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AGING AND TECHNOLOGY PERSPECTIVES OF WEB-BASED CHRONIC
DISEASE SELF-MANAGEMENT

A Dissertation

Presented to

the Faculty of the Graduate School of Social Work

University of Denver

In Partial Fulfillment

of the Requirements for the Degree

Doctor of Philosophy

by

Jennifer Marie Dickman Portz

June 2013

Advisor: Walter F. LaMendola, PhD, Professor

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Abstract

Many people suffer from chronic disease; however, older adults are at greatest risk of chronic conditions. Although social workers regularly engage with chronically ill older adults, they are not noticeably involved with the research and development of chronic disease management. As such, with recent movements toward health information technology, the efficacy of technology-based chronic disease management is not well established for older adults. Informed by theories of self-management, human development, and technology design, this research investigated lifespan differences of web-based chronic disease self-management. Using a sequential mixed methods design, a secondary data analysis of a diabetes specific web-based self-management intervention (n=462) was performed, followed by qualitative focus groups with 40 older intervention participants, and then mixed for overall interpretation. Results indicated that social workers must take a leadership role in the evaluation and implementation of web-based self-management for older adults to address identified lifespan differences.

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Chapter One: Introduction

This study deals with one of the most significant issues facing the social work profession in the United States over the next decade: the role of social work in chronic disease management with older adults. Chronic disease is the leading cause of death and accounts for the highest healthcare spending. Due to the expected growth of the aging population and the age associated risk for chronic disease, increases in the rates and costs of chronic disease are also anticipated. The efficacy of chronic disease self-management across the lifespan is not well established, yet the approach holds great promise particularly when combined with emerging technologies. This research investigates possible lifespan differences in self-management and explores elements of technology for a diabetes specific web-based self-management intervention, My Path to Healthy Life. The engagement of older adults who participated in the intervention is examined to explore outcomes of interest to social work.

This sequential mixed method study took place in three consecutive phases. In the first phase, a secondary analysis of the data collected for the National Institute of Health funded study, My Path to Healthy Life, was conducted to examine the differential influence of age on selected factors, processes, and outcomes. In the second phase, results from the first phase analysis provided direction for developing a deeper understanding of lifespan differences in contextual factors, technology and self-

management processes, and outcomes among older adults who participated in the experiment. To explore older adults' experience and perceptions of web-based self-management interventions, 40 older adults from the My Path to Healthy Life trial participated in 5 focus groups. In the third phase of the study, the results of the first two phases were combined and analyzed using both quantitative and interpretive techniques to explain the relevant components of web-based self-management for older adults to inform future design and denote directions social work might take to be usefully involved in self-management.

This introduction section provides background information describing the current issue in which social work is challenged. Important definitions of key terms are first described, followed by the prevalence of chronic disease among older adults, and the consequences of increased risk for older adults, their families, and society. The current role of social work and new trends in chronic disease management are discussed, ending the chapter with specific research questions.

Definitions

Chronic disease. Chronic diseases, or chronic illnesses, are diseases or adverse health conditions of long duration with generally slow progression. Common examples such as heart disease, stroke, cancer, chronic respiratory diseases and diabetes, are the leading causes of mortality worldwide, representing 63% of all deaths (World Health Organization, 2013). According to the Centers for Disease Control and Prevention (CDC) (n.d.) one out of every two Americans has at least one chronic illness causing 70% of deaths in the U.S, and incidence of chronic illness is expected to increase 42%

by 2030 (Saxton, 2011). It is estimated that about 7% of adults have asthma, 10% have diabetes, and 12% have heart disease (CDC). Heart disease, cancer, and stroke are the leading causes of death; arthritis is the most common cause of disability; and diabetes is the leading cause of kidney failure, non-traumatic extremity amputation, and blindness (CDC). Approximately 4.5 million Americans are affected by Alzheimer's disease, and nearly 192,000 breast cancer cases are diagnosed each year (Center for Managing Chronic Disease, n.d.). Rates of obesity have doubled in the past 30 years; currently one third of the U.S. population is obese (CDC). The U.S. spends 70% of health and social care funding on the treatment of chronic illness, a total impact of 1.3 trillion dollars annually (Saxton, 2011).

Older adult. While both the CDC and the American Association for Retired Persons (AARP) define a senior or older adult as any person over the age 50 (AARP, n.d.), gerontologists focus on those over the age of 60 (American Psychological Association, 2011; Poon, 2003). The U.S. government has several indicators of older age. Medicare and Social Security benefits for the old are offered to those over the age of 65, and official government retirement age is 62 (65 for those born after 1937, and 67 for those born after 1959) (Social Security Administration, 2011). While 65 and older is a common indicator, many researchers and health professionals divide this group into younger old (65-75), older old (75-85) and oldest old (85+) (Poon, 2003). Although this paper focuses on an older adult population that is over the age of 60, information regarding those aged 50-60 was not excluded.

Aging and Chronic Disease

The last century has seen a burgeoning aging population that is only expected to grow. The older population grew from 3 million in 1900 to a total of 40 million in 2010 (Federal Interagency Forum on Aging-Related Statistics, 2012). In 2011, the first of the “baby boomers” turned 65 years of age; by 2020, it is estimated that the population of people over the age of 65 will reach 70 million, representing about 20% of the American population. People over the age of 85 are the fastest growing segment, estimated to reach 5% of the population by 2050 (Federal Interagency Forum on Aging-Related Statistics, 2012). As the number of older adults is expected to double by 2030, it is important to examine the prevalence of chronic illness within the context of a growing aging population.

Currently, there is a high number of older adults with chronic illness. In the United States, nearly 50% of adults over 50, and 88% over 65 have at least one chronic condition (CDC, 2007). In conjunction with higher illness rates, older adults are also more likely than younger adults to have multiple chronic conditions, i.e. co-morbidity (The Henry J. Kaiser Family Foundation, 2010). The most common chronic conditions among older adults are hypertension (53.3%), arthritis (49.5%), heart disease (30.9%), cancer (21.1%), and diabetes (18%); however, rates for mental illness are also high, showing that 13% of adults aged 65-74 and 19% aged 85 and older report chronic depressive symptoms (The Federal Interagency Forum on Aging-Related Statistics, 2010). Five of the seven leading causes of death among older adults are chronic conditions, starting with heart disease, followed by cancer, stroke, respiratory disease, Alzheimer’s disease, diabetes, and influenza/pneumonia (Morewitz & Goldstein, 2010).

Older adults also experience greater functional limitations due to chronic illness. Some common limitations include hearing impairment (36%), vision trouble (18%), edentulism (27%), and at least one deficit in instrumental activities of daily living (IADL) (42%) (The Federal Interagency Forum on Aging-Related Statistics, 2010). The most common debilitating conditions for older adults are mental distress, stroke, vision and hearing limitations, diabetes, and lung conditions(Albert, 2010).

Chronic disease results in major consequences for the individual, including loss of function, decline in mobility, loss of independence, disability, pain, and death. Chronic illness among older adults is related to limitations in physical and mental activities such as speech, vision, and ambulation. Progression of chronic illness often results in disability impacting essential activities of daily living (ADL) of work, household management, personal care, hobbies and recreation, socialization, childcare, errands, sleep, and transportation (Cavanaugh & Blanchard-Fields, 2006). Nearly half of older adults over the age of 85 need assistance with mobility, bathing, preparing meals, and other ADLs (The Federal Interagency Forum on Aging-Related Statistics, 2010). Chronically ill older adults are also more likely to visit their doctor, be admitted to a hospital, stay longer in a hospital, and need long-term care services (Albert, 2010).

