alpha are shown in Table 3 for Chinese version, English version, and the whole sample respectively. The reliability statistics for all the scales were satisfactory.

Table 3

Reliability Statistics for the Scales in the Whole Sample

Scale	Chinese version ($N = 92$)	English version ($N = 107$)	Combined ($N = 199$)
Direct social control (5 items)	.83	.89	.86
Indirect social control (4 items)	.80	.79	.80
Internal health locus of control (6 items)	.84	.76	.79
Self-efficacy (7 items)	.89	.87	.88
Diabetes-related emotional distress (20 items)	.94	.96	.96
Depressive symptoms (9 items)	.80	.89	.85
Self-care activities (8 items)	.68	.73	.70

Table 4 shows descriptive statistics on the variables of direct and indirect health-related social control, self-efficacy, internal health locus of control, and diabetic adjustment outcomes, and the intercorrelations between the variables. The intercorrelations between the key variables show that direct health-related social control was positively related to diabetes-related emotional distress ($r = .15$, $p = .035$) and self-care activities ($r = .20$, $p = .005$), while indirect health-related social control was negatively correlated with depressive symptoms ($r = -.18$, $p = .012$) and positively correlated with self-care activities ($r = .16$, $p = .020$). This suggests that the more direct health-related social control family members provided, the higher diabetes-related emotional distress patients experienced and the better adherence to self-care activities patients had. Meanwhile, if patients internalized a higher sense of responsibility to family members to stay healthy, they experienced fewer depressive symptoms and demonstrated better behavioral adherence. Regarding the effect of personal control, both self-efficacy and internal health locus of control were protective against diabetes-related emotional distress (self-efficacy: $r = -.29$, $p < .001$; internal health locus of control: $r = -.19$, $p = .006$) and depressive symptoms (self-efficacy: $r = -.28$, $p < .001$; internal health locus of control: $r = -.21$, $p = .003$), whereas self-efficacy had additional effect in facilitating self-care activities ($r = .41$, $p < .001$). These results highlight the stress-reducing effect of both self-efficacy and internal health locus of control, and the behavior-facilitating effect of self-efficacy. Among the diabetic adjustment outcomes, diabetes-related emotional distress and depressive symptoms were negatively correlated with overall self-care activities ($r = -.17$, $p = .020$; $r = -.20$, $p = .004$ respectively), while none of psychological aspects or behavioral aspect were significantly related to HbA1c.

Table 4

Intercorrelations between Psychosocial and Diabetic Adjustment Variables

	1.	2.	3.	4.	5.	6.	7.	8.
1. Direct control								
2. Indirect control	.27***							
3. Self-efficacy	.02	.12						
4. IHLC	-.05	.29***	.19**					
5. Emotional distress	.15*	-.05	-.29***	-.19**				
6. Depressive symptoms	-.04	-.18*	-.28***	-.21**	.61***			
7. Self-care	.20**	.16*	.41***	.10	-.17*	-.20**		
8. HbA1c	.13	.02	-.08	-.03	-.02	-.03	.00	
M	2.54	3.46	72.90	32.36	23.59	4.08	0.00	7.30
SD	0.92	0.59	16.24	4.25	21.19	4.38	2.38	1.41
Skewness	-0.10(0.17)	-1.76(0.17)	-0.53(0.17)	-1.35(0.17)	0.97(0.17)	1.58(0.17)	-0.08(0.17)	2.25(0.18)
Kurtosis	-1.05(0.34)	4.58(0.34)	0.29(0.34)	1.78(0.34)	0.35(0.34)	2.64(0.34)	-0.02(0.34)	7.71(0.36)

Note. IHLC = internal health locus of control. M = mean. SD = standardized deviation. *p < .05, **p < .01, ***p < .001

I also explored the differences in each of the psychosocial variables (health-related social control and personal control), psychological adjustment, self-care activities and HbA1c across demographic and treatment categories (gender, marital status, living arrangement, employment, and treatment).

The descriptive statistics stratified by demographic and treatment variables are presented in Table 5. There were gender differences only in depressive symptoms so that females had higher scores on depression scale than males ($t = -2.39$, $p = .018$). No other gender differences were found. In addition, there were marital differences in indirect health-related social control ($t = 2.53$, $p = .012$), self-efficacy ($t = 2.26$, $p = .025$), diabetes-related emotional distress ($t = -2.81$, $p = .005$), and depressive symptoms ($t = -2.39$, $p = .020$). Married participants had higher indirect health-related social control and self-efficacy, but experienced lower diabetes-related emotional distress and fewer depressive symptoms. I also found differences between living arrangements in the experience of direct and indirect health-related social control, $F (2, 196) = 2.94$, $p = .055$, marginally significant; $F (2, 196) = 4.27$, $p = .015$ respectively. Post hoc tests showed that those who lived with spouse and/or children had higher indirect health-related social control than those lived alone ($p = .012$), and those who lived alone experienced lower direct health-related social control than those who lived with others ($p = .019$). Differences in HbA1c across treatment options were found at a trend level, $F (3, 177) = 2.62$, $p = .053$. Patients on insulin treatment had higher HbA1c than those with lifestyle modification ($p = .021$), and than patients on oral medication ($p = .023$). The self-care activities differed by employment conditions, $F (3, 195) = 3.51$, $p = .016$, such that those who were retired had better self-care activities than those who worked full-time (p

= .014), and there were no significant differences among the rest of the groups. No other

significant differences in the key variables by marital status, living arrangement,

treatment, and employment were found.

Table 5

Differences in Psychosocial and Diabetic Adjustment Variables

	Direct control	Indirect control	Self-efficacy	IHLC	Emotional distress	Depressive symptoms	Self-care	HbA1c[a]
Gender								
Male	2.54	3.49	74.10	32.83	21.72	3.33*	-0.03	7.40
Female	2.55	3.43	71.78	31.93	25.33	4.78*	0.01	7.23
Marital Status								
Married	2.58	3.52*	74.61*	32.46	20.94**	3.46*	0.01	7.33
Other	2.46	3.28*	68.80*	32.06	30.40**	5.56*	0.04	7.22
Living Arrangement								
Live with spouse and/or children	2.56	3.50*	72.92	32.38	22.43	3.83	-0.07	7.30
Live with others	3.23*	3.58	68.25	33.17	25.42	5.67	0.69	7.20
Live alone	2.25*	3.13*	74.00	32.04	31.68	5.52	0.26	7.37
Treatment								
Lifestyle modification	2.35	3.52	75.59	32.87	22.50	3.93	-0.62	6.85*
Insulin	2.43	3.40	68.33	32.60	20.58	2.73	0.10	8.08*
Pills	2.61	3.49	73.31	32.22	23.63	4.13	-0.06	7.21*
Insulin & pills	2.42	3.20	72.02	33.00	22.27	4.05	0.83	7.66
Employment								
Full-time	2.58	3.50	72.49	32.45	26.29	4.34	-0.50*	7.18
Part-time	2.41	3.40	71.10	32.68	21.48	2.68	-0.23	7.38
Retired	2.60	3.43	73.75	32.11	20.28	3.71	0.67*	7.44
Unemployed/homemaker	2.40	3.51	73.07	32.57	26.92	5.38	-0.36	7.18

Note. IHLC = internal health locus of control. [a] the unit for HbA1c is %. $^*p < .05$, $^{**}p < .01$

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Note. For the sake of brevity, I only report the significant results in the text. The non-significant results are displayed below.

Gender differences: direct control: $t = -0.09$, *ns*; indirect control: $t = 0.75$, *ns*; self-efficacy: $t = 1.01$, *ns*; IHLC: $t = 1.49$, *ns*; emotional distress: $t = -1.21$, *ns*; self-care: $t = -0.14$, *ns*; HbA1c: $t = 0.76$, *ns*.

Marital status differences: direct control: $t = 0.82$, *ns*; IHLC: $t = 0.58$, *ns*; self-care: $t = -0.07$, *ns*; HbA1c: $t = 0.46$, *ns*.

Living arrangement differences: self-efficacy: $F(2, 196) = 0.30$, *ns*; IHLC: $F(2, 196) = 0.17$, *ns*; emotional distress: $F(2, 196) = 1.98$, *ns*; depressive symptoms: $F(2, 196) = 1.93$, *ns*; self-care: $F(2, 196) = 0.47$, *ns*; HbA1c: $F(2, 178) = 0.04$, *ns*.

Treatment differences: direct control: $F(3, 192) = 0.70$, *ns*; indirect control: $F(3, 192) = 1.61$, *ns*; self-efficacy: $F(3, 192) = 0.61$, *ns*; IHLC: $F(3, 192) = 0.30$, *ns*; emotional distress: $F(3, 192) = 0.12$, *ns*; depressive symptoms: $F(3, 192) = 0.50$, *ns*; self-care: $F(3, 192) = 1.27$, *ns*.

Employment differences: direct control: $F(3, 195) = 0.55$, *ns*; indirect control: $F(3, 195) = 0.30$, *ns*; self-efficacy: $F(3, 195) = 0.17$, *ns*; IHLC: $F(3, 195) = 0.16$, *ns*; emotional distress: $F(3, 195) = 1.33$, *ns*; depressive symptoms: $F(3, 195) = 1.87$, *ns*; HbA1c: $F(3, 177) = 0.47$, *ns*.

5.3   Multivariate Analysis

5.3.1   Relationship between Personal Control and Diabetic Adjustment

The relationship between both personal control beliefs (self-efficacy and internal health locus of control) and each diabetic adjustment outcome were examined, while controlling for its significant covariates. As shown in Tables 6-9, significant covariates for each outcome were controlled for in Model 1, and then self-efficacy was entered in Model 2, and internal health locus of control was entered in Model 3.

In the case of diabetes-related emotional distress and depressive symptoms (Tables 6 & 7), Model 2 showed that self-efficacy demonstrated a significant negative correlation with both. When internal health locus of control was entered in Model 3, internal health locus of control was significantly negatively related to the two outcomes, and self-efficacy remained significant. In the case of self-care activities (Table 8), Model 2 and 3 showed that self-efficacy was consistently positively related to self-care activities, while internal health locus of control was not. Regarding HbA1c, neither of the two was significant (Table 9). The regression results are consistent with the bivariate correlation results. Results suggest that both personal control beliefs are protective against diabetes-related emotional distress and depressive symptoms, with stronger personal control being associated with lower diabetes-related emotional distress and fewer depressive symptoms. Furthermore, self-efficacy has additional behavior-facilitating role in promoting patients to better adhere to the self-care activities. However, neither self-efficacy nor internal health locus of control were significantly related to HbA1c.

5.3.2   Relationship between Health-Related Social Control and Diabetic Adjustment

Similar to the procedure of testing the association between personal control and diabetic adjustment outcomes, hierarchical regression analyses were also conducted to examine the relationship between direct and indirect health-related social control and diabetic adjustment outcomes. Results showed that direct health-related social control was positively related to diabetes-related emotional distress in Model 2, and it remained significant in Model 3 when indirect health-related social control was added, which turned out not to be significant (Table 6). Table 7 shows that indirect health-related social control was negatively related to depressive symptoms, while direct health-related social control was not. With respect to self-care activities, when direct health-related social control was entered with the covariates in Model 2, it was significantly related to better adherence to self-care activities, but it was not significant in Model 3 (Table 8). Indirect health-related social control was not significantly related to self-care activities. Similar to personal control beliefs, the two social control variables were not significantly related to HbA1c (Table 9). Again, the regression results are in line with the bivariate correlation results.

Table 6

Relationship between Personal Control & Health-Related Social Control and Emotional Distress

Variables	Model 1 β	Model 2 β	Model 3 β
Age	-.20**	-.16*	-.17*
[a]Marital status	-.20**	-.16*	-.17*
Relationship satisfaction	-.11	-.08	-.07
Self-efficacy		-.21**	-.17*
IHLC			-.15*
R^2	.085	.123	.145
ΔR^2		.038**	.021*

	Model 1 β	Model 2 β	Model 3 β
Age	-.20**	-.17*	-.18**
[a]Marital status	-.20**	-.21**	-.19**
Relationship satisfaction	-.11	-.15*	-.13
Direct social control		.19**	.21**
Indirect social control			-.08
R^2	.085	.120	.125
ΔR^2		.034**	.006

Note. IHLC = internal health locus of control.

[a] "others" is the reference category

*$p < .05$, **$p < .01$

Table 7

Relationship between Personal Control & Health-Related Social Control and Depressive Symptoms

	Model 1 β	Model 2 β	Model 3 β
[a]Gender	-.10	-.10	-.08
[b]Marital status	-.19*	-.16*	-.16*
Relationship satisfaction	-.10	-.07	-.06
Self-efficacy		-.18**	-.15*
IHLC			-.17*
R^2	.068	.099	.128
ΔR^2		.032**	.029*

	Model 1 β	Model 2 β	Model 3 β
[a]Gender	-.10	-.10	-.10
[b]Marital status	-.19*	-.19*	-.16*
Relationship satisfaction	-.10	-.10	-.07
Direct social control		.03	.06
Indirect social control			-.16*
R^2	.068	.068	.090
ΔR^2		.001	.021*

Note. IHLC = internal health locus of control.

[a] female is the reference category. [b] "others" is the reference category

*p < .05, **p < .01

Table 8

Relationship between Personal Control & Health-Related Social Control and Self-Care

Activities

	Model 1 β	Model 2 β	Model 3 β
[a]Full time	-.05	-.04	-.04
[a]Part time	-.02	.01	.01
[a]Retired	.19	.19	.19
Relationship satisfaction	.20**	.11	.11
Self-efficacy		.37***	.37***
IHLC			.03
R^2	.090	.222	.223
ΔR^2		.132***	.001

	Model 1 β	Model 2 β	Model 3 β
[a]Full time	-.05	-.06	-.05
[a]Part time	-.02	-.01	.00
[a]Retired	.19	.18	.19
Relationship satisfaction	.20**	.17*	.14*
Direct social control		.16*	.13
Indirect social control			.10
R^2	.090	.113	.123
ΔR^2		.023*	.009

Note. IHLC = internal health locus of control. [a] unemployed/homemaker is the reference

category. *$p < .05,$ **$p < .01,$ ***$p < .001$

Table 9

Relationship between Personal Control & Health-Related Social Control and HbA1c[b]

	Model 1 β	Model 2 β	Model 3 β
[a]Insulin	.24[*]	.23[*]	.23[*]
[a]Pills	.11	.11	.10
[a]Insulin & pills	.18	.17	.17
Self-efficacy		-.06	-.06
IHLC			-.02
R^2	.042	.046	.047
ΔR^2		.004	.000

	Model 1 β	Model 2 β	Model 3 β
[a]Insulin	.24[*]	.24[*]	.24[*]
[a]Pills	.11	.09	.09
[a]Insulin & pills	.18	.17	.17
Direct social control		.14	.14
Indirect social control			.00
R^2	.042	.061	.061
ΔR^2		.019	.000

Note. IHLC = internal health locus of control.

[a] lifestyle modification is the reference category

[b] unit for HbA1c is %

[*]$p < .05$

5.3.3 Interaction between Direct Health-Related Social Control and Personal Control

I also examined whether self-efficacy/internal health locus of control moderated the relationship between direct health-related social control and diabetic adjustment outcomes. I ran separate hierarchical regression analyses with each outcome as the dependent variable, while controlling for the significant covariates. Tables 10-13 show the regression results. Significant interactions were further explored using the simple slope tests and were plotted in figures accordingly.