As such, healthcare costs have been found to increase with age and number of chronic conditions. The average annual cost of prescriptions for an older adult without a chronic condition is \$800, while those with five or more chronic conditions average \$3,900 (Federal Inter Agency on Aging Related Statistics, 2008). Cost of healthcare varies across gender and race, showing that women, African Americans, and Hispanics incur the highest out-of-pocket health costs (Albert, 2010; Loue, 2007).

Older adults with diabetes experience higher rates of premature death, disability, heart disease, and stroke (California Healthcare Foundation/American Geriatrics Society Panel on Improving Care for Elders with Diabetes, 2003) and are more likely to develop neuropathies, sexual dysfunction, and bladder dysfunction (NDIC, 2007). Diabetic older adults have higher rates of depression, cognitive dysfunction, incontinence, falls, and chronic pain (California Healthcare Foundation/American Geriatrics Society Panel on Improving Care for Elders with Diabetes, 2003; Rosenstock, 2001). Older adults with arthritis often experience physical and mental health problems, chronic pain, and are at increased risk of falls (Gerasimova, 2006), injury and infection (Doran, Crowson, Pond, O’Fallon, & Gabriel, 2002) and additional co-morbidities (Caporali et al., 2005). Those with arthritis are also less likely to be active and have greater impairment to functioning (Stang, 2006; Verbrugge & Juarez, 2006). Older adults with heart disease, particularly those suffering from a heart attack, bear significant disability and quality of life losses, including decreases in physical functioning, and increases in depressive symptoms and co-morbidity. Chronic conditions such as dementia, Parkinson’s, stroke, hip fracture, and depressive symptoms are strongly associated with long-term institutionalization (Nihtila et al., 2007).

Chronic illness impacts caregivers as well. More than 22 million caregivers provide care for older people (Beers, 2006). Families and friends who care for older adults with chronic illness take on major responsibilities, including care management, medical decision making, and patient advocacy which can adversely affect the family structural norms, communication processes, and family beliefs (Almgren & Diwan, 2009; Auslander & Freedenthal, 2006; Berkman, 2006). While providing care for loved-ones

can be rewarding (Beers, 2006) incidence of social isolation, stress, depression, reduced quality of life (Roth, Perkins, Wadley, Temple, & Haley, 2009), and physical/mental illness is high among caregivers (Family Caregiver Alliance, National Center on Caregiving, n.d.), especially those that care for loved-ones with dementia (Cavanaugh & Blanchard-Fields, 2006; Rowe, 2008). As a result of providing care, informal caregivers are estimated to lose on average over \$25,000 in Social Security benefits, \$67,000 in pension, and nearly \$567,000 in wages, a total loss of \$659,000 over a lifetime (Family Caregiver Alliance, National Center on Caregiving, n.d.).

Spending related to chronic disease is estimated to reach \$6 trillion annually by 2050 (DeVol & Bedroussian, 2007), and Medicare and Medicaid spending is substantially higher for patients with multiple diagnoses. Medicare beneficiaries without a chronic condition incur an average \$4,718 in health care costs compared to those with more than 5 conditions who incur an average \$20,334 (The Henry J. Kaiser Family Foundation, 2010). Approximately 1 out of every 10 healthcare dollars is spent on diabetes, showing that in 2007, the national cost of diabetes exceeded \$174 billion (NDIC, 2007). In 2010, the total cost of cardiovascular disease was estimated at \$444 billion, 1 out of every 6 healthcare dollars (CDC, 2010). Cost of other common chronic conditions include, arthritis \$127 billion (CDC, 2003), dementia \$76 billion (Alzheimer's Association International, 2007), cancer \$125 billion (National Cancer Institute, 2011), and respiratory diseases \$144 billion (Agency for Healthcare Research and Quality, 2007). Between 1997 and 2006, Medicare spending increased for all chronic conditions: 81% for hypertension, 65% for heart disease, and 36-37% for diabetes, arthritis, mental illness and COPD (DeVol & Bedroussian, 2007).

Social Work and Chronic Disease Management

With a rich history of promoting healthcare services and improving public health conditions, today social workers are found in every aspect of the healthcare system. Social workers regularly interact with individuals impacted by chronic illness particularly in settings of community based care, palliative care, rehabilitation and geriatric services (NASW, 2005). According to recent surveys by the National Association of Social Workers (NASW), 14% of social workers specialize in health practice, and 9% practice specifically with older adults (NASW Membership Workforce, 2008). Social workers responded that 13% of consumers' primary diagnosis was a "health concern" and more than 36% had at least one chronic condition (NASW Practice Research Network, 2005). Given that social workers frequently practice with individuals, groups and organizations experiencing the challenges of chronic disease, social workers have much to offer in the behavioral change interventions, and ongoing health maintenance (Auslander & Freedenthal, 2006). Social workers have substantial knowledge of empowerment and systems approaches that can enhance chronic disease prevention and management for older adults.

Through the promotion of self-determination and dignity of people, the *Code of Ethics* directs social workers to participate in healthcare focusing on individual and social wellbeing (NASW, 2008). However, these practice standards are not noticeably pursued for chronic disease management. Since the 1980s, social workers appear to have lost their place in the management of chronic disease. A search of literature in Social Work Abstracts regarding chronic disease results in a total of 25 articles, of which 17 were published prior to 1998. Searches through Google Scholar resulted in similar findings;

the majority of publications noting social work in chronic disease care were dated between 1970 and 1990. In 2000, it was found that only three randomized trials related to social work and chronic disease management were published since 1966; calling for further research to “clarify social workers role in chronic disease care” (Wagner, 2000). If social workers are not involved in the research development and intervention of chronic disease management, important issues related to social work, such as effectiveness and/or applicability of interventions with vulnerable and marginalized populations will likely be ignored. This is the case with new trends in chronic disease management for older adults.

With the emergence of successful and optimal aging perspectives, the 1990 publication of Healthy People 2000: National Disease Prevention and Health Promotion Objectives first reframed the issue of chronic illness as a normal aspect of aging to support a new concept of healthy aging and health promotion (Cavanaugh & Blanchard-Fields, 2006; Hudson, 2010). This shift promotes the idea that disease management, meaning coordinated care for individuals with significant self-care disease needs (Care Continuum Alliance, n.d.), rather than acute treatment models, as the focus for healthcare systems. However, disease management requires more than in-patient care traditionally seen in treatment modalities; much of the prevention and health promotion activities take place outside of the clinical setting. The handling of outpatient day-to-day care, such as medication adherence, diet management, and changing and maintaining healthy behaviors refers to chronic disease self-management, or simply *self-management* (SM) (Bodenheimer, 2002; Lorig & Holman, 2003).

With the rise of new technology, SM has been combined with health information technology (HIT) methodologies to promote health. HIT refers to the exchange of health information in an electronic format (ONC, 2011). The concepts of both SM and HIT expanded in the 1990s and have claimed a prominent role in healthcare literature over the last decade (Eysenbach, 2001; Hsu, 2004). The expansion of the internet, e-health, and electronic communication within the health sector (World Health Organization, 2011) gave way to new technologies notably shaping the delivery of healthcare. With booming information technology, pressure to establish cost-effective chronic disease management programming, and strong theoretical and empirical foundations for SM on successful health outcomes, HIT formats appear particularly appealing.

This dissertation focuses on a popular HIT chronic disease management intervention delivered through the internet known as *web-based chronic disease self-management* (web-based SM). Emerging trends in healthy aging perspectives and healthcare technology indicate that web-based SM interventions may improve chronic illness outcomes for older adults (Bond, Burr, Wolf, & Feldt, 2010; Bond et al., 2007). However, current literature gaps exist regarding web-based SM, technology engagement and aging considerations.