Table 10 shows the regression results for diabetes-related emotional distress. In Model 1, age ($\beta = -.20$, $p = .004$), and marital status ($\beta = -.20$, $p = .004$) were negatively correlated with diabetes-related emotional distress. The older the participants, the lower the level of diabetes-related emotional distress experienced. Married participants experienced lower diabetes-related emotional distress than those who were alone, divorced/separated, or widowed. However, relationship satisfaction with family members was not a significant correlate. The significance of age and marital status remained across the three models. In Model 2, direct health-related social control was positively related to ($\beta = .18$, $p = .010$), but self-efficacy ($\beta = -.17$, $p = .018$) and internal health locus of control ($\beta = -.14$, $p = .043$) were negatively related to diabetes-related emotional distress. When patients received more direct health-related social control from family members, they tended to experience higher diabetes-related emotional distress. But patients' self-efficacy and internal health locus of control were protective factors. In Model 3, the interaction between direct health-related social control and self-efficacy was significant ($\beta = .14$, $p = .046$), but not for the interaction between direct health-related social control

and internal health locus of control ($\beta = .05$, *ns*). I further used the simple slope test to explore the significant interaction. Results showed that more direct health-related social control was related to higher diabetes-related emotional distress only for patients with higher self-efficacy ($t = 3.24$, $p = .001$), but not for patients with lower self-efficacy ($t = 0.38$, *ns*; Figure 1). The whole model explained 19.1% of variance in diabetes-related emotional distress.

Table 10

Interaction between Direct Health-Related Social Control and Self-Efficacy/Internal Health Locus of Control on Emotional Distress

Variables	Model 1 β	Model 2 β	Model 3 β
Age	-.20**	-.15*	-.14*
[a]Marital status	-.20**	-.17*	-.17*
Relationship satisfaction	-.11	-.11	-.09
Direct social control		.18**	.17*
Self-efficacy		-.17*	-.17*
IHLC		-.14*	-.13
Direct SC x Self-efficacy			.14*
Direct SC x IHLC			.05
R^2	.085	.174	.191
ΔR^2		.089***	.017

Note. IHLC = internal health locus of control. SC = social control.

[a] "others" is the reference category

$^{+}p < .06$, $^{*}p < .05$, $^{**}p < .01$

Figure 1. Interaction between Direct Health-Related Social Control and Self-Efficacy on

Emotional Distress
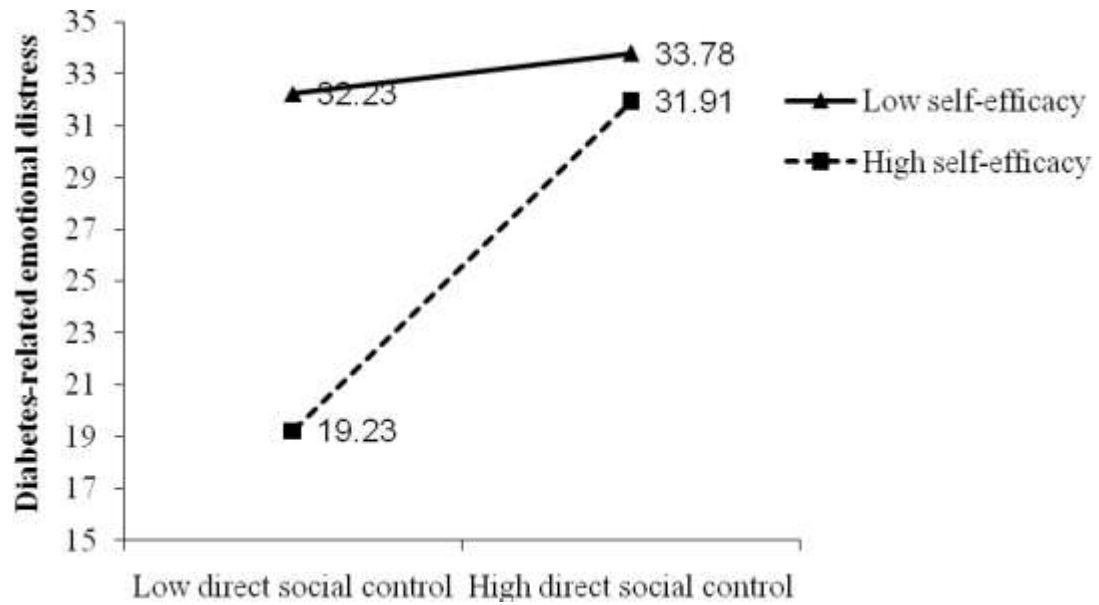
Note. Simple slope test results showed that higher direct health-related social control was

positively related to diabetes-related emotional distress only for patients with higher self-

efficacy (see the dashed line), but not for those with lower self-efficacy (see the solid

line).

With respect to depressive symptoms (Table 11), in Model 1, marital status (β = -.19, p = .011) was significantly negatively correlated with depressive symptoms. Married patients tended to experience fewer depressive symptoms. The significance remained across the three models. However, gender and relationship satisfaction were not significantly correlated with depressive symptoms. In Model 2, direct health-related social control was not significantly correlated with depressive symptoms (β = .01, *ns*), but self-efficacy (β = -.15, p = .032) and internal health locus of control (β = -.17, p = .024) demonstrated a significant and negative correlation with depressive symptoms. In Model 3, self-efficacy and internal health locus of control remained significant. More importantly, the interaction between direct health-related social control and self-efficacy was significant (β = .23, p = .002), but not for the interaction between direct health-related social control and internal health locus of control (β = -.07, *ns*). Follow-up analysis revealed that more direct health-related social control was related to more depressive symptoms for patients with higher self-efficacy (t = 2.24, p = .026), while related to fewer depressive symptoms for those with lower self-efficacy (t = -2.24, p = .026; Figure 2). The whole model explained 17.3% of variance in depressive symptoms.

Table 11

Interaction between Direct Health-Related Social Control and Self-Efficacy/Internal

Health Locus of Control on Depressive Symptoms

| Variables	Model 1 β	Model 2 β	Model 3 β
Gender	-.10	-.08	-.10
[a]Marital status	-.19*	-.17*	-.16*
Relationship satisfaction	-.10	-.06	-.03
Direct social control		.01	-.01
Self-efficacy		-.15*	-.15*
IHLC		-.17*	-.16*
Direct SC x Self-efficacy			.23**
Direct SC x IHLC			-.07
R^2	.068	.128	.173
ΔR^2		.060**	.045**

Note. IHLC = internal health locus of control. SC = social control.

[a] "others" is the reference category

*$p < .05$, **$p < .01$

Figure 2. Interaction between Direct Health-Related Social Control and Self-Efficacy on

Depressive Symptom
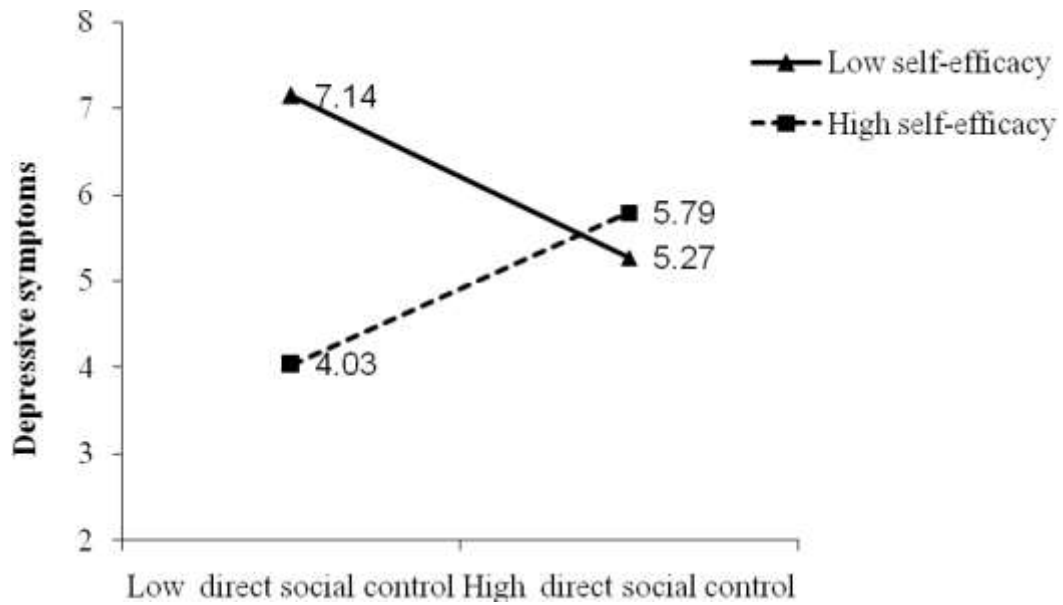
Note. Simple slope test results showed that higher direct health-related social control was positively related to depressive symptoms for patients with higher self-efficacy (see the dashed line), but negatively related to depressive symptoms for those with lower self-efficacy (see the solid line).

With respect to self-care activities (Table 12), Model 1 shows that patients with higher level of relationship satisfaction with family members tended to take better care of themselves (β = .20, p = .005), while employment status was not significantly related to self-care activities. In Model 2, both direct health-related social control (β = .17, p = .008) and self-efficacy (β = .37, p < .001) were significantly related to better self-care activities, but not for internal health locus of control (β = .04, ns). Patients with more experience of direct health-related social control and higher self-efficacy tended to better adhere to self-care activities. In Model 3, the effects of both direct health-related social control and self-efficacy remained significant. However, neither the interaction between direct health-related social control and self-efficacy (β = -.06, ns) nor the interaction between direct health-related social control and internal health locus of control (β = -.06, ns) was significant. The whole model explained 25.9% of variance in self-care activities.

Table 12

Interaction between Direct Health-Related Social Control and Self-Efficacy/Internal

Health Locus of Control on Self-Care Activities

	Model 1 β	Model 2 β	Model 3 β
[a]Full time	-.05	-.05	-.05
[a]Part time	-.02	.01	.01
[a]Retired	.19	.17	.18
Relationship satisfaction	.20[**]	.07	.05
Direct social control		.17[**]	.18[**]
Self-efficacy		.37[***]	.37[***]
IHLC		.04	.06
Direct SC x Self-efficacy			-.06
Direct SC x IHLC			-.06
R^2	.090	.251	.259
ΔR^2		.161[***]	.008

Note. IHLC = internal health locus of control. SC = social control.

[a] "unemployment/homemaker" is the reference category

[*]$p < .05$, [**]$p < .01$, [***]$p < .001$

In terms of physiological aspect of diabetic adjustment (Table 13), Model 1 shows that patients who injected insulin had higher HbA1c level compared to patients on lifestyle modification ($\beta = .24$, $p = .023$). This relationship remained significant across the three models. The other variables were not significant. In addition, direct health-related social control, self-efficacy, internal health locus of control, and the interactions were not significant. The whole model explained 6.6% of variance in HbA1c.

Table 13

Interaction between Direct Health-Related Social Control and Self-Efficacy/Internal Health Locus of Control on HbA1c[b]

	Model 1 β	Model 2 β	Model 3 β
[a]Insulin	.24*	.23*	.23*
[a]Pills	.11	.08	.08
[a]Insulin & pills	.18	.16	.16
Direct social control		.14	.14
Self-efficacy		-.06	-.06
IHLC		-.01	-.01
Direct SC x Self-efficacy			.02
Direct SC x IHLC			.01
R^2	.042	.065	.066
ΔR^2		.023	.001

Note. IHLC = internal health locus of control. SC = social control.

[a] "lifestyle modification" is the reference category

[b] unit for HbA1c is %   *$p < .05$

5.3.4 Mediation Analyses

Mediation analyses were conducted using Preacher and Hayes' (2008) INDIRECT macro to examine the mediating role of self-efficacy and internal health locus of control underlying the link between indirect health-related social control and each diabetic adjustment outcome. The mediation results are shown in Tables 14 and 15.

In the case of diabetes-related emotional distress, the indirect effect of indirect health-related social control on diabetes-related emotional distress via self-efficacy was not significant ($a_1 = 2.36$, $b_1 = -0.23$, $a_1b_1 = -0.53$, 95% CI: -2.1029 to 0.1770, including zero). However, indirect health-related social control was related to higher internal health locus of control ($a_2 = 2.23$), which in turn was related to lower diabetes-related emotional distress ($b_2 = -0.78$). The bias-corrected bootstrap confidence interval for the indirect effect via internal health locus of control ($a_2b_2 = -1.73$) based on 5,000 bootstrap samples was below zero (95% CI: -4.2966 to -0.3000, excluding zero), suggesting the indirect effect was significant. There was no evidence that indirect health-related social control directly influenced diabetes-related emotional distress (c' = 1.05, *ns*). Overall, the model was significant, $R^2 = .15$, $F (6, 190) = 5.38$, $p < .001$ (Figure 3).

In the case of depressive symptoms, the indirect effect of indirect health-related social control on depressive symptoms via self-efficacy was not significant ($a_1 = 1.43$, $b_1 = -0.04$, $a_1b_1 = -0.06$, 95% CI: -0.3661 to 0.0588, including zero). However, indirect health-related social control was related to higher internal health locus of control ($a_2 = 2.23$), which in turn was related to fewer depressive symptoms ($b_2 = -0.15$). The bias-corrected bootstrap confidence interval for the indirect effect via internal health locus of control ($a_2b_2 = -0.33$) based on 5,000 bootstrap samples was below zero (95% CI:

-0.8577 to -0.0115, excluding zero), suggesting the indirect effect was significant. There was no evidence that indirect health-related social control directly influenced depressive symptoms (c' = -0.63, *ns*). Overall, the model was significant, $R^2 = .13$, $F(6, 190) = 4.92$, $p < .001$ (Figure 4).

In the case of self-care activities, the indirect effect of indirect health-related social control on self-care activities via self-efficacy ($a_1 = 1.64$, $b_1 = 0.05$, $a_1b_1 = 0.09$, 95% CI: -0.1071 to 0.3372, including zero) or via internal health locus of control ($a_2 = 2.19$, $b_2 = 0.00$, $a_2b_2 = 0.00$, 95% CI: -0.2223 to 0.2093, including zero) was not significant. There was no evidence that indirect health-related social control directly influenced self-care activities (c' = 0.45, *ns*). Overall, the model was significant, $R^2 = .23$, $F(7, 190) = 8.27$, $p < .001$.

In the case of HbA1c, the indirect effect of indirect health-related social control on HbA1c via self-efficacy ($a_1 = 2.56$, $b_1 = -0.01$, $a_1b_1 = -0.01$, 95% CI: -0.1028 to 0.0183, including zero) or via internal health locus of control ($a_2 = 2.21$, $b_2 = -0.01$, $a_2b_2 = -0.03$, 95% CI: -0.2174 to 0.1095, including zero) was not significant. There was no evidence that indirect health-related social control directly influenced HbA1c (c' = 0.13, *ns*). Overall, the model was not significant, $R^2 = .05$, $F(6, 174) = 1.51$, *ns*.

In sum, the results suggest that internal health locus of control, not self-efficacy, mediates the relationship between indirect health-related social control and psychological component (but not behavioral and physiological aspects) of diabetic adjustment outcomes.

Figure 3. Relationship between Indirect Health-Related Social Control and Emotional

Distress via Self-Efficacy and IHLC
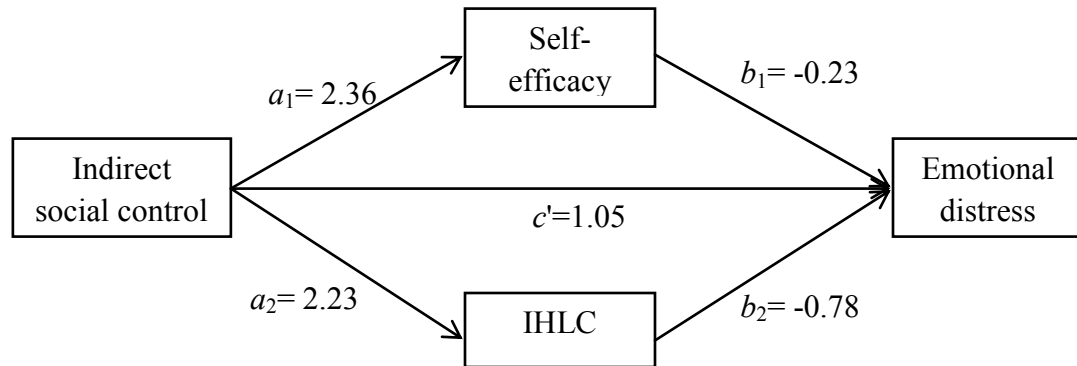
Note. Internal health locus of control, but not self-efficacy mediated the link between

indirect health-related social control and diabetes-related emotional distress. IHLC =

internal health locus of control

Figure 4. Relationship between Indirect Health-Related Social Control and Depressive

Symptoms via Self-Efficacy and IHLC
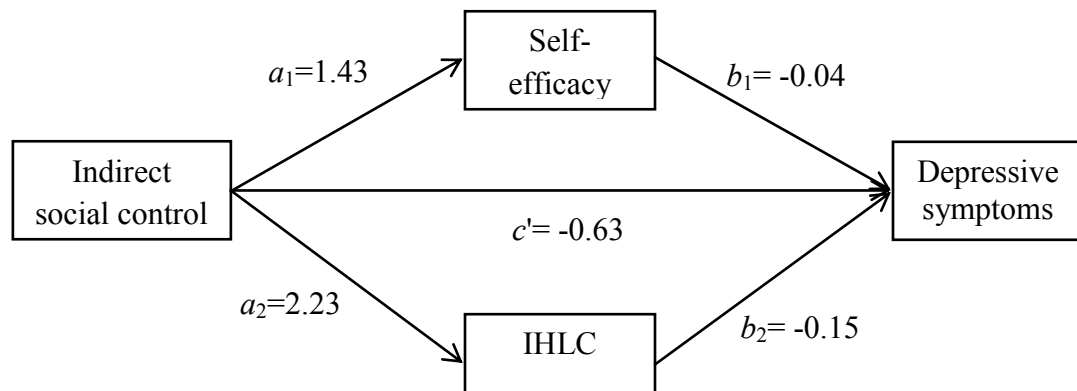
Note. Internal health locus of control, but not self-efficacy mediated the link between

indirect health-related social control and depressive symptoms. IHLC = internal health

locus of control

Table 14

Indirect Health-Related Social Control Multiple Mediator Model for Diabetes-Related Emotional Distress and Depressive

Symptoms

							Consequent						
		Self-efficacy				IHLC				Emotional Distress			
Antecedent		Coeff	SE	p		Coeff	SE	p		Coeff	SE	p	
Indirect SC	a_1	2.36	1.93	0.224	a_2	2.23	0.52	< .001	c'	1.05	2.62	0.689	
Self-efficacy		—	—	—		—	—	—	b_1	-0.23	0.10	0.019	
IHLC		—	—	—		—	—	—	b_2	-0.78	0.35	0.028	

$R^2 = .15$
$F (6, 190)= 5.38, p < .001$

							Consequent						
		Self-efficacy				IHLC				Depressive Symptoms			
Antecedent		Coeff	SE	p		Coeff	SE	p		Coeff	SE	p	
Indirect SC	a_1	1.43	1.96	0.466	a_2	2.23	0.51	<.001	c'	-0.63	0.53	0.232	
Self-efficacy		—	—	—		—	—	—	b_1	-0.04	0.02	0.038	
IHLC		—	—	—		—	—	—	b_2	-0.15	0.07	0.042	

$R^2 = .13$
$F (6, 190)= 4.92, p < .001$

Note. SC = social control. IHLC = internal health locus of control.

Table 15

Indirect Health-Related Social Control Multiple Mediator Model for Self-Care Activities and HbA1c[a]

Antecedent		Self-efficacy				IHLC				Self-care		
		Coeff	SE	p		Coeff	SE	p		Coeff	SE	p
indirect SC	a_1	1.64	1.98	0.407	a_2	2.19	0.51	< .001	c'	0.45	0.28	0.106
self-efficacy	—	—	—	—	—	—	—	—	b_1	0.05	0.01	< .001
IHLC	—	—	—	—	—	—	—	—	b_2	0.00	0.04	0.991

$R^2 = .23$

$F(7,190) = 8.27, p < .001$

Antecedent		Self-efficacy				IHLC				HbA1c		
		Coeff	SE	p		Coeff	SE	p		Coeff	SE	p
indirect SC	a_1	2.56	2.05	0.214	a_2	2.21	0.53	< .001	c'	0.13	0.19	0.487
self-efficacy	—	—	—	—	—	—	—	—	b_1	-0.01	0.01	0.421
IHLC	—	—	—	—	—	—	—	—	b_2	-0.01	0.03	0.667

$R^2 = .05$

$F(6,174) = 1.51, ns$

Note. SC = social control. IHLC = internal health locus of control. [a] unit for HbA1c is %

5.4   Indirect Health-Related Social Control & Personal Control on Diabetic Adjustment: The Role of Relationship Satisfaction

Given the importance of relationship satisfaction (Lewandowski Jr, Nardonea, & Raines, 2010), I also explored the role of relationship satisfaction in the indirect health-related social control to personal control to diabetic adjustment outcomes linkage. Figure 5 depicts the conceptual model. The two-stage mediation model hypothesized that indirect health-related social control could impact diabetic adjustment via different pathways: (1) direct influence, (2) relationship satisfaction, (3) personal control, and (4) relationship satisfaction and personal control sequentially. Hayes' (2013) PROCESS macro was used to examine the mediation model, with one of the two personal control beliefs included in the model at a time, either self-efficacy or internal health locus of control, given the distinction between self-efficacy and internal health locus of control.

Figure 5. Conceptual Model for the Two-Stage Mediation Analysis
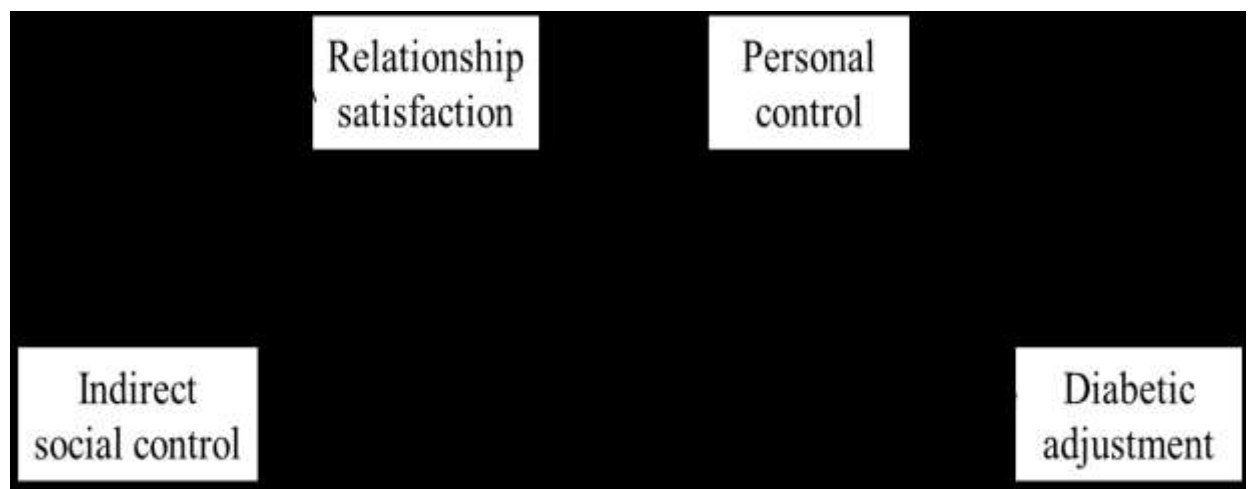
When self-efficacy was included in the model for diabetes-related emotional distress, results showed that the link of indirect health-related social control to relationship satisfaction to self-efficacy to diabetes-related emotional distress was significant (B= -0.29, SE= 0.23, 95% CI: -1.1052 to -0.0357, excluding zero; Figure 6), while the link of indirect health-related social control to relationship satisfaction to diabetes-related emotional distress (B= -0.63, SE = 0.68, 95% CI: -2.4709 to 0.2706, including zero) and the link of indirect health-related social control to self-efficacy to diabetes-related emotional distress (B= -0.63, SE= 0.61, 95% CI: -2.2526 to 0.2606, including zero) were not significant. The direct effect of indirect health-related social control on diabetes-related emotional distress was not significant either (B= -0.58, SE= 2.54, ns). The significant linkage showed that indirect health-related social control was positively related to relationship satisfaction (B= 0.66, SE= 0.19, $p < .001$), and relationship satisfaction was positively related to self-efficacy (B= 1.63, SE= 0.71, p = .023), and self-efficacy in turn was negatively related to diabetes-related emotional distress (B= -0.27, SE= 0.09, p = .005). It suggests that the two-stage mediation model was significant, in which the relationship between indirect health-related social control and diabetes-related emotional distress was sequentially mediated by relationship satisfaction and self-efficacy.

Figure 6. Two Stage Mediation Model of Indirect Health-Related Social Control for Diabetes-Related Emotional Distress
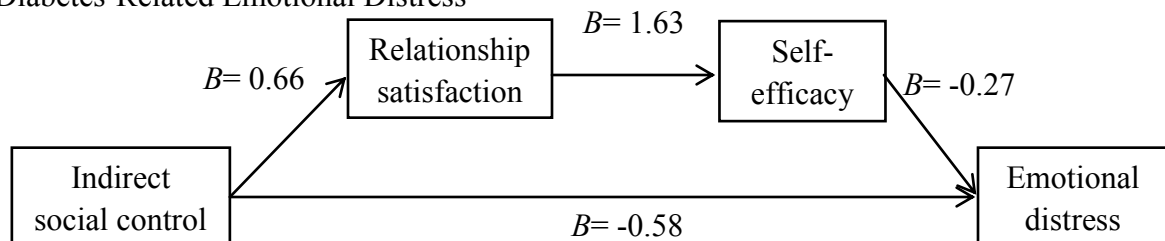
When internal health locus of control was included in the model for diabetes-related emotional distress, results showed that the link of indirect health-related social control to relationship satisfaction to diabetes-related emotional distress (B = -0.95, SE = 0.72, 95% CI: -2.9251 to -0.0145, excluding zero) and the link of indirect health-related social control to internal health locus of control to diabetes-related emotional distress (B = -2.10, SE = 1.01, 95% CI: -4.6145 to -0.6449, excluding zero) were significant, while the link of indirect health-related social control to relationship satisfaction to internal health locus of control to diabetes-related emotional distress (B = 0.03, SE = 0.15, 95% CI: -0.2353 to 0.3813, including zero) was not significant. The direct effect of indirect health-related social control on diabetes-related emotional distress was not significant either (B = 0.88, SE = 2.65, ns). The significant link showed that indirect health-related social control was positively related to relationship satisfaction (B = 0.66, SE = 0.19, p < .001), and relationship satisfaction was negatively related to diabetes-related emotional distress (B = -1.43, SE = 0.93, ns). Similarly, indirect health-related social control was positively related to internal health locus of control (B = 2.23, SE= 0.52, p < .001), and internal health locus of control was negatively related to diabetes-related emotional distress (B = -0.94, SE = 0.35, p = .008).

When self-efficacy was included in the model for depressive symptoms, results showed that the link of indirect health-related social control to relationship satisfaction to self-efficacy to depressive symptoms was significant (B = -0.05, SE = 0.05, 95% CI: -0.2234 to -0.0033, excluding zero; Figure 7), while the link of indirect health-related social control to relationship satisfaction to depressive symptoms (B = -0.06, SE = 0.13, 95% CI: -0.3882 to 0.1510, including zero) and the link of indirect health-related social

control to self-efficacy to depressive symptoms (B = -0.07, SE = 0.10, 95% CI: -0.3668 to

0.0848, including zero) were not significant. The direct effect of indirect health-related

social control on depressive symptoms was not significant either (B = -0.95, SE = 0.51,

ns). The significant link showed that indirect health-related social control was positively

related to relationship satisfaction (B = 0.66, SE = 0.19, $p < .001$), and relationship

satisfaction was positively related to self-efficacy (B = 1.43, SE = 1.96, p = .026), and

self-efficacy in turn was negatively related to depressive symptoms (B = -0.05, SE = 0.02,

p = .013). Similar to diabetes-related emotional distress, the two-stage meditational

model was also significant for depressive symptoms.

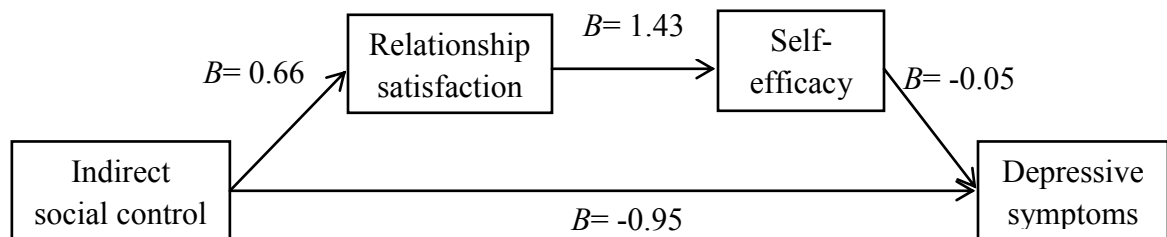Figure 7. Two Stage Mediation Model of Indirect Health-Related Social Control for

Depressive Symptoms

When internal health locus of control was included in the model for depressive symptoms, results showed that the link of indirect health-related social control to internal health locus of control to depressive symptoms ($B = $ -0.39, $SE = 0.22$, 95% CI: -0.9368 to -0.0762, excluding zero) was significant, while the link of indirect health-related social control to relationship satisfaction to internal health locus of control to depressive symptoms ($B = 0.00$, $SE = 0.03$, 95% CI: -0.0491 to 0.0598, including zero) and the link of indirect health-related social control to relationship satisfaction to depressive symptoms ($B = $ -0.12, $SE = 0.14$, 95% CI: -0.4931 to 0.0837, including zero) were not significant. The direct effect of indirect health-related social control on depressive symptoms was not significant either ($B = $ -0.62, $SE = 0.53$, ns). Indirect health-related social control was positively related to internal health locus of control ($B = 2.23$, $SE = 0.51$, $p < .001$), and internal health locus of control was negatively related to depressive symptoms ($B = $ -0.18, $SE = 0.07$, $p = .014$).

When self-efficacy was included in the model for self-care activities, the link of indirect health-related social control to relationship satisfaction to self-efficacy to self-care activities was significant ($B = 0.08$, $SE = 0.05$, 95% CI: 0.0153 to 0.2214, excluding zero; Figure 8). But the link of indirect health-related social control to relationship satisfaction to self-care activities ($B = 0.08$, $SE = 0.07$, 95% CI: -0.0175 to 0.2669, including zero) and the link of indirect health-related social control to self-efficacy to self-care activities ($B = 0.09$, $SE = 0.10$, 95% CI: -0.1007 to 0.3149, including zero) were not significant. The direct effect of indirect health-related social control on self-care activities was not significant as well ($B = 0.45$, $SE = 0.26$, ns). The significant link showed that indirect health-related social control was positively related to relationship

satisfaction ($B = 0.66$, $SE = 0.19$, $p < .001$), and relationship satisfaction was positively

related to self-efficacy ($B = 2.12$, $SE = 0.72$, $p = .004$), and self-efficacy in turn was

positively related to self-care activities ($B = 0.05$, $SE = 0.01$, $p < .001$). The two-stage

mediation model was significant for self-care activities.