Although derived from health models, web-based SM often lacks the incorporation of technology perspectives. For example, in an examination of participant engagement in a web-based SM trial, Glasgow et al. (2011) found that participant utilization of the website and self-monitoring dramatically decreased after 6 months. Although efforts are made by web-based SM to promote engagement, interventions lack the qualities and design support features promoted by Fogg and his colleagues at

Stanford's Persuasive Tech Lab, who specifically explore the use of technology to change behaviors and attitudes, known as *persuasive technology*. While health promotion and technology perspectives have been developed separately, as health interventions continue to be technology-mediated, it will be increasingly important to integrate these perspectives.

In addition to the continued segregation of health and technology perspectives, web-based SM interventions are not commonly directed toward an aging population. Although many Americans suffer from chronic disease and health concerns, the incidence of chronic conditions and co-morbidity increases with age. Although HIT is used for health prevention and promotion among older adults, as social workers are well aware, it cannot be assumed that older adults have the same needs as younger populations in regards to health management or technology use. As a part of this dissertation, this research investigates possible age-related differences and explores elements of persuasive technology for a diabetes specific web-based SM intervention, *My Path to Healthy Life*.

From a health perspective, older adults and their families have much to gain from web-based SM, to improve the general wellbeing of individuals, reduce caregiver burden, and provide a unique opportunity for older adults to actively engage in their health (Bertera, Bertera, Morgan, Wuertz, & Attey, 2007; Cresci, Yarandi, & Morrell, 2010; Flynn, Smith, & Freese, 2006; Selwyn, Gorard, Furlong, & Madden, 2003). From an economic and public health perspective, the success of web-based SM could profoundly affect healthcare organizations and healthcare funders, particularly Medicare and Medicaid. Demonstrated intervention effectiveness and cost efficiency of web-based SM could improve the health of patients using more affordable approaches, while reducing

the need for clinical and acute care. If these benefits could be demonstrated, they have the potential to mitigate the exorbitant cost of chronic illness on healthcare systems (Barr, 2007; Hudson, 2010). The success of web-based SM could provide an opportunity for social workers to improve the social condition by offering affordable, disease management supports to aid at risk populations, including older adults, to engage in healthy living and enhanced wellbeing.

Chapter Summary

Over the next six chapters, this dissertation investigates relevant components of web-based SM for older adults to inform future intervention design and evaluation. Chapter two presents several important theoretical frameworks for this research and the current knowledge regarding web-based SM specifically for older adults. Chronic disease SM is first defined followed by the presentation of contemporary SM models. In addition to SM perspectives, lifespan theory is used to discuss potential age related differences in SM. The chapter moves forward to discuss technology discourse regarding persuasive technology to demonstrate the importance of integrating technology approaches with web-based SM. Current literature related to aging, SM, technology, and web-based SM are summarized, and specific research questions are presented upon conclusion of chapter two. Chapter three outlines the explanatory sequential mixed methodology employed to address these research questions. The chapter specifically describes the three phases of research that took place in sequential order, from Phase I, a secondary data analysis of a randomized control trial of a web-based diabetes specific SM intervention conducted at Kaiser Permanente Colorado (KPCO), to Phase II, a

qualitative stage utilizing focus groups with older adult participants from the intervention trial, followed by Phase III, a blending of the quantitative and qualitative findings for overall interpretation. The fourth chapter provides the quantitative Phase I findings, specifically participant characteristics and age related differences related to technology engagement, SM processes, and web-based SM intervention outcomes. The Phase II qualitative results are then presented in chapter five, reporting major themes identified from the focus groups enhancing the understanding of Phase I results. In chapter six, the previous phases' findings are then mixed by merging, connecting, and embedding the data. Chapter seven serves as a discussion piece highlighting the overall findings, implications for social work practice, study limitations, and final conclusions.

Chapter Two: Review of the Literature

Chronic Disease Self-Management

Chronic-disease *self-management* (SM) is a term used interchangeably to mean a *process*, care behaviors and routines, an *intervention*, a program or service designed to support healthy behaviors and routines, and an *outcome*, healthy behaviors and care routines as a result of intervention (Ryan & Sawin, 2009) . Although SM processes differ based on chronic illness, common care routines include, symptom recognition, medication adherence, nutrition and exercise maintenance, managing relations with family, friends and providers, and psychological response management (Bodenheimer, 2002). SM interventions support SM processes using self-efficacy and self-regulation approaches, founded in empowerment and social cognitive theory, paying particular focus to patient-specific problems, improving patient problem solving, decision making, resource utilization, provider partnership formation, and action initiation (Lorig & Holman, 2003; Lorig et al., 1999). SM empowers individuals to take responsibility in their care by handling out-patient day-to-day care, such as medication adherence, diet management, and changing and maintaining healthy behaviors (Bodenheimer, 2002; Lorig & Holman, 2003). While an exact definition of SM is not yet specified, it is commonly used in healthcare settings to indicate that individuals are active and

responsible for their health (Bährer-Kohler, 2009; Bodenheimer, 2002; Lorig & Holman, 2003; Lorig et al., 1999; Ryan & Sawin, 2009).

Contemporary models for chronic disease self-management. While founded in theories of empowerment, self-regulation, and self-efficacy (Lorig & Holman, 2003) several models were established to outline specific and necessary components of SM interventions. An early model, established by Kanfer & Gaelick-Buys in 1991, outlined a seven-phase SM model focusing on: establishing favorable starting conditions, building motivation, analyzing behavior, creating goals, selecting methods to achieve goals, evaluating success, and end of therapy.

In 2002, Glasgow et al. proposed a patient-centered, SM program called the *5 A's*, each of which represents a behavioral intervention: assess, advice, agree, assist, and arrange, emphasizing patient choice and individual relevance for sustainable behavior change (Glasgow et al., 2002; Whitlock, 2002). This model proposed the examination of knowledge and beliefs (assess) with collaborative goal setting (agree) emphasizing patient empowerment and motivational interviewing to identify specific behavioral change needs (advise) and barriers (assist) followed by ongoing support (arrange) to maintain healthy behaviors. In a later article published in 2007, Glasgow recommended integrating the *5 A's* with the *Chronic Care Model* (Wagner, 2000) emphasizing SM within the context of social and healthcare environments, connecting SM to medical support and community resources (Glasgow & Emmons, 2007). While the *5 A's* model, under the support of the Agency for Health Research and Quality, is widely used in clinical settings and the development of SM interventions, it is simply a practice model lacking underlying elements of SM.

In an effort to guide research efforts, the Yale University's Center of Self-Management, developed a framework for the study of self and family management of chronic conditions (Grey, Knafl, & Mccorkle, 2006; Grey, Knafl, Ryan, & Sawin, 2010) ascertaining that management exists within the context of families and that outcomes are influenced by risk factors related to the condition, individual, psychosocial, family, and environmental factors. The *Self and Family Management Framework* suggests that SM interventions addressing and targeting these risk factors could lead to improved management behaviors and outcomes. The framework is fundamental to the inclusion of family and risk/protective factors within the SM perspective; however the model was formulated as an initial guide for future research (Grey, Knafl, & Mccorkle, 2006).

Building upon this previous SM literature, Ryan & Sawin (2009) proposed a mid-range theory of SM focusing on the individual factors, family dyads, self-management components, and outcomes. Their *Individual and Family Self-Management Theory (IFSMT)* (Figure 1), which serves as the focus for this research, is a four level process framework outlining the impact of contextual factors with SM processes and outcomes.

Contextual factors focus on concepts related to the individual and family, physical and social environments, and specific chronic condition factors. Individual and family factors are characteristics specific to the individual or family, and would include individual characteristics, development stage, perspectives, and capabilities. Psychological and social environment considers issues of healthcare, provider settings, transportation, neighborhood, culture and social capital. Condition specific factors relate to psychological, structural, and functional characteristics of the condition and its treatment.