Figure 8. Two Stage Mediation Model of Indirect Health-Related Social Control for Self-Care Activities
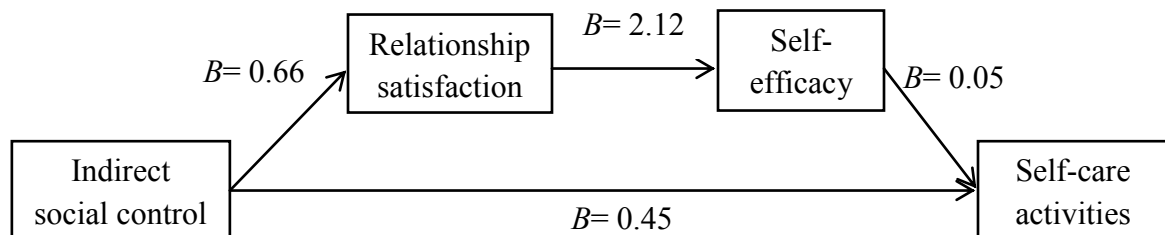
When internal health locus of control was included in the model for self-care activities, the link of indirect health-related social control to relationship satisfaction to self-care activities was significant ($B = 0.16$, $SE = 0.09$, 95% CI: 0.0361 to 0.3962, excluding zero). But the link of indirect health-related social control to relationship satisfaction to internal health locus of control to self-care activities ($B = 0.00$, $SE = 0.01$, 95% CI: -0.0246 to 0.0096, including zero) and the link of indirect health-related social control to internal health locus of control to self-care activities ($B = 0.09$, $SE = 0.10$, 95% CI: -0.0808 to 0.3354, including zero) were not significant. The direct effect of indirect health-related social control on self-care activities was not significant as well ($B = 0.45$, $SE = 0.30$, ns). The significant link showed that indirect health-related social control was positively related to relationship satisfaction ($B = 0.66$, $SE = 0.19$, $p < .001$), and relationship satisfaction was positively related to self-care activities ($B = 0.25$, $SE = 0.11$, $p = .021$).

In terms of HbA1c, no significant mediation effects were found.

5.4.1 Result Comparison between Single-Mediator Model and Two-Stage Mediation Model

Comparing the mediation results with relationship satisfaction as a mediator (two-stage mediation model) with the mediation results with relationship satisfaction as a covariate (single-mediator model), the analyses revealed some common findings, as well as different results. Both the single-mediator and two-stage mediation analyses showed that the indirect effect of indirect health-related social control on diabetes-related emotional distress and depressive symptoms was significant via internal health locus of control. Single-mediator analysis results showed that self-efficacy was not a significant

mediator underlying the link between indirect health-related social control and psychological aspect of diabetic adjustment. However, when relationship satisfaction was included as a mediator in the model, results showed that self-efficacy was a significant mediator in the two-stage mediation model in which the indirect effect of indirect health-related social control on psychological aspect of diabetic adjustment was sequentially mediated by relationship satisfaction and self-efficacy. In addition, the two-stage mediation model was also significant for self-care activities. Taken together, relationship satisfaction plays an important role underlying the link between indirect health-related social control and diabetic adjustment outcomes.

5.5   Age Differences

Given that literature has documented age differences in chronic illness adjustment and personal control beliefs (e.g., Piazza, Charles, & Almeida, 2007; Ross & Mirowsky, 2002), I divided the whole sample into two groups: late-middle-aged adults (< 65 years old, $N = 118$) and older adults (≥ 65 years old, $N = 81$) and examined whether the relationships found above would differ in the two age groups.

5.5.1   Age Differences in the Key Variables

First, I tested the differences in key variables between the two age groups. Results showed that there were differences in duration of diabetes ($t = - 2.21$, $p = .028$) and the number of other chronic illnesses ($t = - 2.96$, $p = .003$). Older adults (duration: $M = 13.71$, $SD = 9.29$; number of illness: $M = 1.24$, $SD = 0.82$) had longer duration of diabetes and more other types of chronic illnesses than late-middle-aged adults (duration: $M = 10.78$, $SD = 9.06$; number of illness: $M = 0.89$, $SD = 0.81$). In addition, age differences in the two types of health-related social control were found (direct: $t = 2.22$, $p = .028$; indirect: $t = 2.97$, $p = .003$). Late-middle-aged patients (direct: $M = 2.66$, $SD = 0.88$; indirect:

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M = 3.56, *SD* = 0.51) received more direct health-related social control from family

members and experienced higher indirect health-related social control than older adults

(direct: *M* = 2.37, *SD* = 0.95; indirect: *M* = 3.31, *SD* = 0.67). The two age groups also

differed on self-care activities (*t* = -2.00, *p* = .047), such that older adults (*M* = 0.39, *SD* =

2.25) achieved better adherence to self-care activities than their late-middle-aged

counterparts (*M* = -0.29, *SD* = 2.44).

5.5.2   Age Differences in the Role of Personal and Social Control and the Interaction in Diabetic Adjustment

I examined whether the role of personal control, health-related social control and

the interaction between direct health-related social control and personal control in

diabetic adjustment outcomes differed in the two age groups. I first tested whether age

moderated the relationship between two personal control beliefs (self-efficacy and

internal health locus of control) and diabetic adjustment, then I tested the moderation role

of age between health-related social control and diabetic adjustment. After that, I

examined whether age had additional moderating role in the interaction between direct

health-related social control and self-efficacy/internal health locus of control on diabetic

adjustment.

When examining age differences in the relationship between personal control

(self-efficacy and internal health locus of control) and diabetes-related emotional distress,

results showed that the interaction between age and internal health locus of control was

significant (β = .20, *p* = .041), while the interaction between age and self-efficacy was not

significant (β = -.01, *ns*). Follow-up analysis showed that internal health locus of control

was negatively correlated with diabetes-related emotional distress only for late-middle-

aged adults (t = -2.86, p = .005), while not for older adults (t = 0.08, ns; Figure 9). When looking at age differences in the relationship between health-related social control and diabetes-related emotional distress, no significant interactions were found. When examining whether the interaction between direct health-related social control and personal control on diabetes-related emotional distress differed in the two age groups (3-way interaction: age x direct health-related social control x self-efficacy/internal health locus of control), the interaction between direct health-related social control and self-efficacy remained significant (β = .14, p = .046), but the age differences in the interaction between direct health-related social control and self-efficacy/internal health locus of control were not found.

Figure 9. Interaction between Age and Internal Health Locus of Control on Emotional
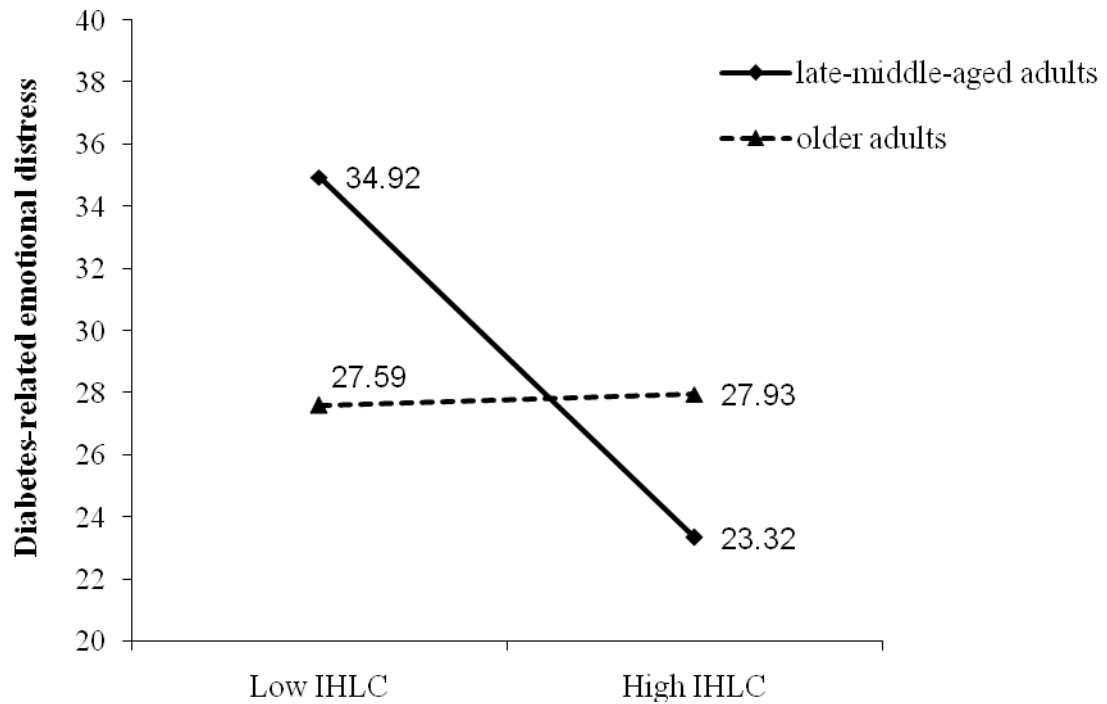
Distress

Note. Simple slope test results showed that internal health locus of control was negatively

related to diabetes-related emotional distress only for late-middle-aged adults (see the

solid line), but not for older adults (see the dashed line). IHLC = internal health locus of

control.

When examining age differences in the relationship between personal control (self-efficacy and internal health locus of control) and depressive symptoms, results showed that the interaction between age and internal health locus of control was not significant (β = .04, *ns*), but the interaction between age and self-efficacy was significant (β = .22, *p* = .015). Follow-up analysis showed that self-efficacy was negatively correlated with depressive symptoms only for late-middle-aged adults (*t* = -2.56, *p* = .011), but not for older adults (*t* = 0.92, *ns*; Figure 10). When looking at age differences in the relationship between health-related social control and depressive symptoms, no significant interactions were found. When examining whether the interaction between direct health-related social control and self-efficacy/internal health locus of control on depressive symptoms differed in the two age groups (3-way interaction: age x direct health-related social control x self-efficacy/internal health locus of control), the interaction between direct health-related social control and self-efficacy remained significant (β = .23, *p* = .001), but the age differences in the interaction between direct health-related social control and self-efficacy/internal health locus of control were not found.

Figure 10. Interaction between Age and Self-Efficacy on Depressive Symptoms
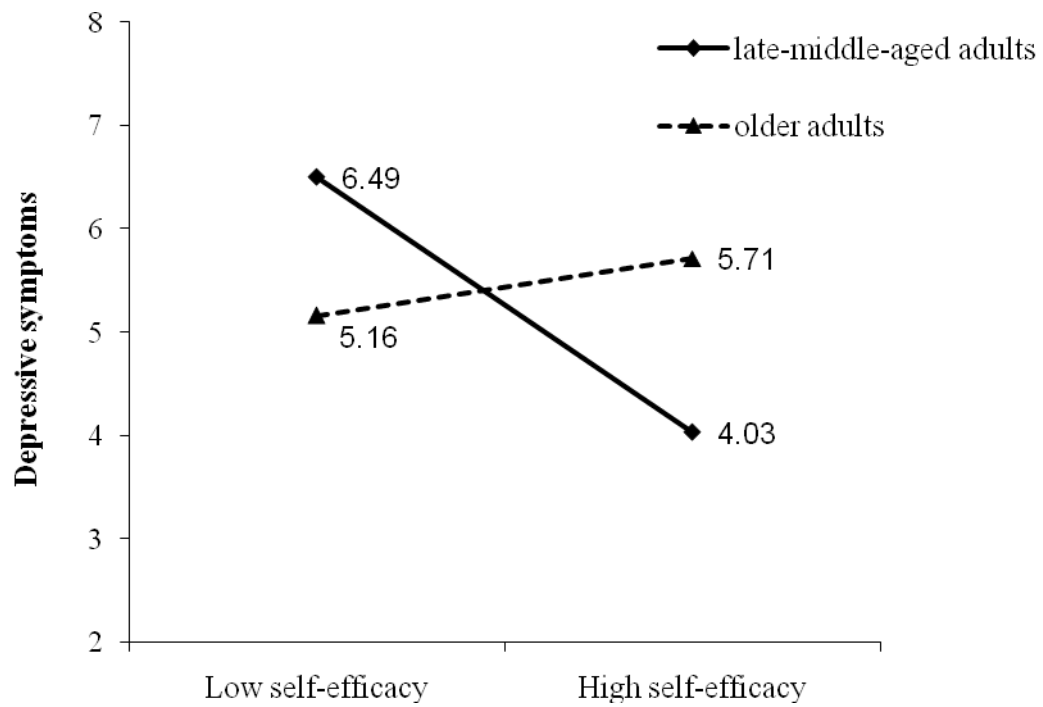
Note. Simple slope test results showed that self-efficacy was negatively related to depressive symptoms only for late-middle-aged adults (see the solid line), but not for older adults (see the dashed line).

When examining age differences in the relationship between personal control (self-efficacy and internal health locus of control) and self-care activities, results showed that the interaction between age and internal health locus of control was not significant (β = -.03, *ns*), but the interaction between age and self-efficacy was marginally significant (β = -.16, *p* = .061). Follow-up analyses revealed that self-efficacy exerted a stronger correlation with self-care activities for late-middle-aged adults (*t* = 5.38, *p* < .001) than for older adults (*t* = 1.94, *p* = .054; Figure 11). When looking at age differences in the relationship between health-related social control and self-care activities, no significant interaction was found between age and direct health-related social control (β = .06, *ns*). But the interaction between age and indirect health-related social control was significant (β = -.23, *p* = .030). Follow-up analysis showed that indirect health-related social control was positively correlated with better self-care activities only in late-middle-aged adults (*t* = 2.75, *p* = .007), but not for older adults (*t* = -0.24, *ns*; Figure 12). When examining whether the interaction between direct health-related social control and self-efficacy/internal health locus of control on self-care activities differed in the two age groups (3-way interaction: age x direct health-related social control x self-efficacy/internal health locus of control), no significant results were found.

In the case of HbA1c, none of the interactions were significant.

Figure 11. Interaction between Age and Self-Efficacy on Self-Care Activities
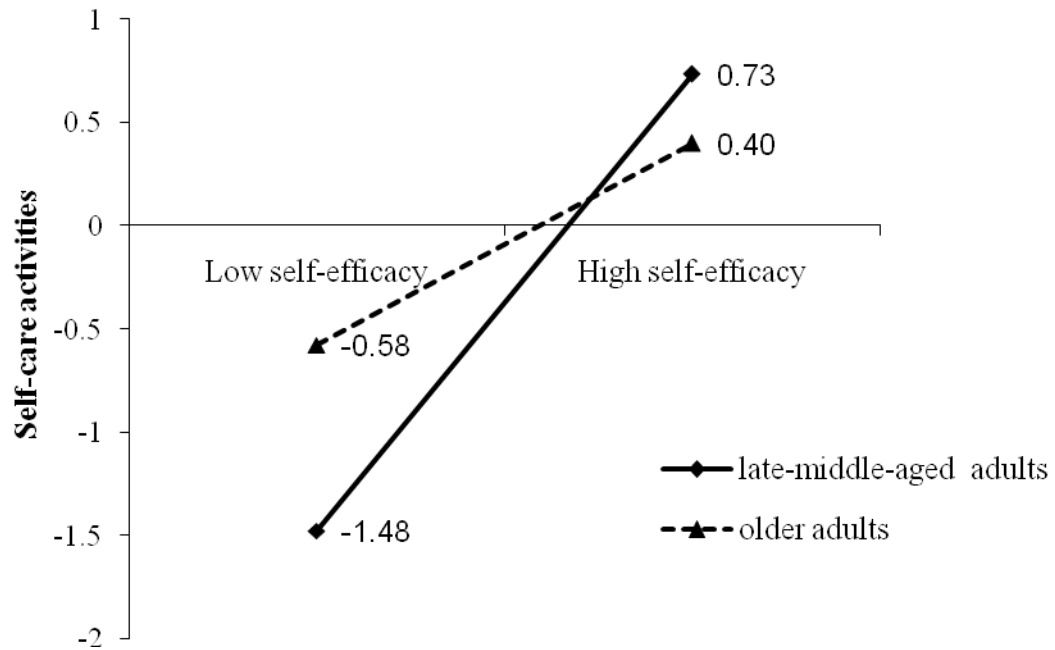
Note. Simple slope test results showed that self-efficacy exerted a stronger effect on self-care activities for late-middle-aged adults (see the solid line) than for older adults (see the dashed line).

Figure 12. Interaction between Age and Indirect Health-Related Social Control on Self-
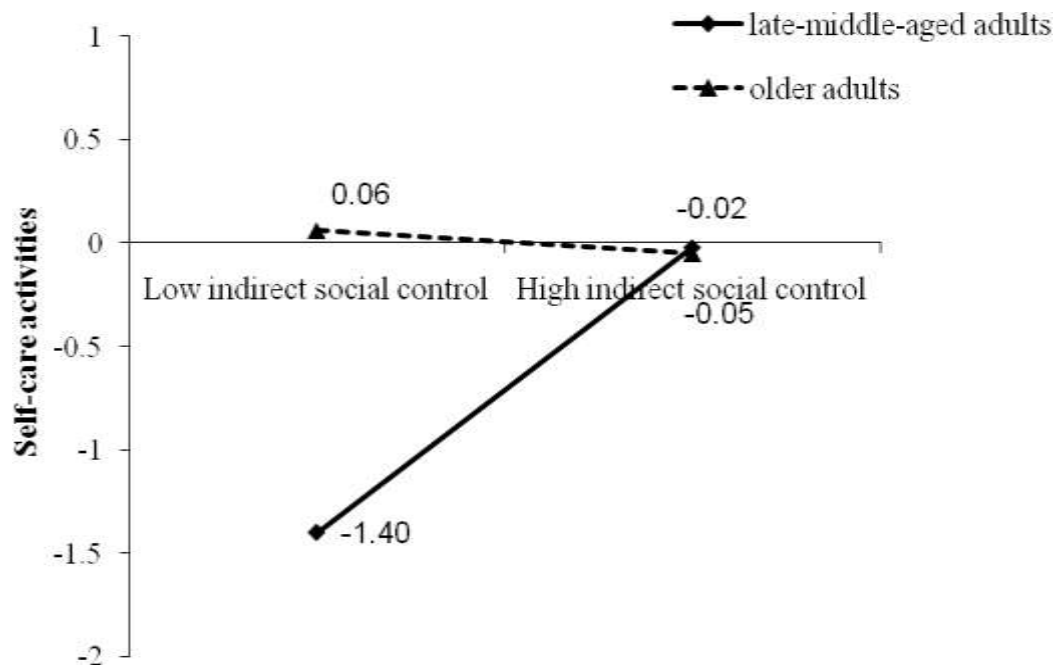
Care Activities

Note. Simple slope test results showed that indirect health-related social control was

positively related to self-care activities only for late-middle-aged adults (see the solid

line), but not for older adults (see the dashed line).

5.5.3 Age Differences in the Mediation

I also tested whether the single-mediator model differed between the two age groups by conducting two separate sets of meditational analyses in the two age groups. Among late-middle-aged patients, results showed significant findings. In the case of psychological aspect of diabetic adjustment, the indirect effect of indirect health-related social control on diabetes-related emotional distress via internal health locus of control was significant (B = -2.68, SE = 1.91, 95% CI: -7.8835 to -0.3273, excluding zero). In addition, the indirect effect of indirect health-related social control on depressive symptoms via internal health locus of control was also significant (B = -0.35, SE = 0.27, 95% CI: -1.1599 to -0.0212, excluding zero). More specifically, indirect health-related social control was positively related to internal health locus of control, which in turn was negatively correlated with diabetes-related emotional distress and depressive symptoms. However, the indirect effect of indirect health-related social control on diabetes-related emotional distress and depressive symptoms via self-efficacy was not significant (B = -1.00, SE = 1.07, 95% CI: -4.3071 to 0.2345, including zero; B = -0.30, SE = 0.29, 95% CI: -1.1475 to 0.0732, including zero, respectively). In terms of self-care activities and HbA1c, no significant indirect effect of indirect health-related social control via self-efficacy or internal health locus of control was found.

In contrast, no significant indirect effect of indirect health-related social control on diabetic adjustment outcomes via self-efficacy or internal health locus of control was found among older patients 65 years old and above.

5.6   Gender Differences

In addition to examining the age differences, I also examined whether there were gender differences in the above relationships. After comparing the key variables in the two gender groups (female: $N = 103$; male: $N = 96$), I examined whether the effects of personal control, health-related social control, the interaction between direct health-related social control and personal control on diabetic adjustment outcomes, and the single-mediator model differed in the two gender groups. Following the statistical procedure used above, I first tested whether gender moderated the relationship between two personal control beliefs and diabetic adjustment, then I tested the moderation role of gender between health-related social control and diabetic adjustment. After that, I examined whether gender had additional moderating effect on the interaction between direct health-related social control and self-efficacy/internal health locus of control on diabetic adjustment. Lastly, I tested whether the single-mediator model differed in the two gender groups.

5.6.1   Gender Differences in the Key Variables

Gender differences in depressive symptoms were found ($t = 2.39$, $p = .018$). In particular, females ($M = 4.78$, $SD = 5.10$) scored higher on the depression scale than males ($M = 3.33$, $SD = 3.32$). Regarding personal control beliefs, males ($M = 74.10$, $SD = 14.26$) scored higher than females ($M = 71.78$, $SD = 17.89$) on self-efficacy, and males ($M = 32.83$, $SD = 3.91$) scored higher than females ($M = 31.93$, $SD = 4.52$) on internal health locus of control, even though the differences were not significant. No gender differences in other variables were found.

5.6.2 Gender Differences in the Role of Personal and Social Control and the Interaction in Diabetic Adjustment

When examining gender differences in the relationship between personal control and depressive symptoms, results showed that the interaction between gender and internal health locus of control was marginally significant ($\beta = -.17$, $p = .058$). Follow-up analysis showed that internal health locus of control was negatively correlated with depressive symptoms only for males ($t = -3.07$, $p = .002$), but not for females ($t = -0.78$, ns; Figure 13). No interactions between gender and other variables or 3-way interaction (gender x direct health-related social control x self-efficacy/internal health locus of control) were found for depressive symptoms. But the interaction between direct health-related social control x self-efficacy remained significant for diabetes-related emotional distress ($\beta = .14$, $p = .048$) and depressive symptoms ($\beta = .23$, $p = .008$).

No significant interactions between gender and other variables or 3-way interaction (gender x direct health-related social control x self-efficacy/internal health locus of control) were found for diabetes-related emotional distress, self-care activities, and HbA1c.

Figure 13. Interaction between Gender and Internal Health Locus of Control on

Depressive Symptoms
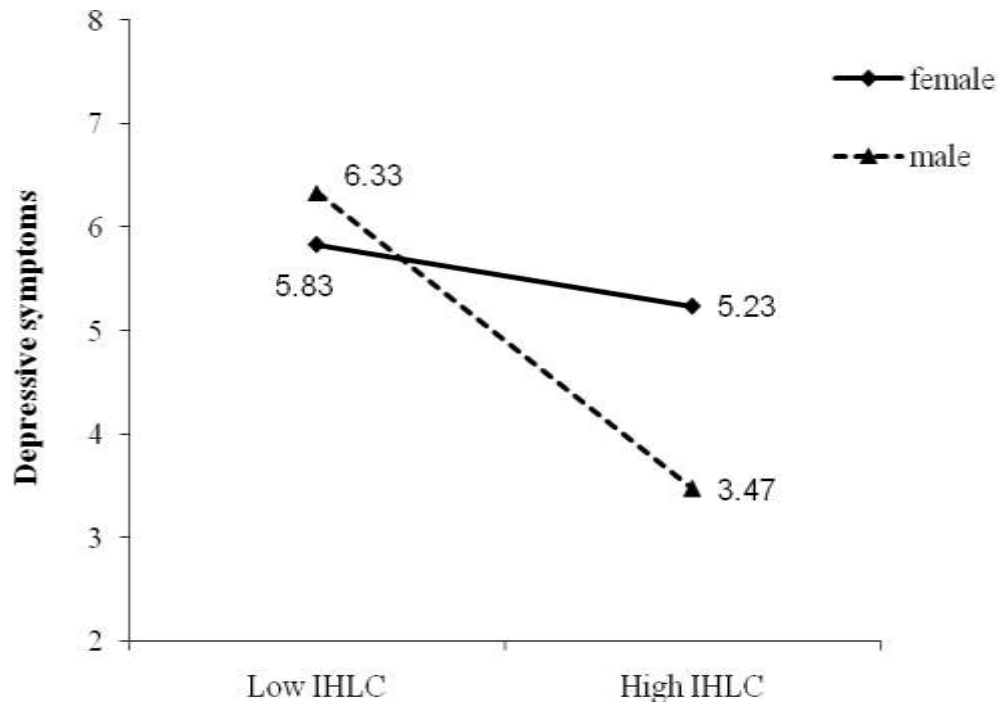
Note. Simple slope test results showed that internal health locus of control was negatively

related to depressive symptoms only for males (see the dashed line), but not for females

(see the solid line). IHLC = internal health locus of control.

5.6.3 Gender Differences in the Mediation

I conducted two separate sets of meditational analyses in the two gender groups.

Among the male patients, results showed significant findings. In the case of

psychological aspect of diabetic adjustment, the indirect effect of indirect health-related

social control on diabetes-related emotional distress via internal health locus of control

was significant ($B = -6.02$, $SE = 2.48$, 95% CI: -12.0904, -2.2851, excluding zero). In

addition, the indirect effect of indirect health-related social control on depressive

symptoms via internal health locus of control was also significant ($B = -1.30$, $SE = 0.50$, 95% CI: -2.4928, -0.5274, excluding zero). More specifically, indirect health-related social control was positively related to internal health locus of control, which in turn was negatively correlated with diabetes-related emotional distress and depressive symptoms. However, the indirect effect of indirect health-related social control on diabetes-related emotional distress and depressive symptoms via self-efficacy was not significant ($B = -1.41$, $SE = 1.17$, 95% CI: -4.6076, 0.1257, including zero; $B = -0.04$, $SE = 0.15$, 95% CI: -0.4481, 0.1903, including zero respectively). In terms of self-care activities and HbA1c, no significant indirect effect of indirect health-related social control via self-efficacy or internal health locus of control was found.

In contrast, no significant indirect effect of indirect health-related social control on diabetic adjustment outcomes via self-efficacy or internal health locus of control was found among the female patients.

CHAPTER SIX

DISCUSSION

6.1   Summary of the Current Study

Chronic illness, such as diabetes, is quite common in later life stage, and it requires long-term adherence to the medical regimen in order to achieve an optimal adjustment. Due to the functional decline and the difficulty in changing the habitual lifestyles, optimal diabetic adjustment across different domains may be a big challenge for late-middle-aged and older adults. Patients' self-efficacy and internal health locus of control are crucial predictors of better diabetic adjustment. However, life-time adherence to the medical regimen might be difficult, and others in the social network, like family members may get involved in patients' diabetes management. For instance, family members may provide health-related social control—regulatory function of social relationships—in order to help patients better manage diabetes. Despite the importance of patients' personal control belief and health-related social control from family members in chronic illness adjustment, little research has examined their joint relationship with chronic illness adjustment. In order to address this gap in the literature, the overarching goal of the current study is to examine the interplay of patients' personal control beliefs (self-efficacy and internal health locus of control) and health-related social control received from family members (direct and indirect) on diabetic adjustment outcomes, including its psychological (diabetes-related emotional distress and depressive symptoms), behavioral (self-care activities), and physiological (HbA1c) components.

In a sample of Singaporean late-middle-aged and older adults diagnosed with Type 2 diabetes, the current research examined the role of personal control (i.e., diabetes-

related self-efficacy and internal health locus of control), health-related social control (i.e., direct and indirect), and the interplay of the two types of control variables on diabetic adjustment outcomes. Findings were that (a) personal control (self-efficacy and internal health locus of control) was beneficial to psychological and behavioral diabetic adjustment outcomes; (b) direct health-related social control was positively related to diabetes-related emotional distress and self-care activities; (c) indirect health-related social control was negatively correlated with depressive symptoms, but positively correlated with self-care activities (bivariate correlation); (d) the relationship between direct health-related social control and diabetes-related emotional distress and depressive symptoms was moderated by self-efficacy. More specifically, direct health-related social control was positively related to diabetes-related emotional distress and depressive symptoms for patients higher in self-efficacy, but negatively related to depressive symptoms for patients lower in self-efficacy; and (e) indirect health-related social control was indirectly associated with diabetes-related emotional distress and depressive symptoms via internal health locus of control, but not via self-efficacy. Indirect health-related social control was positively correlated with internal health locus of control, which in turn was negatively correlated with diabetes-related emotional distress and depressive symptoms.

Taken together, the current study represents a valuable attempt to integrate a less studied mechanism of social relationship—health-related social control received from family members with patients' personal control beliefs—self-efficacy and internal health locus of control for understanding the interplay of social environmental and personal variables on diabetic adjustment outcomes. The study demonstrated that the relationship

between direct health-related social control and psychological diabetic adjustment varied with patients' self-efficacy level, and elucidated the mechanism underlying the relationship between indirect health-related social control and diabetic adjustment by examining the mediation role of personal control. Consistent with the social cognitive theory (Bandura, 1986), the influence of social environmental factors on chronic illness adjustment cannot be isolated from personal characteristics. Instead, it is the interplay of personal factors and social environmental factors that jointly determines the ultimate chronic illness adjustment. It highlights the necessity of examining social environmental and personal factors simultaneously when studying chronic illness adjustment.

6.2 Differences in the Key Variables across the Demographic Variables

Results showed gender differences in depressive symptoms, such that females experienced more depressive symptoms than males, which is consistent with the literature. For instance, a meta-analysis suggests that the prevalence of depression is higher for female patients with diabetes than for male counterparts (Anderson et al., 2001). The gender differences in depression may be due to a variety of factors ranging from psychosocial attributes to biological factors (Piccinelli & Wilkinson, 2000). Moreover, males had higher self-efficacy and internal health locus of control than females at a trend level, and these two have been shown to protect from depression (Weng et al., 2008; Zampieri & de Souza, 2011), thus it may partially explain the gender differences in depressive symptoms.

In addition, marital differences were found in indirect health-related social control, self-efficacy, diabetes-related emotional distress, and depressive symptoms. That is, married participants experienced higher indirect health-related social control and self-

efficacy, but lower diabetes-related emotional distress and fewer depressive symptoms. Marriage serves as a protective factor of self-efficacy and psychological distress. Spouses could provide patients with emotional affirmation and help, thus enhancing patients' self-efficacy and reducing the distress (Cutrona, 1996). Moreover, marital status is often used as a proxy measure of health-related social control in previous studies. But the current study only found marital differences in indirect health-related social control, but not direct health-related social control. It is possible that marriage is a strong motivator for patients to endorse a sense of responsibility to their spouse or children to stay healthy (Umberson, 1987), but not necessarily that they receive more direct health-related social control.