The context influences SM processes specific to knowledge, beliefs, self-regulation, and social facilitation. Based in theories of behavior change, self-regulation, and social support, individuals engage in healthy behaviors when they are informed, if they develop self-regulation abilities, and experience social support to positively influence these abilities. Knowledge and beliefs impact self-efficacy, outcome expectancy, and goal congruence. Self-regulation includes the processes of goal setting, self-monitoring, decision making, planning, and engaging in healthy behaviors. Social facilitations are supports, such as family and provider collaboration, that can positively influence healthy behaviors.

SM interventions typically target knowledge, self-regulation, and social facilitation to improve proximal SM behaviors while reducing individual cost of care, ultimately impacting distal outcomes including, health status, quality of life, and cost of health. However, factors in the context dimension affect one's ability to engage in SM processes directly impacting outcomes. Therefore, SM interventions should also address the context in which one self-manages.

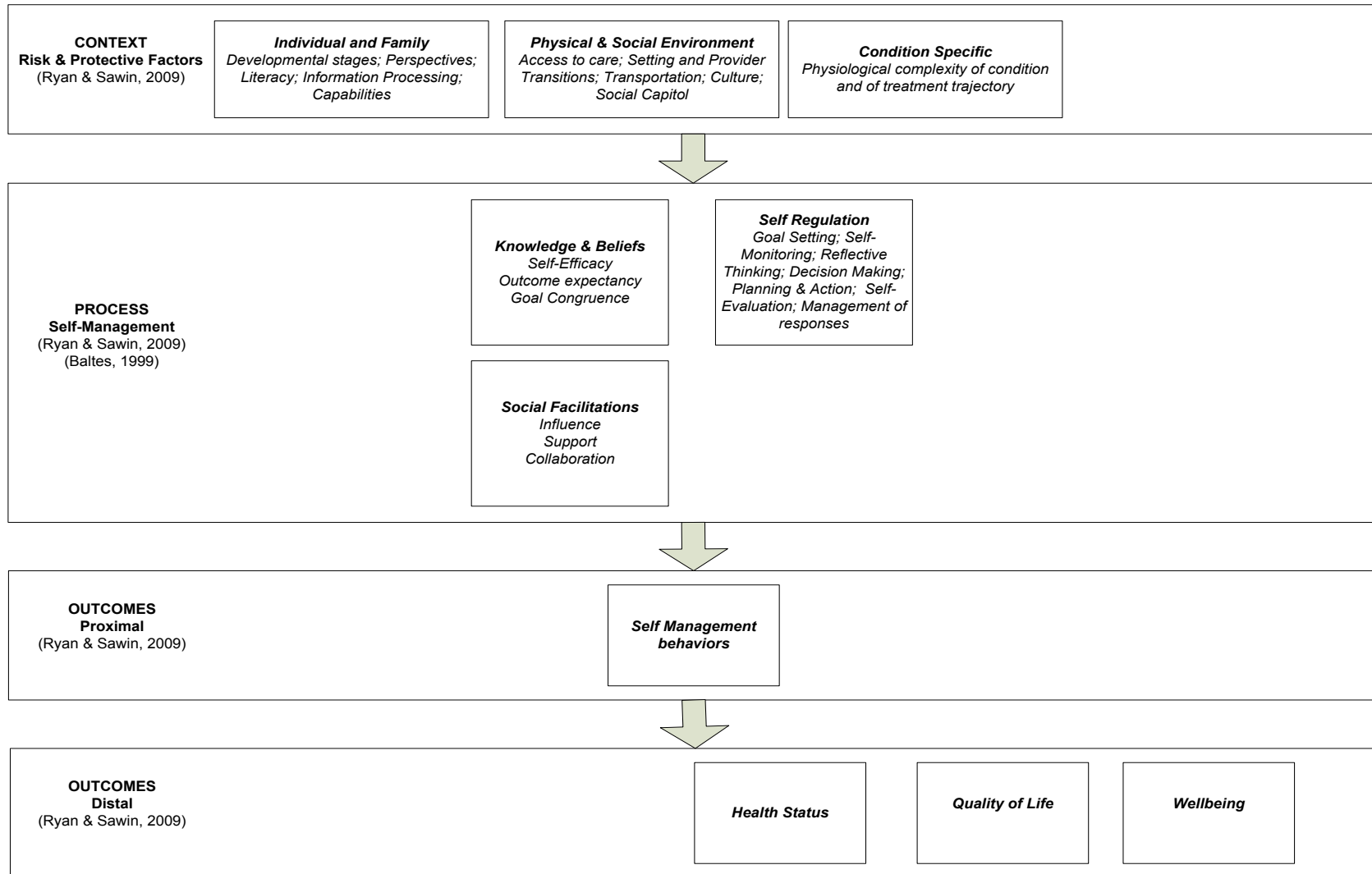


Figure 1. Individual and Family Self-Management

Effectiveness of chronic disease self-management. Recent evidence suggests that SM interventions improve health services, health conditions, and enhance self-care (Bodenheimer, 2002; Glasgow & Emmons, 2007; Lorig & Holman, 2003). While the success of SM is well reported, challenges are documented related to the definition of SM, standards for implementation, understanding the underlying mechanisms of successful outcomes, and integrating SM into healthcare systems (Bährer-Kohler, 2009; Lorig et al., 1999).

Although clarification is still needed on the standardization of SM and the underlying mechanisms of positive outcomes, reviews over the last five years found SM to increase self-efficacy, health status, and quality of life while reducing healthcare utilization and costs across multiple chronic conditions (Du & Yuan, 2010). SM interventions decreased depression and enhanced physical functioning among stroke survivors (Jones & Riazi, 2011); improved pain and disability for musculoskeletal illnesses (Shizheng Du et al., 2011); promoted diabetes specific quality of life and clinical outcomes (Heinrich, Schaper, & de Vries, 2010); stimulated healthy active lifestyles and quality of life for patients with COPD (Zagers, 2011); augmented medication taking, social functioning, and resource utilization of heart failure patients (Boren, Wakefield, Gunlock, & Wakefield, 2009); enhanced emotional status, daily living, and self-efficacy for older adults with macular degeneration (Lee, Packer, Tang, & Girdler, 2008); increased exercise and reduced pain among people with osteoarthritis (Walsh, Mitchell, Reeves, & Hurley, 2006); and improved asthma health outcomes (Willems, Joore, Hendriks, Wouters, & Severens, 2006).

Aging Perspective and Chronic Disease Self-Management

While SM models are increasing in popularity, without the consideration of aging issues these methods may not be applicable to older populations. Specifically, further testing of IFSMT is needed to provide clarity and increased understanding of mediating and moderating relationships of SM concepts to determine if these concepts are applicable to sub-populations (Ryan & Sawin, 2010). In discussing SM, it cannot be assumed that older adults have the same needs as younger populations in regard to context, SM processes, and outcomes.

From a *lifespan* perspective, which studies “the constancy and change in behavior throughout the life course, from conception to death” (Baltes, 1987, p. 611), behavioral development is explicitly age-related, indicating SM behaviors are directly influenced by the lifespan. According to the lifespan approach, there are lifelong characteristics of development, including: context, multidimensional, multidirectional, plasticity, and involves growth, maintenance and regulation (Baltes, Staudinger, & Lindenberger, 1999; Baltes, 1987, 1997; Freund & Baltes, 2002). Similar to IFSMT, lifespan development is contextual; therefore age-related, historical, and individual factors influence behavioral development. According to this position, change in SM is not only possible in later life, but inevitable and bound by one’s aging context.

Lifelong development implies that development extends over the lifespan, rather than emphasizing childhood, and suggests that change processes occur in various periods of life, even in late life. Development is also considered multidimensional integrating complex dimensions of biological, cognitive, emotional, and social factors within the

development process; simply, there is no single factor dictating development, requiring an interdisciplinary representation of behavioral development.