With respect to the differences across living arrangements, those living with their spouse and/or children experienced higher indirect health-related social control than those living alone, and those living alone experienced lower direct health-related social control than those living with others. Similar to the marital differences in indirect health-related social control, living with their spouse and/or children could also instill a sense of responsibility to family members to stay healthy. This suggests that individuals, either married or living with spouse and/or children tend to establish stronger emotional ties with family members, and thus are more likely to develop a stronger sense of responsibility to family members to stay healthy (Umberson, 1987). Additionally, those living with others (e.g., maid) experienced higher direct health-related social control than those living alone, perhaps that those other members of their household are exerting more direct health-related social control in order to better fulfill their role in taking care of the patients. No differences in other variables were found, and this may suggest that living

arrangements are more strongly related to health-related social control than other variables, such as personal control and adjustment outcomes.

The differences across treatment options were found only for HbA1c. Patients on insulin treatment had higher HbA1c than those on lifestyle modification, and than patients on oral medication. Perhaps patients cannot control their HbA1c level by only oral medications or just lifestyle modification, instead they need to inject insulin in order to control the blood glucose and reduce the burden on the pancreas.

Lastly, the differences across employment statuses were found only for self-care activities. Those who were retired had better self-care activities than those who worked full-time. Considering that diabetes management requires a lot of time every day (Weijman et al., 2005), it is possible that retired patients have more time to engage in the self-care activities, while those working full-time may be too busy and possibly skip pills or sugar-monitoring sometimes. On the other hand, retired patients are usually older than those working full time, and have longer duration of living with diabetes. In this sense, retired patients may get used to diabetes-related behaviors required to manage diabetes and have incorporated diabetes-related behaviors into part of their life, thus achieving better self-care.

6.3   Personal Control and Health-Related Social Control & Diabetic Adjustment

6.3.1   Relationship between Two Personal Control Beliefs and Diabetic Adjustment

The current study showed that both self-efficacy and internal health locus of control were negatively related to diabetes-related emotional distress and depressive symptoms, and self-efficacy had an additional positive correlation with self-care

activities, while neither of the two were significantly correlated with the physiological indicator—HbA1c.

In line with previous literature, self-efficacy benefits psychological and behavioral aspects of diabetic adjustment (DeVellis & DeVellis, 2001; Mancuso et al., 2001; Stretcher et al., 1986). First, patients with higher self-efficacy tended to achieve better psychological adjustment, such that they experienced lower level of diabetes-related emotional distress and fewer depressive symptoms. As suggested by the literature (Bandura, 1999), self-efficacy could affect human functioning via cognitive and emotional processes. More specifically, self-efficacy belief can influence people's self-evaluation and strategic flexibility, and how much stress, anxiety or depression they experience when facing difficult situations, like diabetes. Accordingly, highly self-efficacious patients tend to have a more positive evaluation of self and have higher strategic flexibility, and can better cope with the stress due to the disease, thus experience lower level of diabetes-related emotional distress and fewer depressive symptoms. In addition to its role as a protective factor of distress and depression, self-efficacy has additional behavior-facilitating effect due to its motivational component, with higher self-efficacy predicting better adherence to the self-care activities. Highly self-efficacious patients usually are more motivated to make more effort to achieve the goal, thus achieving better adherence.

Similar to self-efficacy, internal health locus of control is also beneficial in terms of diabetes-related emotional distress and depressive symptoms. Internal health locus of control is a resource of individual coping abilities, and can assist patients in dealing with the stress (Landau, 1995). Different from other advanced-stage or life-threatening

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diseases, patients with diabetes can do something tangible (e.g., eat healthy and exercise) to control the disease, thus the belief that one's behaviors determine one's health could play a role. However, different from self-efficacy, its effect on self-care activities was not significant. As previous literature suggests, internal health locus of control may not be a sufficient factor of health behaviors (Wallston, 1994). With respect to physiological aspect of diabetic adjustment—HbA1c, neither self-efficacy nor internal health locus of control were significant. Similarly, the decrease of HbA1c for Type 2 diabetic patients in a health belief modification program was not due to the changes in health beliefs or health locus of control (Wooldridge, Wallston, Graber, Brown, & Davidson, 1992). It could be possible that physiological aspect may be influenced directly by factors other than personal control beliefs. The regression results showed that patients on insulin treatment had higher HbA1c than those on just lifestyle modification. It suggests that treatment modalities may be related to the HbA1c level. Overall, results imply that there might be a more complex picture for the physiological aspect of diabetic adjustment, as measured by HbA1c.

Despite the non-significance of personal control on HbA1c, the current study highlights the importance of enhancing patients' personal control in achieving better psychological and behavioral adjustment outcomes. There are interventions in the literature showing efficacy in enhancing personal control. For instance, self-management training focusing on different skills (e.g., emotion management, exercise appropriately, communicate with family and physicians effectively) is a widely used method to enhance patients' self-efficacy (Bodenheimer, Lorig, Holman, & Grumbach, 2002; Holman & Lorig, 2004; Lorig & Holman, 2003). Research also suggests that cognitive training, such

as reasoning and memory could increase cognitive-specific internal locus of control (Wolinsky et al., 2010). Moreover, problem-solving techniques training could increase internal locus of control belief (Duckworth, 1983). These intervention programs may be modified in this population to enhance their personal control.

6.3.2 Relationship between Two Social Control Variables and Diabetic Adjustment

Different from previous literature with a major focus on direct health-related social control, the current study examined both direct and indirect health-related social control, representing two distinct dimensions. Results showed that direct health-related social control was positively related to diabetes-related emotional distress and self-care activities, but not for depressive symptoms and HbA1c; and indirect health-related social control was negatively related to depressive symptoms, but not for the rest of the outcome variables.

Consistent with the dual effects model, direct health-related social control from the family members facilitates patients' self-care activities, but produces emotional distress. Direct health-related social control from family members, involving regulations or constraints of patients' unhealthy behaviors, may communicate a sense of disapproval or dissatisfaction with patients' current behaviors. As a result, patients may have to change their unhealthy behaviors, and this reflects the behavior-corrective nature of direct health-related social control. On the other hand, patients may experience emotional distress due to family members' disapproval or dissatisfaction with their current behaviors. However, its relationship with depressive symptoms was not significant, possibly due to the distinction between diabetes-related emotional distress and depression

(Carper et al., 2013; Fisher et al., 2010). Different from depression, diabetes-related emotional distress stems from the burden of diabetes (e.g., hyperglycemia and complications) and a strict self-care regimen. Perhaps direct health-related social control from family members makes patients more likely to have concerns that they are not managing the disease well, or they might suffer from complications if diabetes is not well controlled, or others do not understand the difficulty of managing diabetes, thus leading to emotional distress; however, such influence may not be sufficient to produce depressive symptoms. For instance, Fekete, Stephens, Druley, and Greene (2006) found that direct health-related social control, using either positive or negative strategies, was not significantly correlated with depression. Or perhaps direct health-related social control carries an indirect effect on depressive symptoms, rather than a direct effect. Stephens et al. (2009) found no direct effect of direct health-related social control on depression, and instead they found that direct health-related social control exerted its influence on depression via emotional response.

With respect to indirect health-related social control, it was significantly related to depressive symptoms, but not diabetes-related emotional distress, with higher indirect health-related social control relating to fewer depressive symptoms, indicating its buffering effect. Indirect health-related social control had no significant correlation with self-care activities. Perhaps the responsibility to family members to stay healthy is not adequate to translate into behavioral change, or it exerts an indirect effect on self-care activities via other variables. In sum, it implies that patients could better cope with the possible psychological problems, if they internalize a sense of responsibility to family members to stay healthy. It would help if patients cultivate such responsibility.

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Similar to the relationship between personal control and HbA1c, no significant relationship was found between either direct or indirect health-related social control and HbA1c. It is possible that physiological aspect may be influenced by other factors, such as treatment options suggested by the regression results.

6.4 Interaction between Direct Health-Related Social Control and Personal Control

In addition to the independent effect of direct health-related social control on diabetic adjustment, the moderator role of self-efficacy and internal health locus of control was also examined in the process. The interaction between direct health-related social control and self-efficacy was found to be significant for diabetes-related emotional distress and depressive symptoms, but not for self-care activities and HbA1c. More specifically, direct health-related social control demonstrated a positive correlation with diabetes-related emotional distress and depressive symptoms for those with higher self-efficacy, but a negative correlation with depressive symptoms for those with lower self-efficacy. Regarding self-care activities, both direct health-related social control and self-efficacy were positively related to self-care activities, suggesting that both social regulation of diabetes-related behaviors and patients' confidence belief in their ability to perform diabetes-related behaviors were significant contributors to self-care activities. However, the interaction between the two variables was not significant on self-care activities. It suggests that direct health-related social control was positively related to self-care activities, regardless of the self-efficacy level, which is consistent with dual effects model of direct health-related social control regarding the behavioral effect.

Unexpectedly, the moderation role of internal health locus of control was not found. It provides additional support to the idea that self-efficacy and internal health locus of control are two distinct concepts. Given the multidimensional nature of health locus of control, perhaps powerful others health locus of control, which refers to the belief that powerful others (e.g., family, doctors) are responsible for one's health, may be more sensitive to social regulation on health-related behaviors, and it may moderate the relationship between direct health-related social control and diabetic adjustment. However, such possibility needs further research. The non-significance of internal health locus of control could also be due to the sample characteristics. Research shows that individuals are more susceptible to social influence when things are out of their control (Fennis & Aarts, 2012). Descriptive statistics showed that the majority of participants scored pretty high on internal health locus of control, and this may reduce the sensitivity to direct health-related social control from family members.

The significant interaction between direct health-related social control and self-efficacy findings corroborate the compensation and interference hypotheses (e.g., Schrőder, 1997; Warner et al., 2011). For instance, in a sample of patients after heart surgery, Schrőder (1997) found that patients higher in self-efficacy reported higher illness-related sorrows than those lower in self-efficacy when they received more social support. It suggests that individuals with higher self-efficacy may find the external influence autonomy-threatening, but this is not the case for those lower in self-efficacy. Warner et al.'s study (2011) actually resonates with this statement. In a sample of older individuals with multiple medical conditions, Warner et al. (2011) found that the effect of instrumental social support on autonomy depended on patients' self-efficacy level, such

that instrumental social support was positively related to autonomy for those with lower self-efficacy, but negatively related to autonomy for those with higher self-efficacy.

Specifically in the current study, results suggest that direct health-related social control may exert an interference effect for patients higher in self-efficacy, but a compensation effect for patients lower in self-efficacy in terms of psychological diabetic adjustment. In other words, patients with lower self-efficacy benefit more from family members' social influence than their highly self-efficacious counterparts. It is consistent with previous literature showing that patients with lower self-efficacy achieve better outcomes from interventions with different focus, like self-management training. It is possible that patients with different levels of self-efficacy may have varying perceptions of direct health-related social control received from family members. Those with lower self-efficacy may perceive the influence from family members as a useful way of remedying their low level of self-efficacy, or compensating their personal resources to cope with the chronic disease. As they usually do not have enough confidence in the self-care activities, they may perceive that family members are really offering help and trying to get them to better engage in the self-care activities. Thus they do not experience as much emotional distress or many depressive symptoms as those with higher self-efficacy due to the experience of direct health-related social control. In contrast, patients with higher self-efficacy, who are confident in their abilities in managing diabetes, may perceive the influence from family members as a sign of dissatisfaction or mistrust in their ability, which in turn impacts patients psychologically and produces emotional distress or even depressive symptoms. Moreover, direct health-related social control may threaten the autonomy for those higher in self-efficacy. Individuals with higher self-

efficacy tend to exert control over their environment or behaviors, whereas external influence might affect their experience of control, thus leading to higher emotional distress or more depressive symptoms.

As suggested by self-determination theory (Deci & Ryan, 1985; Ryan & Deci, 2000), autonomy is one basic need and fulfillment of this need is essential for behavioral motivation and well-being. In the context of chronic illness, a supportive and autonomous social environment would facilitate chronic illness adjustment, whereas a demanding or unsupportive environment may deter chronic illness adjustment. Whether the environment is supportive or unsupportive might depend on individual perceptions, which are affected by individual difference variables. It is reasonable to infer that individuals with different levels of self-efficacy may perceive direct health-related social control to be autonomy-threatening to a different degree, with a stronger effect for those higher in self-efficacy, thus leading to poorer psychological outcomes. From a practical perspective, an autonomy supportive environment motivates patients to adhere to medical regimens and achieve better mental health (King et al., 2010; Williams & Deci, 2001). This highlights the importance of a supportive family atmosphere and the communication between family members and patients. When family members get involved in patients' diabetes management, it would benefit if they understand patients' perspective and feelings, provide advice without pressure or demand, which in turn promotes their autonomous motivation, rather than threatens their autonomy (Williams, Freedman, & Deci, 1998). Special attention is needed when family members provide direct health-related social control to patients with higher self-efficacy.

In addition, the results could also partially explain the inconsistent findings of direct health-related social control in the literature. As aforementioned, direct health-related social control was positively related to behavioral change in a sample of older patients after orthopedic surgery (Stephens et al., 2009), but unrelated or negatively related to medical regimen adherence and mental health in patients with Type 2 diabetes and patients in cardiac rehabilitation (Franks et al., 2006; Khan et al., 2013). Given that knee replacement surgery is physically strenuous and places great limits on patients' daily activities, self-efficacy amongst this population could be lower than that of the other two populations. Thus due to the differences in self-efficacy and the differential effect of direct health-related social control for patients with different levels of self-efficacy, patients after the orthopedic surgery might benefit more from direct health-related social control than patients with diabetes or participating in cardiac rehabilitation. In related research, young adults' relatively higher self-efficacy (Specht, Egloff, & Schmukle, 2013) could explain the non-significant effect of direct health-related social control in a sample of young adults with diabetes (Thorpe, Lewis, & Sterba, 2008), while older adults' relatively lower self-efficacy could explain direct health-related social control's positive effect on medical recommendation adherence in a sample of older diabetic patients (Stephens, Rook, Franks, Khan, & Lida, 2010). As the findings suggest, self-efficacy could explain the inconsistent findings regarding the effect of direct health-related social control not only in patients with different types of chronic diseases, but also in patients with the same type of chronic disease at different developmental stages—younger and older adults.

Taken together, the current study adds to the existing literature by examining the moderator role of self-efficacy and internal health locus of control in the relationship between direct health-related social control and diabetic adjustment outcomes. Results suggest that direct health-related social control demonstrated differential relationships with psychological aspects of diabetic adjustment for patients with varying self-efficacy levels and could possibly explain the inconsistencies regarding the effect of direct health-related social control on chronic illness adjustment in the literature.