Traditionally, development is often regarded as a linear increase in human efficiency, but lifespan's multidirectionality posits that there is a general process of adaptation over the lifespan, with individuals experiencing both loss and gains at each phase of life. Multidirectionality indicates that as new skills are created others are lost or decrease in efficiency. Plasticity is one's capacity for change created by individual conditions and experiences.

The lifespan approach argues that development involves growth, maintenance, and regulation. As individuals age the maintenance and regulation components increase in importance, shifting to maintenance and slowed deterioration of capacities, deemphasizing growth (Willis, Schaie, & Martin, 2009). While individuals experience gains, losses, and the capacity to modify behaviors, lifespan suggests that neither the gain/loss relationship nor the range of plasticity is constant over time. While proportionate in nature across the lifespan, gains are likely to be experienced earlier in life, while loss more frequent in later life. SM processes are then stimulated by individual capacity to adapt (plasticity) and experienced loss of capabilities (multidirectionality) over the lifespan.

As a component of the lifespan perspective, the *selective optimization with compensation model (SOC)* outlines the process of adaptation to these constrictions in multidirectionality and plasticity in later life (Baltes, 1987, 1997; Martin, Deshpande-Kamat, Poon, & Johnson, 2011). Confronted with decline in resources and capacity, older adults experience increasing pressure to narrow or define goals and activities (Zarit,

2009). This process of restricting focus refers to selection, confining goals to realistic and simple functions, limiting goals to an area of expertise that can then be optimized. Despite losses, individuals must maximize gains in their selected area of expertise subsequently reducing interest in other areas. Individuals spend more time, energy and practice with the specified activity, therefore increasing or maintaining high levels of functionality in the selected area. While optimizing gains and minimizing losses, compensation refers to the acquisition of new or alternative methods of reaching selected goals once capacity is lost. When a capacity is lost, individuals adapt through the reallocation and substitution of unused or new resources, compensating for the loss to maintain functionality.

SOC impacts SM knowledge, beliefs, self-regulation and social facilitation. Self-managing older adults narrow their health goals (selection) to focus on areas in which they believe they can maintain, directly influencing self-efficacy, outcome expectancy, and goal congruence. As older adults spend more time on these specified activities (optimization), self-monitoring, decision making, planning, and social interactions may be enhanced or limited contingent on the older adult's focus. Self-regulation, social facilitations, and knowledge may be supported if these components prove to compensate for recently lost capacity (compensate). SM processes will only result in positive outcomes for older adults if they are specific to individual abilities, enhance current abilities, and compensate for lost capabilities and resources.

According to lifespan, success is also contextually based on variations in goal attainment and level of functionality (Baltes, 1987, 1997; Martin et al., 2011; Willis et al., 2009; Zarit, 2009). Here lifespan highlights the importance of including global indicators

of success for outcomes including, subjective wellbeing and goal attainment, and satisfaction with health and aging. As the developmental focus in later in life shifts from that of growth to maintenance and regulation, SM outcomes may remain stable and still be successful.

In their IFSMT, Ryan and Sawin (2009) are the first to explicitly consider the importance of human development within the context of SM by emphasizing the influence of individual and family risk factors on one's ability to self-manage their chronic disease. However, the model lacks the complexity of multidimensionality highlighted by lifespan development in terms of SM process and outcomes. Here, lifespan perspectives can further develop IFSMT (Figure 2).

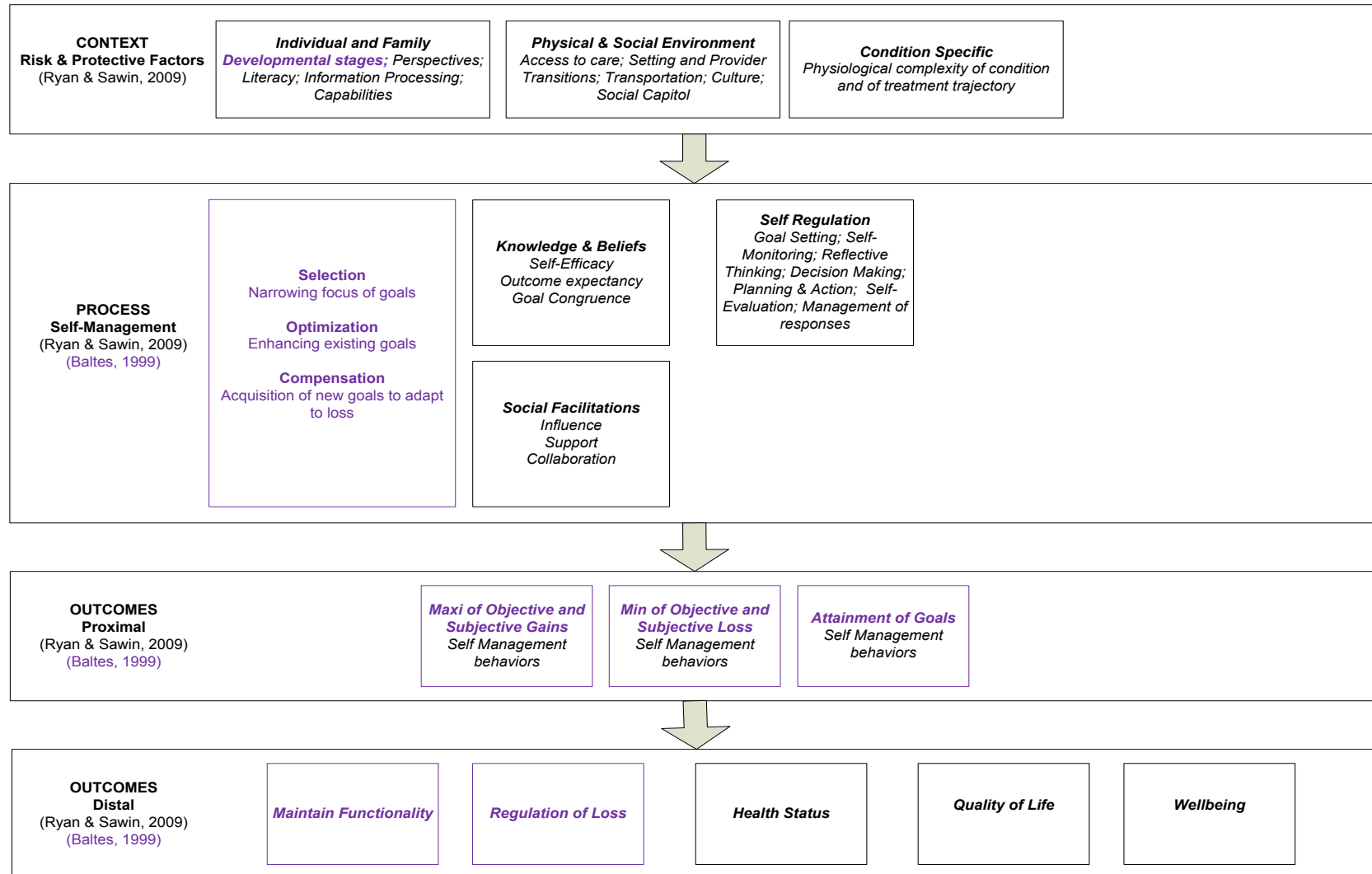


Figure 2. Lifespan modified individual and family self-management (Baltes, 1999; Ryan & Sawin, 2009)

Aging and the self-management context. According to SM and lifespan perspective, development and behavior change are bound by context. Both perspectives highlight the importance of individual biopsychosocial, environmental, and behavioral factors and their potential impact on SOC and SM processes. As such it is important to understand the biopsychosocial-behavioral risk factors associated with the lifespan.