6.5   Interplay of Indirect Health-Related Social Control and Personal Control

The majority of studies in the literature focused on direct health-related social control, and less is known about the role of indirect health-related social control in chronic illness adjustment, and even less is known about the underlying mechanism. The mediation analysis showed that only internal health locus of control, but not self-efficacy, mediated the relationship between indirect health-related social control and diabetes-related emotional distress and depressive symptoms—psychological diabetic adjustment, but not self-care activities or HbA1c. More specifically, indirect health-related social control was positively related to internal health locus of control, which in turn was negatively related to diabetes-related emotional distress and depressive symptoms. The mediation model was not significant for either self-care activities or HbA1c. The non-significant mediation model on self-care activities or HbA1c may be due to that internal health locus of control may not necessarily translate into behavioral or physiological change. Research suggests that health locus of control may be meaningfully related to behavioral or medical outcomes, but such relationship may not be captured through the examination of internal health locus of control only, and may be only found when other

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dimensions of health locus of control (e.g., powerful other health locus of control) were also considered (O'Hea et al., 2005; Wallston, 1992).

Indirect health-related social control works on the basis of a sense of responsibility to family members and thus is consistent with Asian cultural values for family interdependence (Tseng & Hsu, 1991). It claims that self is often defined in relations to others, like family members, and family members have obligations or responsibilities to maintain a harmonious familial relationship, which involves norms for mutual understanding and relatedness. Under such cultural influence, the sense of responsibility to the family members to stay healthy could encourage patients to take better care of themselves, and it is one useful way of maintaining the harmony of a familial relationship. Relating one's health to family members and fostering a sense of responsibility to family members to stay healthy represents the cultural value of family interdependence. If people do not take good care of themselves and stay healthy, they may bring burden to family members' normal life and work, or even the family financial status. This violates their sense of responsibility to family members and thus they may try to avoid this. Simply put, indirect health-related social control is a strong motivator for patients to achieve better diabetic adjustment.

Furthermore, internal health locus of control serves as a mediator underlying the link between indirect health-related social control and psychological diabetic adjustment. Responsibility to family members to stay healthy is an important resource for internal health locus of control, such that the sense of responsibility can be translated into a belief that their health is determined by their own behaviors. A belief that one is responsible for one's own health is a good way of fulfilling their responsibility to their family members

to stay healthy, which in turn benefits patients' illness adjustment. The findings also highlight the importance of fostering a sense of responsibility to family members to stay healthy. Living in a supportive family may help patients develop a belief that they need to take good care of themselves in order not to disappoint their supportive family (Williams, Freedman, & Deci, 1998). Future intervention programs may consider cultivating a supportive family atmosphere and fostering patients' responsibility to family members to maintain healthy, or enhancing the belief that their own behaviors determine their own health.

However, contrary to predictions, self-efficacy was not a significant mediator underlying the link between indirect health-related social control and any of the diabetic adjustment outcomes. Results of intercorrelation analyses between the variables showed that indirect health-related social control was not significantly related to self-efficacy, but positively related to internal health locus of control. According to Bandura (1999), previous mastery experiences are the most direct and effective source of self-efficacy. It is possible that the sense of responsibility to family members to stay healthy may not entail mastery experiences, thus it has a limited direct effect on self-efficacy. It suggests that a sense of responsibility to family members may not necessarily translate into a belief of confidence in one's abilities to engage in diabetes-related behaviors. Or perhaps indirect health-related social control does not exert a direct effect on self-efficacy, leading to the non-significance of self-efficacy underlying the link.

Taken together, the study adds to the growing literature on health-related social control by examining one less studied dimension—indirect health-related social control and the underlying mechanism between indirect health-related social control and diabetic

adjustment. Results showed that indirect health-related social control carries an indirect effect on diabetes-related emotional distress and depressive symptoms via internal health locus of control, but not via self-efficacy. It highlights the underlying mechanisms and the importance of fostering patients' sense of responsibility to family members to stay healthy.

6.6   Discussion on Supplemental Analyses

6.6.1   The Role of Relationship Satisfaction

The two-stage mediation model hypothesized that indirect health-related social control could impact diabetic adjustment via different pathways: (1) direct influence, (2) relationship satisfaction, (3) personal control, and (4) relationship satisfaction and personal control sequentially. Given the distinction between self-efficacy and internal health locus of control, each of the two personal control beliefs was examined separately. Results showed that the linkage of indirect health-related social control to internal health locus of control to diabetes-related emotional distress/depressive symptoms was significant, which is consistent with the single-mediator model. In addition, the linkage of indirect health-related social control to relationship satisfaction to self-efficacy to diabetes-related emotional distress/depressive symptoms/self-care activities was significant. Different from the single-mediator model, the two-stage mediation model suggests that relationship satisfaction does play a role in the process of indirect health-related social control on diabetic adjustment.

Results showed that indirect health-related social control was related to higher relationship satisfaction, which in turn was related to higher self-efficacy, leading to lower level of diabetes-related emotional distress and fewer depressive symptoms, and better self-care activities. Usually people tend to experience higher level of responsibility

to family members to stay healthy if they live in a supportive family environment, it is logical that they tend to have a more satisfactory relationship with family members. Furthermore, close relationship often plays a role in shaping the self, and inclusion of others in the self is one of the mechanisms. According to the self-expansion theory, close others' resources may be incorporated into the self in the self-expansion process, and this could strengthen one's abilities to cope with stress (Aron & Aron, 1996; Aron, Aron, & Norman, 2001). In other words, self-expansion could provide more coping resources and thus increase individuals' self-efficacy. Moreover, self-efficacy has been shown to serve as a protector of stress and lead to lower levels of emotional distress and fewer depressive symptoms, and better adherence to self-care activities.

Interestingly, the different pathways of indirect health-related social control on diabetic adjustment via the two personal control beliefs provide extra evidence on the distinction between internal health locus of control and self-efficacy. Indirect health-related social control provides a direct resource for internal health locus of control, leading to better psychological aspect of diabetic adjustment, but this is not the case for self-efficacy. Instead, indirect health-related social control is positively related to better psychological and behavioral aspects of diabetic adjustment via relationship satisfaction and self-efficacy sequentially.

6.6.2   Age Differences

Given the age differences in personal control and health-related social control, age differences in the above relationships (examined in the main analysis) were also examined. Results showed that late-middle-aged adults reported more direct and indirect health-related social control, and poorer self-care activities than older adults. Perhaps late-middle-aged adults are more frequently exposed to the resources of direct health-

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related social control (e.g., children, spouse, parents) and have poorer self-care activities, thus they experience higher level of direct health-related social control. Moreover, as late-middle-aged adults may serve as parental, spousal, or child roles, they may serve more roles than older adults, thus the occupancy in multiple roles instills them with a stronger sense of responsibility to family members to stay healthy or a belief that family members are dependent on them. Regarding self-care activities, older adults usually have longer duration of diabetes, and may have incorporated the self-care regimen as part of their life and thus have better self-care activities.

Further explorations showed that the interaction between age and internal health locus of control was significant for diabetes-related emotional distress, such that internal health locus of control was negatively related to diabetes-related emotional distress only for late-middle-aged adults, but not for older adults. Moreover, the interaction between age and self-efficacy was significant for depressive symptoms, such that self-efficacy was negatively related to depressive symptoms only in late-middle-aged adults, but not for older adults. The interaction between age and self-efficacy was marginally significant for self-care activities, such that self-efficacy demonstrated a stronger correlation with self-care activities for late-middle-aged adults than for older adults. This suggests that internal health locus of control and self-efficacy demonstrate a relatively stronger effect for late-middle-aged adults than older adults. It is possible that the health or functional status for late-middle-aged adults is relatively better than for older adults, or late-middle-aged adults have more resources available (e.g., cognitive) than older adults (Windsor, Burns, & Byles, 2013), thus late-middle-aged adults could better mobilize the available

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resources if they have higher personal control than their older counterparts, leading to a stronger protective correlation between personal control and diabetic adjustment.

In addition, the interaction between age and indirect health-related social control was significant for self-care activities, such that indirect health-related social control was positively related to self-care activities for late-middle-aged adults, but not for older adults. Perhaps late-middle-aged adults serve more roles and possess higher level of responsibility to family members, which is more intrinsically motivating for them than their older counterparts. No significant interaction between age and direct health-related social control was found. Although late-middle-aged adults experienced higher direct health-related social control than older adults, the two groups may react similarly to such external influence.

Furthermore, the mediation role of internal health locus of control underlying the link between indirect health-related social control and diabetes-related emotional distress/depressive symptoms was found only in late-middle-aged adults, but not for older adults. It may suggest that the responsibility to family members is a stronger motivator for late-middle-aged adults to endorse a belief that they are responsible for their own health. While for older adults, the sense of responsibility to family members to stay healthy may not necessarily translate into internal health locus of control, which may be more influenced by previous life experience.

No significant interactions between age and either personal control or health-related social control variables were found for HbA1c. As discussed previously, the physiological marker may not be sensitive to the psychosocial factors measured in the current study.

6.6.3   Gender Differences

With respect to gender differences, fewer significant results were found. Results revealed that females experienced more depressive symptoms than males, which is consistent with the literature, possibly due to psychosocial attributes or biological factors (Anderson et al., 2001). Further analysis showed that internal health locus of control was negatively correlated with depressive symptoms only for males, but not for females. Given the gender differences in internal health locus of control at a trend level, it may partially explain the gender differences in depressive symptoms found in the current study. No significant interactions between gender and self-efficacy or health-related social control variables were found for any of the diabetic adjustment outcomes.

In addition, the mediation analysis results showed the linkage of indirect health-related social control to internal health locus of control to diabetes-related emotional distress/depressive symptoms was significant only for males, but not for females. Perhaps the belief of internal health locus of control is more consistent with the gender role expectations for males, in which they are expected to be more independent and possess more power and control, whereas the belief is less in line with the gender role expectations for females (Eagly & Wood, 1991). Thus the internal health locus of control serves as a stronger protector of diabetes-related emotional distress/depressive symptoms for males than for females. Following the gender role expectations, males tend to develop a sense of internal health locus of control to better deal with the chronic illness. It is possible that females tend to use other strategies to cope with the stress due to the chronic illness, such as seeking social support. Thus internal health locus of control is a significant mediator for males, but not for females.

6.7   Theoretical Contributions

Chronic illness is an increasingly severe public health issue that merits more research in order to facilitate chronic illness adjustment and reduce the disease burden on the individual patients, the families, and the health care system. As social cognitive theory (Bandura, 1986) suggests, personal factors do not function alone, instead they operate in the social context on chronic illness adjustment. The theory highlights the necessity of investigating the interplay of both personal factors and social environmental factors on chronic illness adjustment. Different from previous literature examining personal characteristics and social environmental factors separately in the context of chronic illness, the current study focused on the interplay of one under-studied social relationship mechanism—health-related social control and one personal characteristic—personal control (self-efficacy and internal health locus of control) on chronic illness adjustment in a sample of Singaporean late-middle-aged and older adults with Type 2 diabetes. Adopting a control orientation from personal control to interpersonal control—health-related social control, the study first examined the role of personal control and then the role of health-related social control, followed by the examination of the interplay between personal control and health-related social control on diabetic adjustment.

The current study found that direct health-related social control exerts differential effects on psychological aspect of diabetic adjustment for patients with varying levels of self-efficacy. Direct health-related social control exerts a compensation effect for those relatively lower in self-efficacy, whereas it exerts an interference effect for those relatively higher in self-efficacy. It suggests that direct health-related social control may not always produce emotional distress as indicated by the dual effects model. Instead, it actually compensates for those lower in self-efficacy, perhaps the reminders from family

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members could help patients with their diabetes management or at least help reduce the disease burden on the patients, leading to lower level of emotional distress and few depressive symptoms. In contrast, for patients higher in self-efficacy, direct health-related social control may be perceived as a threat to their autonomy or a sign of mistrust in their ability to engage in diabetes self-management, and may lead to higher emotional distress and more depressive symptoms. The compensation and interference effect could help explain the inconsistent effect of direct health-related social control in patients with difference types of chronic diseases in the literature.

In addition, previous literature mainly focused on direct health-related social control, much less is studied on indirect health-related social control. The current study examined the role of indirect health-related social control on diabetic adjustment and more importantly the underlying mechanism. Bivariate correlation results revealed that indirect health-related social control was positively related to self-care activities, but negatively related to depressive symptoms. Moreover, internal health locus of control functions as a mediator underlying the link between indirect health-related social control and psychological aspect of diabetic adjustment. Supplementary analysis also showed that indirect health-related social control could impact psychological and behavioral diabetic adjustment via a two-stage mediation model—relationship satisfaction and self-efficacy sequentially. It provides a more comprehensive understanding of the relationship between indirect health-related social control and diabetic adjustment outcomes.

Lastly, the current study also provides evidence to the statement that self-efficacy and internal health locus of control are two important yet distinct aspects of personal control. Results found similarity and difference of self-efficacy and internal health locus

of control. Firstly, results on the relationship between the two personal control beliefs and diabetic adjustment outcomes showed that both self-efficacy and internal health locus of control function as a buffer of diabetes-related emotional distress and depressive symptoms, whereas self-efficacy has additional behavioral facilitating effect. Secondly, self-efficacy serves as a moderator of the link between direct health-related social control and psychological aspect of diabetic adjustment. Thirdly, internal health locus of control serves as a mediator underlying the link between indirect health-related social control and psychological aspect of diabetic adjustment, whereas self-efficacy is a significant mediator in the two-stage mediation model.

6.8   Implications

The current study has potential implications for patients who are dealing with a chronic illness and their family members. From patients' perspective, a stronger sense of personal control could facilitate psychological and behavioral aspects of diabetic adjustment. Thus, interventions may target patients' personal control in order to facilitate their diabetic adjustment. For instance, nurses in the community can teach patients disease management skills to increase patients' self-efficacy. Furthermore, given that health-related social control from family members is not always beneficial for patients, and it highlights the importance of open communication between patients and family members. It is helpful for patients to communicate their needs and preferences with their family members, and identify the things they want family members to get involved in. Open communication may reduce the undesirable consequences of direct health-related social control for those with higher self-efficacy, and increase the desirable effect of direct health-related social control for those with lower self-efficacy.

From the perspective of family members, despite their good intentions, their influence may sometimes backfire, so it is equally important for families to consider patients' self-efficacy level and understand patients' psychological needs. Again, open communication with patients could help family members decide when to offer help and what types of help to offer. When family members get involved in patients' diabetes management, it is helpful if they could understand patients' perspective and feelings, and provide advice without pressure or demand, which in turn promotes patients' autonomous motivation. Furthermore, given the benefits of indirect health-related social control, it would also benefit to create a supportive family environment to encourage patients' responsibility to family members to stay healthy.

Taken together, it would benefit from community-based interventions by enhancing patients' self-efficacy and internal health locus of control, and teaching both patients and family members communication skills in order to enhance the benefits and reduce the adverse effects of the social influence from family members, and help patients achieve optimal diabetic adjustment.