Biological. A common risk factor for many chronic conditions and co-morbidity is age (Albert, 2010; Beers, 2006; Berkman, 2006; Morewitz & Goldstein, 2010; Poon, 2003). The oldest of the old report poorer health status, increased multiple health-related conditions, and greater functional limitations. Fifty percent of the younger old have a chronic condition compared to nine out of ten oldest old (The Federal Interagency Forum on Aging-Related Statistics, 2010). Heart disease, hypertension, cancer, and dementia are highest among the oldest cohort, but kidney disease, arthritis, and respiratory disease do not significantly increase with age (Loue, 2007).

Genetic components and family medical history play an important role in the onset of chronic illness (Aldwin, 2004; Beers, 2006; Berkman, 2006; Lorig et al., 1999; Morewitz & Goldstein, 2010; Poon, 2003). Generally, risk factors cross multiple chronic conditions. For example, obesity is associated with heart disease, hypertension, arthritis, stroke, and diabetes, while high blood cholesterol, metabolic syndromes, and hypertension are risk factors for diabetes, and diabetes is then a risk factor for heart disease. While also related to weight concerns, joint injury and infection are risk factors for arthritis, and circulation problems for stroke. While age is the number one risk factor related to dementia, head injuries, mild cognitive impairments, and diabetes have also been shown to increase the risk of Alzheimer's disease (Alzheimer's Association

International, 2011). Participation in hormone therapy, particularly for the treatment of menopause symptoms, has been attributed to stroke, heart disease, blood clots, and cancer. Infections, such as hepatitis, human immunodeficiency virus (HIV), and human papillomavirus (HPV), can also lead to certain types of cancer (National Cancer Institute, 2011).

Psychological. Psychological factors are affective state or mood, cognitive or mental status, and a person's behavioral dimensions (Greene, Cohen, Galambos, & Kropf, 2007). Mental health is also related to development of chronic illness and condition outcomes. Older adults with psychological distress are more likely to be obese and have a diagnosis of diabetes, heart disease, or stroke. Long-term depression is inversely related to health status and positively correlated to cognitive and physical disability (Steffens, Fisher, Langa, Potter, & Plassman, 2009; Vink, Aartsen, & Schoevers, 2008). Depression increases the risk of heart disease, diabetes, and HIV and has substantial consequences for functioning and mortality (Steffens et al., 2009; Vink et al., 2008). Depression impacts biological responses, medication treatments, and limits physical functioning, resulting in greater impairment and increased mortality (Auslander & Freedenthal, 2006). In a review of risk factors associated with anxiety and depression in the elderly, Vink et al (2008) found that hypertension, cognitive impairment, personality traits, and dysfunctional coping strategies are correlated with anxiety symptoms, while vascular factors, health status, medication use, self-perceived health, personality traits, dysfunctional coping, negative self-image, stressful events, and living conditions were associated with depressive symptoms and disorders.

Chronically ill older adults often suffer from additional stressors, including pain, fatigue, and fear of losing independence (Bayliss, 2003). Once diagnosed with a chronic condition, adjustments are often made to acclimate to the condition. Perceived threats to life goals, disease specific expectancies, and meaning of the disease are important factors for the progression of disease. With an understand of the significance of their illness, those who can adapt goals and increase disease specific self-efficacy, i.e. confidence in their ability to regulate and attain these goals, experience improved physical and mental health, such as reduced pain and distress, and slower disease-specific declines (Stanton, Revenson, & Tennen, 2007).

Behavioral. Chronic conditions are commonly attributed to lifestyle and behavioral risk factors. Tobacco use, alcohol consumption, poor diet, and lack of physical activity increase the likelihood of all major chronic conditions (Aldwin, 2004; Beers, 2006; Berkman, 2006; Lorig et al., 1999; Morewitz & Goldstein, 2010; Poon, 2003). Although the percentage of current older smokers has decreased since 1965, 55% of older adults are former smokers (The Federal Interagency Forum on Aging-Related Statistics, 2010). The declines have been most evident among men, while rates of smoking have remained higher and consistent for women and African American older adults.

On average older adults meet federal quality standards for fruit, grains, and meats/beans intake, but fell short in the areas of vegetables, whole grains, milk and oils. Average intakes of saturated fat, sodium, calories from fats, alcoholic beverages and sugars were too high. Only about 22% of older adults engage in regular physical activity which increasingly declines as people age. Men and older whites report higher levels of physical activity (The Federal Interagency Forum on Aging-Related Statistics, 2010).

High rates of smoking history and poor diet combined with fairly sedentary lifestyles place older adults at greater risk of chronic illness.

Lifestyle changes to diet, exercise, smoking, and alcohol consumption can also alter the trajectory of chronic illness. Adherence to healthy lifestyle changes are associated with longer survival times, reduced cancer reoccurrence, increased transplant success, reduced antidepressant treatment, improved mobility, and reduced rates of delirium (Shumaker, 2009). However, it can sometimes be difficult for older adults to adopt and maintain new healthy lifestyle habits. Misinterpretation of symptoms, physical limitations, cognitive impairments, and lack of motivation are common barriers to adapting behaviors to improve health. When these adaptations are negatively perceived, such as restrictive diets or using tobacco, older adults are less likely to make these changes. Increases in physical activity and therapy can result in discomfort leading to inactivity (Shumaker, 2009).

At some point, all chronic conditions require adherence to medications to effectively manage the illness. Older adults who are less engaged in managing their disease are more likely to experience health problems, appear sicker, have more contact with healthcare systems, and less likely to follow provider advice (AARP, 2009a). Medication adherence among older adults is estimated to be as low as 40%, increasing the risk for debilitating health problems, increased institutionalization, and death (Berkman, 2006; Shumaker, 2009). Often older adults do not adhere to medical treatments because they do not perceive the benefits of medication and have negative beliefs about their illness, overmedication, medication interactions, and costs.

Complexities of the regimen, adverse side effects, and poor patient-provider relationships have been associated with medication non-adherence (Shumaker, 2009).

Gender. Older women outnumber older men, and the proportion of women increases with age, as such, women represent 58% of the population over the age of 65 and 67% of the population over 85 (The Federal Interagency Forum on Aging-Related Statistics, 2010). Women report higher rates of arthritis and hypertension than men, and men report higher levels of heart disease and cancer. While the prevalence of depression is similar for both men and women (Steffens et al., 2009) women experience higher levels of functional limitations, disability (Hung, Ross, Boockvar, & Siu, 2011), and poorer health status, showing greater restrictions in the ability to stoop, reach over head, write, walk short distances, and lift 10 pounds (Banerjee, Perry, Tran, & Arafat, 2009). However, men have higher suicide rates, with the highest rate among white men over the age of 85 (Federal Inter Agency on Aging Related Statistics, 2008). Once diagnosed with cancer, women have been found to live longer than men (Albert, 2010).

Race and ethnicity. As the older population continues to grow, it will also become more diverse. Currently whites account for 80% of older adults. Although it is estimated that by 2050 whites will still account for 59% of the older population, older African Americans are expected to increase from 9 to 12% and older Hispanics 7 to 20%. Asian older adults are also expected to increase from 3 to 9% (The Federal Interagency Forum on Aging-Related Statistics, 2010).

In 2008, Hispanic and African American older adults reported higher levels of hypertension and diabetes compared to whites, and white older adults are more likely to report good health (The Federal Interagency Forum on Aging-Related Statistics, 2010).

African Americans report poorer health outcomes (Banerjee et al., 2009), and the incidence of Alzheimer's disease is highest among Asian, African American and Latino groups (Morrell, Echt, & Caramago, 2008). Depression is more common among Hispanics and whites compared to African Americans (Steffens et al., 2009). Older American Indians and Alaska Natives suffer from some of the highest rates of disability and disease, experiencing disproportionate levels of heart disease, cancer, and diabetes, with high rates of obesity and smoking (Loue, 2007). Older women of color are disproportionately affected by HIV, showing 70% of women over the age of 50 with HIV are African American or Latino (CDC, 2008). Older African Americans are twice as likely as whites to have diabetes and prevalence among Hispanics was 78% higher than whites (Vona-Davis & Rose, 2009). Diabetes related mortality and complications (vision impairment, disability, and amputation) are higher among Hispanics, American Indians and Native Alaskans, and African Americans. The prevalence of stroke and stroke related mortality is also highest among minority groups (Loue, 2007).