6.9 Limitations and Future Directions

Several limitations for the study should be noted. Firstly, it is important to consider the potential selection bias of participants. It is possible that those who are active in their self-care activities or who achieve relatively good glycemic control came to participate in this study. This may limit the generalizability of the results. Secondly, glycemic control was measured by participants' self-reported most recent HbA1c. However, patients' self-reported HbA1c is limited in terms of the accuracy (Heisler, Piette, Spencer, Kieffer, & Vijan, 2005). Future research with HbA1c measured using

patients' blood sample is needed to confirm the results of the current study. Moreover, the status of Type 2 diabetes was also self-reported by patients. Despite the evidence in the literature showing that patients' self-reported diabetes is reliable with good sensitivity and specificity (Huerta, Tormo, Egea-Caparrós, Ortolá-Devesa, & NavarroSchneider, 2009; Pankow, Heiss, & Selvin, 2012), such information from medical chart review is merited in order to confirm patients' health status. Thirdly, patients without other major chronic illnesses were recruited. However, it is quite possible that patients' other minor health conditions, such as hypertension, may also elicit direct health-related social control from family members, which in turn has spreading effect on patients' diabetic adjustment. However, the current study cannot examine such effect. Future studies are needed to measure health-related social control on other health issues and examine its effect on diabetic adjustment. Fourthly, health-related social control from family members was measured by patients' self-report, rather than family members' report. Despite the evidence showing a moderate concordance between patients' self-reported health-related social control and family members' reports (Helgeson et al., 2004), it is quite possible that there is discrepancy between patients' self-report and family members' report of health-related social control. For instance, social network members may provide support, but recipients may not recognize the support, which is called "invisible support" (Bolger, Zuckerman, & Kessler, 2000). Thus it is reasonable to infer the discrepancy between patients' self-reported health-related social control and family members' report. Moreover, patients' individual difference characteristics may influence their perception of family members' provision of health-related social control, and the two types of measurements may have differential correlations with patients' diabetic adjustment

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outcomes via different mechanisms. Thus future research is needed to investigate how health-related social control reported by patients and family members operate on patients' diabetic adjustment differently. Fifthly, depressive symptoms were measured by patients' self-report on PHQ-9, which has been proved to be a reliable scale (Kroenke, Spitzer, & Williams, 2001; Spitzer, Kroenke, & Williams, 1999). However, the scale contains several somatic items, which could be confounded by the physical symptoms of diabetes. A structured clinical interview, known as the gold standard for assessing depression, is needed in future studies in order to increase the accuracy of depression screening. Sixthly, this study used a cross-sectional survey, thus it cannot demonstrate the causality among the variables, and the findings of the study should be cautiously interpreted. For instance, the mediation model suggests that personal control mediated the relationship between indirect health-related social control and the psychological aspect of diabetic adjustment outcomes. However, due to the cross-sectional nature of the study, the results cannot provide the directionality between the variables (e.g., indirect health-related social control is an antecedent of internal health locus of control, which is in turn an antecedent of psychological diabetic adjustment). Given the other possible explanations of the results, alternative models were examined in order to exclude such possibilities. Examination of alternative models may partially remedy the limitations of cross-sectional study, but definitely longitudinal studies are needed to substantiate the causal relationships between the variables in the future study.

Last but not least, the current study focused on Chinese Singaporeans. Given Singapore is a multi-ethnic society, the results of the current study may not be able to be generalized to other ethnic groups, such as Malay or Indian. However, I also administered

the same set of survey to a sample of 49 Malay and Indian patients. The small sample

may not be able to make a meaningful comparison with the Chinese sample. But

preliminary results revealed ethnic differences in the following variables: direct health-

related social control ($t = -2.94$, $p = .004$), internal health locus of control ($t = 2.68$, p

$= .008$), diabetes-related emotional distress ($t = -2.75$, $p = .006$), and HbA1c ($t = -2.54$, p

$= .014$). More specifically, Chinese patients reported lower direct health-related social

control, lower level of diabetes-related emotional distress and HbA1c, but higher internal

health locus of control than their Malay/Indian counterparts. This implies that Chinese

patients seemed to achieve better diabetic adjustment than Malay/Indian patients. Perhaps

Malay/Indian patients had poorer adjustment, thus they received more direct health-

related social control from their family members, which aimed to correct their behaviors

and improve their adjustment. It would be beneficial for future research to examine

factors that contribute to ethnic differences in diabetic adjustment, perhaps by recruiting

more Malay/Indian patients.

6.10   Conclusion

Despite these limitations, the study examined the role of personal control and

health-related social control, and the interplay of both direct and indirect social control

and personal control on diabetic adjustment outcomes in a sample of Singaporean late-

middle-aged and older adults with Type 2 diabetes. To the best of my knowledge, this

study is the first attempt in the health-related social control l iterature to test the

moderating/mediating role of self-efficacy and internal health locus of control. It provides

a clearer picture of how social environmental and personal factors jointly determine

diabetic adjustment outcomes. The study highlights the importance for family members

to consider patients' self-efficacy level when they are trying to get involved in patients'

diabetes management, although they are well-intended. Intervention programs can be

created to target patients' personal control beliefs, and to teach both patients and family

members effective communication strategies, in order to better prompt patients to adhere

to regimen and enhance their quality of life. Taken together, if used appropriately,

effective social control from family members is a useful way of helping patients manage

diabetes and achieve better diabetic adjustment.

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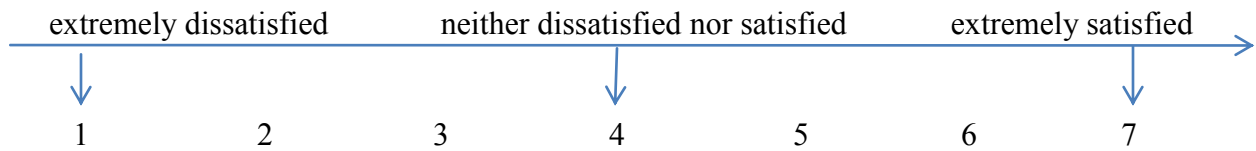
Appendix

<u>Psychosocial Factors of Diabetic Adjustment Survey</u>

Thank you for participating in this study. This study is about your experience on how you cope with diabetes. Your information will be completely confidential. Please answer the questions based on your experience with the disease and your experience with your family.

A. General information (Please tick √ where applicable)

(1) Age: _____

(2) Gender: Male _____   Female _____

(3) Race: Chinese_____   Malay_____   Indian_____   Other_____(please specify)

(4) Employment: Retired _____   Unemployed/homemaker _____

Full-time _____   Part-time _____   Other_____ (please specify)

(5) Marital Status: Married_____   Divorced/Separated _____   Widowed_____

Single _____   Other_____

(6) Living Arrangement: Live only with spouse _____   Live only with children _____

Live alone_____   Live with spouse and children_____   Other_____ (please specify)

(7) Highest Educational Level: Primary _____   Secondary _____

JC/Polytechnic _____   University _____   Other_____

(8) Your Religion: Christianity _____   Buddhism_____   Taoism_____   Islam_____

Hinduism_____   Other religions_____   No religion_____

(9) Medical Insurance: Yes _____   No _____

(10) How many people are there in your household? _____ (including yourself)

(11) Type of Diabetes: Type 1_____   Type 2_____   Other_____

(12) Duration of Diabetes: _____years _____months

(13) Treatment: insulin injection _____   oral hypoglycemic medication_____

both insulin injection and oral hypoglycemic medication_____   other_____

(14) Other Major Chronic Diseases:

hypertension_____   hyperlipidemia_____   heart disease_____   cancer _____   arthritis____

other___

(15)Glucose Level: fasting glucose level _____; most recent HbA1c _____ (write the number)

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(16) How satisfied do you feel about the relationship with your family?

extremely dissatisfied   neither dissatisfied nor satisfied   extremely satisfied

1   2   3   4   5   6   7

B. People can influence each other's health behaviors in a lot of different ways. For each of the following items, please rate how true each item is of your relationships with your family. Try to base your answers on your past experience with your family.

(1) How often did your family members remind you to **eat healthy**?

    A. never   B. seldom   C. sometimes   D. often

(2) How often did your family members remind you to **exercise**?

    A. never   B. seldom   C. sometimes   D. often

(3) How often did your family members remind you to **monitor your blood sugar**?

    A. never   B. seldom   C. sometimes   D. often

(4) How often did your family members remind you to take **diabetes medication (oral and/or insulin)**?

    A. never   B. seldom   C. sometimes   D. often

(5) How often did your family members remind you of **your foot care**?

    A. never   B. seldom   C. sometimes   D. often

(6) How often did your family members remind you to **quit smoking**? (mark if applicable to you)

    A. never   B. seldom   C. sometimes   D. often

(7) I feel a sense of responsibility to my family to try to stay in good health.

    A. Strongly disagree   B. disagree   C. agree   D. strongly agree

(8) My family expects me to try to stay healthy.

    A. Strongly disagree   B. disagree   C. agree   D. strongly agree

(9) If I didn't make an effort to try to be healthy, I think that my family will be disappointed.

    A. Strongly disagree   B. disagree   C. agree   D. strongly agree

(10)   It is important to my family that I make an attempt to be physically fit for health reasons.

    A. Strongly disagree   B. disagree   C. agree   D. strongly agree

C. Each item below is a belief statement about your medical condition with which you may agree or disagree. Please make sure that you answer EVERY ITEM and that you circle ONLY ONE number per item. This is a measure of your personal beliefs; there are no right or wrong answers.

Strongly Disagree	Moderately Disagree	Slightly Disagree	Slightly Agree	Moderately Agree	Strongly Agree
1	2	3	4	5	6

1. If my condition (diabetes) worsens, it is my own behavior which determines how soon I will feel better again.	1	2	3	4	5	6
2. As to my condition (diabetes), what will be will be.	1	2	3	4	5	6
3. If I see my doctor regularly, I am less likely to have problems with my condition (diabetes).	1	2	3	4	5	6
4. Most things that affect my condition (diabetes) happen to me by chance.	1	2	3	4	5	6
5. Whenever my condition (diabetes) worsens, I should consult a medically trained professional.	1	2	3	4	5	6
6. I am directly responsible for my condition (diabetes) getting better or worse.	1	2	3	4	5	6
7. Other people play a big role in whether my condition (diabetes) improves, stays the same, or gets worse.	1	2	3	4	5	6
8. Whatever goes wrong with my condition (diabetes) is my own fault.	1	2	3	4	5	6
9. Luck plays a big part in determining how my condition (diabetes) improves.	1	2	3	4	5	6
10. In order for my condition (diabetes) to improve, it is up to other people to see that the right things happen.	1	2	3	4	5	6
11. Whatever improvement occurs with my condition (diabetes) is largely a matter of good fortune.	1	2	3	4	5	6
12. The main thing which affects my condition (diabetes) is what I myself do.	1	2	3	4	5	6
13. I deserve the credit when my condition (diabetes) improves and the blame when it gets worse.	1	2	3	4	5	6
14. Following doctor's orders to the letter is the best way to keep my condition (diabetes) from getting any worse.	1	2	3	4	5	6
15. If my condition (diabetes) worsens, it is a matter of fate.	1	2	3	4	5	6
16. If I am lucky, my condition (diabetes) will get better.	1	2	3	4	5	6
17. If my condition (diabetes) takes a turn for the worse, it is because I have not been taking proper care of myself.	1	2	3	4	5	6
18. The type of help I receive from other people determines how soon my condition (diabetes) improves.	1	2	3	4	5	6

D. This questionnaire is a series of statements about your personal attitudes. Please be very truthful and describe yourself as you really are, not as you would like to be. Please rate the items **by writing a number ranging** from 0 = "not at all confident" to 100 = "very confident".

item	score
1. How confident are you in your ability to follow your diet?	
2. How confident are you in your ability to test your blood sugar at the recommended frequency?	
3. How confident are you in your ability to exercise regularly?	
4. How confident are you in your ability to keep your weight under control?	
5. How confident are you in your ability to keep your blood sugar level under control?	
6. How confident are you in your ability to resist food temptations?	
7. How confident are you in your ability to follow your diabetes treatment (diet, medication, blood sugar testing, and exercise)?	

E. The questions below ask you about your diabetes self-care activities <u>during the past 7 days</u>. If you were sick during the past 7 days, please think back to the last 7 days that you were not sick.

Items	Number of days							
1. How many of the last seven days have you followed a healthy eating plan?	0	1	2	3	4	5	6	7
2. On average, over the past month, how many days per week have you followed your eating plan?	0	1	2	3	4	5	6	7
3. On how many of the last seven days did you eat five servings of fruits and vegetables?	0	1	2	3	4	5	6	7
4. On how many of the last seven days did you eat high fat foods such as red meat or full-fat dairy products?	0	1	2	3	4	5	6	7
5. On how many of the last seven days did you participate in at least 30 minutes of physical activity? (total minutes of continuous activity, including walking)	0	1	2	3	4	5	6	7
6. On how many of the last seven days did you participate in a specific exercise session (such as swimming, walking, biking) other than what you do around the house or as part of your work?	0	1	2	3	4	5	6	7
7. On how many of the last seven days did you test your blood sugar?	0	1	2	3	4	5	6	7
8. On how many of the last seven days did you test your blood sugar the number of times recommended by your health care provider?	0	1	2	3	4	5	6	7
9. On how many of the last seven days did you take recommended diabetes oral medication?	0	1	2	3	4	5	6	7
10. On how many of the last seven days did you inject recommended insulin?	0	1	2	3	4	5	6	7
11. On how many of the last seven days did you check your feet?	0	1	2	3	4	5	6	7
12. On how many of the last seven days did you inspect the inside of your shoes?	0	1	2	3	4	5	6	7
13. Have you smoked a cigarette-even one puff- during the past seven days?	0. No 1. Yes. If yes, how many cigarettes did you smoke on an average day? Number of cigarettes:_____							

F. Which of the following diabetes issues is currently a problem for you? Circle the number that best describes you.

not a problem	minor problem	moderate problem	somewhat serious problem	serious problem
0	1	2	3	4

1. Not having clear and concrete goals for your diabetes care	0	1	2	3	4
2. Feeling discouraged with your diabetes treatment plan	0	1	2	3	4
3. Feeling scared when you think about living with diabetes	0	1	2	3	4
4. Uncomfortable social situations related to your diabetes care (e.g., people telling you what to eat)	0	1	2	3	4
5. Feelings of deprivation regarding food and meals	0	1	2	3	4
6. Feeling depressed when you think about living with diabetes	0	1	2	3	4
7. Not knowing if your mood or feelings are related to your diabetes	0	1	2	3	4
8. Feeling overwhelmed by your diabetes	0	1	2	3	4
9. Worrying about low blood sugar reactions	0	1	2	3	4
10. Feeling angry when you think about living with diabetes	0	1	2	3	4
11. Feeling constantly concerned about food and eating	0	1	2	3	4
12. Worrying about the future and the possibility of serious complications	0	1	2	3	4
13. Feelings of guilt or anxiety when you get off track with your diabetes management	0	1	2	3	4
14. Not "accepting" your diabetes	0	1	2	3	4
15. Feeling unsatisfied with your diabetes physician	0	1	2	3	4
16. Feeling that diabetes is taking up too much of your mental and physical energy every day	0	1	2	3	4
17. Feeling alone with your diabetes	0	1	2	3	4
18. Feeling that your friends and family are not supportive of your diabetes management efforts	0	1	2	3	4
19. Coping with complications of diabetes	0	1	2	3	4
20. Feeling "burned out" by the constant effort needed to manage diabetes	0	1	2	3	4

G. Over the last 2 weeks, how often have you been bothered by any of the following problems? Please circle number that best describes you.

not at all	several days	more than half the days	nearly every day
0	1	2	3

1. Little interest or pleasure in doing things	0	1	2	3
2. Feeling down, depressed, or hopeless	0	1	2	3
3. Trouble falling or staying asleep, or sleeping too much	0	1	2	3
4. Feeling tired or having little energy	0	1	2	3
5. Poor appetite or overeating	0	1	2	3
6. Feeling bad about yourself—or that you are a failure or have let yourself or your family down	0	1	2	3
7. Trouble concentrating on things, such as reading the newspaper or watching television	0	1	2	3
8. Moving or speaking so slowly that other people could have noticed. Or the opposite—being so fidgety or restless that you have been moving around a lot more than usual	0	1	2	3
9. Thoughts that you would be better off dead, or of hurting yourself in some way	0	1	2	3

If you checked off any problems, how difficult have these problems made it for you to do your work, take care of things at home, or get along with other people? _____

A. not difficult at all   B. somewhat difficult   C. very difficult   D. extremely difficult

Thank you very much for your participation!