Income and education. Older adults experience high levels of poverty (Hudson, 2010); for the 3.7 million older adults (McCubbin, 2010) who do not have sufficient funds to meet basic needs, the payment for out of pocket health expenses (expensive medications) and health promotion activities (healthy food purchases or gym memberships) are implausible. Socioeconomic status influences wellbeing in older ages. The burden of chronic disease is greater for low-income older adults, showing higher rates of heart disease, diabetes, and mental illness than middle and upper class groups (Morrell et al., 2008; The Federal Interagency Forum on Aging-Related Statistics, 2010; Vona-Davis & Rose, 2009). Higher levels of education are associated with higher

incomes, higher standards of living, and above average health status. The last century has seen increases in education and incomes, however older white men are the most educated and women and minorities are more likely to live in poverty. Forty-two percent of older people living in poverty do not have natural teeth, compared to 23% of those in middle and upper classes (The Federal Interagency Forum on Aging-Related Statistics, 2010).

Occupation also impacts risk of health status in later life. Older adults who experience higher levels of formal education and stimulating occupations are at lower risk of Alzheimer's disease (Alzheimer's Association International, 2011). Currently, two thirds of older men are veterans; veterans tend to have higher family incomes, but higher percentages of functional limitations, disability, and poor self-rated health status (The Federal Interagency Forum on Aging-Related Statistics, 2010). Those who worked in labor intensive occupations requiring squatting and lifting are at greater risk of arthritis (Doran et al., 2002).

Literacy. In the U.S., health literacy is lower among older adults compared to younger populations, as such they tend to lack general knowledge specific to their diagnosis leading to an unawareness of symptoms and treatment (Easom, 2003). Older people with low health literacy and those facing language barriers are less likely to receive preventative services, adhere to medications and treatment regimes, understand diagnosis and medical instructions, and are less satisfied with care (AARP, 2009).

Aging and self-management processes. In addition to barriers the general population faces in regard to disease-management, challenges for SM differ specifically for older adults. Age-related expectations have been found to be a barrier to SM processes (Easom, 2003). Many older adults believe that chronic disease is a normal part

of the aging process, perhaps hindering the initiation in SM processes (Cavanaugh & Blanchard-Fields, 2006). Bodenheimer (2002) claims that self-efficacy and motivation, which are positively related to health behavior, might be perceived differently among older populations. In combination with normal physical changes associated with aging, a chronic disease may seem impossible to manage, reducing one's belief that they can carry out self-regulation skills. Lastly, Bayliss argued that with older adults' deeply rooted and longstanding routines (Bayliss, Ellis, & Steiner, 2007; Bayliss, 2003) commonly used behavior change models may not address the factors necessary to promote healthy behavioral change among older adults.

SM processes often rely on the support of others; as older adults typically have reduced social networks, they often have less family and friends to rely upon than younger cohorts (Gallant, Spitze, & Prohaska, 2007). Outcomes for patients are improved when families are engaged in care. Social support and caregiving is associated with postponed and shorter lengths of institutionalization, decreased problematic hospitalizations and readmissions, and reductions in healthcare utilization (Shumaker, 2009). Individuals with limited social support are more likely to have unmet needs in personal and medical care, and patients receiving help are more likely to adhere to treatments (Almgren & Diwan, 2009).

Web-Based Chronic Disease Self-Management

With the expansion of technology in the healthcare field, SM interventions have been combined with internet delivery mechanisms to establish *web-based chronic disease self-management* (web-based SM). Web-based SM has been used in the management of,

among others, heart disease, chronic obstructive pulmonary disease, hypertension, obesity, diabetes mellitus, and asthma (Wantland, Portillo, Holzemer, Slaughter, & McGhee, 2004).

Effectiveness of web-based self-management. Literature in this area includes meta-analyses and systematic reviews (Kaufman, 2010; Murray, Burns, See Tai, Lai, & Nazareth, 2005; Neve, Morgan, Jones, & Collins, 2010; Samoocha, Bruinvels, Elbers, Anema, & van der Beek, 2010; Wantland et al., 2004), which have yielded mixed but rather positive outcomes. Searching articles related to web-based (or internet), e-health, telehealth and SM interventions resulted in over 20 reviews conducted evaluating the efficacy of web-based SM.

Review years ranged from 1966 to 2008, including more than 200 studies, yielding positive outcome effects. Interventions were found to improve behavioral outcomes such as exercise and physical activity (Nguyen, 2004; Wantland et al., 2004), diet (Nguyen, 2004), patient adherence (Solomon, 2008), and weight-loss maintenance (Wantland et al., 2004). Internet interventions for depression and anxiety disorders were reported as promising self-help applications (Griffiths, Farrer, & Christensej, 2010), and effects of web-based SM were demonstrated to reduce chronic pain (Macea, Gajos, Daglia Calil, & Fregni, 2010). Positive effects on health knowledge (Nguyen, 2004; Ryhänen, Siekkinen, Rankinen, Korvenranta, & Leino-Kilpi, 2010; Solomon, 2008), hospitalization (Kuhl, Sears, & Conti, 2006; Maric, Kaan, Ignaszewski, & Lear, 2009), and disease-specific clinical outcomes were also identified (Dorr et al., 2007; Dummrongpakapakorn, Hopkins, Sherwood, Zorn, & Donovan, 2009; Kaufman, 2010; Kuhl et al., 2006; Maric et al., 2009; Murray et al., 2005; Nguyen, 2004). Results

demonstrated improvement among psychosocial outcomes as well, including self-efficacy (Kuhl et al., 2006; Murray et al., 2005; Nguyen, 2004; Solomon, 2008), social support (Murray et al., 2005), and quality of life (Maric et al., 2009; Nguyen, 2004). Effect sizes reported for successful interventions ranged from .40 to .75 (Wantland et al., 2004).

Interventions that directed participants to relevant-tailored information reported increased website utilization, and those offering chat rooms had greater social support outcome improvements (Wantland et al., 2004). Particularly successful interventions included components such as linkages to an electronic medical record (EMR), computerized prompts, electronic care scheduling, and personal health records (Dorr et al., 2007). Interventions based in theory and those that used more behavioral change techniques resulted in significantly larger effects ($d_+ = .36$, CI 0.15 to 0.56), and effectiveness of interventions was also enhanced through the use of text messaging (Webb, Joseph, Yardley, & Michie, 2010).

With positive effects clearly highlighted, other reviews reported inconclusive or negative conclusions. Several authors reviewing over 60 publications between 1995 and 2005 identified efficacy concerns. Kirsch and Lewis (2004) evaluated the components, utility, and efficacy, identifying few significant changes on behavioral outcomes. Norman et al., (2007) and Vandelanotte, Spathonis, Eakin, and Owen (2007) found mixed and limited evidence related to web-based physical activity and diet interventions. Successful indicators have not yet been confirmed for asthma care (McLean et al., 2010), weight-loss (Arem & Irwin, 2011), or smoking cessation (Civljak, Sheikh, Stead, & Car, 2010), and recently Ekeland, Bowes, & Flottorp (2010) concluded that chronic illness

telemedicine results were promising but inconclusive due to limitations and inconsistencies.

Limitations were also identified by reviewers' findings. Reviewed study designs led to inconclusive results regarding clinical outcomes (Solomon, 2008), costs (Wantland et al., 2004), data privacy and security issues (Dorr et al., 2007), and economic outcomes (Murray et al., 2005). Questions regarding long term effects and cost effectiveness (Murray et al., 2005; Wantland et al., 2004) remain. Studies were also cited for lacking integration to clinical practice and discrepancies across study results (Webb et al., 2010). Reviewers call for more research, naming these positive outcomes preliminary findings (Nguyen, 2004) in need of more high quality investigation with large sample sizes to confirm these initial findings and potential effects on different groups of people with chronic illness (Murray et al., 2005).

In addition to the limitations identified by researchers, issues of the lifespan were not explored. Age was not specifically examined by reviewers in terms of intervention efficacy for older populations. However, intervention trials did include older adults, and samples were older among diabetes, pain, and arthritis relates investigations. In a call for further research, reviewers did not include recommendations for the involvement of social work, or implications for social work specific practice with marginalized populations.

Integrating Technology and Aging Perspectives for Web-Based Self-Management

As a model for SM rather than web-based SM, IFSMT clearly highlights the relationship of the context on SM practices, but excludes the influence of context on

technology. Because web-based SM incorporates a technology platform, the influences of these contextual factors, and specifically lifespan, on technology engagement (Russell E Glasgow et al., 2011) and the subsequent relationship with health outcomes should also be considered.

Persuasive technology, a term which originated in social psychology and education, is the “interactive computing systems designed to change people’s attitudes and behaviors”(Fogg, 2003, p. 1). Persuasive technology is commonly used in the public health sector to refer to computer-mediated interventions that promote healthy behavior and attitude change through the integration of social cognitive behavioral strategies with computer mediated interventions (Fogg, 2009; Kim & Fesenmaier, 2008; Looije, Neerinx, & Cnossen, 2010; Redstrom, 2006). Persuasive technology offers persistence, anonymity, multiple modality, access, and interactivity that traditional formats of are unable to provide with the potential for increasing human capabilities, providing experience, and creating relationships (Fogg, 2003).

Building on Fogg’s persuasive technology perspective, Oinas-Kukkonen and Harjumaa (2009; 2008) developed the *Persuasive System Design (PSD)* model for analyzing, designing and evaluating persuasive systems describing content and functionality components. Although relatively new, it is one of the most elaborate persuasive design tools at this time (Lehto & Oinas-Kukkonen, 2011). The model presents three phases of persuasive systems development: 1) understanding key issues of persuasive design, 2) analyzing the persuasion context, and 3) system feature design which leads to behavior and/or attitude change.

In understanding key issues of persuasive design, issues regarding ongoing influences of information technology, world views, route of persuasive messages, process, openness, obtrusiveness, and usefulness of system should be addressed. Because “information technology is never neutral, always influencing people’s behaviors and attitudes” the analysis of the persuasion context is essential to the design and persuasiveness of the technology (Oinas-Kukkonen & Harjumaa, 2009). Therefore, the user and technology context are essential to changes in behaviors and attitudes. User context suggest that user’s interests, needs, goals, motivations, abilities, pre-existing attitudes, commitment, life-styles, persistence of change, cultural factors, and deep-seated attitudes should be considered in technology design. Technology dependent features are also important. As technologies are rapidly developed, the strengths, weaknesses, and opportunities of the technology platform, application and features must be understood.

IFSM, lifespan, and PSD perspectives emphasize the importance of contextualization. While the IFSMT explore the influences of risk and protective factors, it lacks the contextualization of technology. In the case of web-based SM, it is important to understand that the purpose of the web-application is not solely for SM, but rather changing behaviors and attitudes related to **both** health and technology. As technology is “not neutral”, users, potentially even more so among older groups, have opinions about technologies which can profoundly influence the types of technology adopted and used. Here PSD builds on IFSMT and lifespan to examine the word views and perspectives explicit to technology, including personal experiences and generational opinions related to technology.

Persuasive communication produces a complicated interchange between technology, message and user. In order for a person to be persuaded to change behaviors, information must be presented in a way that can be comprehended and retained. Therefore persuasive technologies employ design principles including, primary task, dialogue, system credibility, and social support features (Table 1). The first design principle outlined by the model is primary task support, a feature that supports users to carry out primary tasks, including reduction, tunneling, tailoring, personalization, self-monitoring, simulation and rehearsal of a behavior and/or attitude. The second principle is the inclusion of dialogue support, providing feedback to users to facilitate improvement toward goal or target behavior, through praise, rewards, reminders, suggestion, similarity, liking, and social role. System credibility support, or increased perceived reliability in the technology and information provided by the technology, results in increased persuasion, requires a system viewed with trustworthiness, expertise, surface credibility, real-world feel, authority, third-party endorsements, and verifiability. The social support principle argues that systems motivate users with social influences through social learning, social comparison, normative influence, social facilitation cooperation, competition and recognition.

Table 1.
Persuasive System Features (Oinas-Kukkonen & Harjumaa 2009)

Principle	Feature	Definition
Primary Task	Reduction	Reducing complex behavior into simple tasks to help user perform the behavior
	Tunneling	Guiding users through a process or experience
	Tailoring	Targeting information at potential needs, interests, personality, usage context, other factors relevant to a user group.
	Personalization	Offering personalized content or services
	Self-Monitoring	Keeping track of one's own performance or status
	Simulation	Providing simulations to enable users to observe immediately the link between cause and effect regarding user's behavior
Dialogue Support	Rehearsal	Providing means to rehearse a behavior to enable user to change their attitudes or behavior
	Praise	Using praise via words, images, symbols or sounds to provide feedback on users behaviors
	Rewards	Offering virtual rewards to give credit for performing behaviors
	Reminders	Using reminders to remind user of their behaviors
	Suggestions	Offering fitting suggestions for user to carry out behavior
	Similarity	System reminds user of themselves
Credibility Support	Liking	Visually attractive system that is appealing to users
	Social Role	Integrating a social role
	Trustworthiness	Providing information that is truthful and unbiased
	Expertise	Providing information demonstrating knowledge, experience, and competence
	Credibility	Providing a reliable look
	Real-World Feel	Highlighting information about the organization and actual people
Social Support	Authority	Refers to people in a role of authority
	Third Party Endorsement	Including endorsements from well-known and respected sources
	Verifiability	Providing a means to verify the accuracy of the site contents
	Social Learning	Providing means to observe others who are performing target behaviors and to see the outcomes of their behaviors
	Social Comparison	Providing means for comparing performance with others
	Normative Influence	Leveraging peer pressure
	Social Facilitation	Providing a means for people to feel that others are performing the behavior along with them
	Cooperation	Providing means for people to cooperate with others
	Competition	Providing means for people to compete with others
	Recognition	Providing public recognition for users who perform target behavior

IFSMT suggests that self-efficacy and social support facilitates SM processes, while PSD outlines features that support SM behavior change and technology engagement. According to SOC, as people age they will narrow their focus to emphasize health function and social attachments, prioritizing based on level of satisfaction. If older

adults do not perceive benefits or experience high levels of satisfaction with the web-based SM, they are unlikely to select these activities as goals. Although PSD provides features for both optimization of resources and compensation after losses related to health and technology, if features do not offer ways to acquire new skills to optimize or compensate health function, older adults are likely to reconsider goals shifting focus elsewhere. While web-based SM features can help compensate for losses by providing new resources and connections, it can also be a burden. Older adults with limited computer skills selecting into web-based SM, will increasingly need support to facilitate the acquisition of new skills and legitimize increased effort expenditure.

Without a specific theoretic framework for web-based SM for older adults, connections between SM, lifespan and persuasive technology can be made. These approaches complement each other regarding contextual factors, technology engagement, SM processes, and outcomes, informing a more comprehensive approach to design and evaluation of web-based SM for older populations (Figure 3).

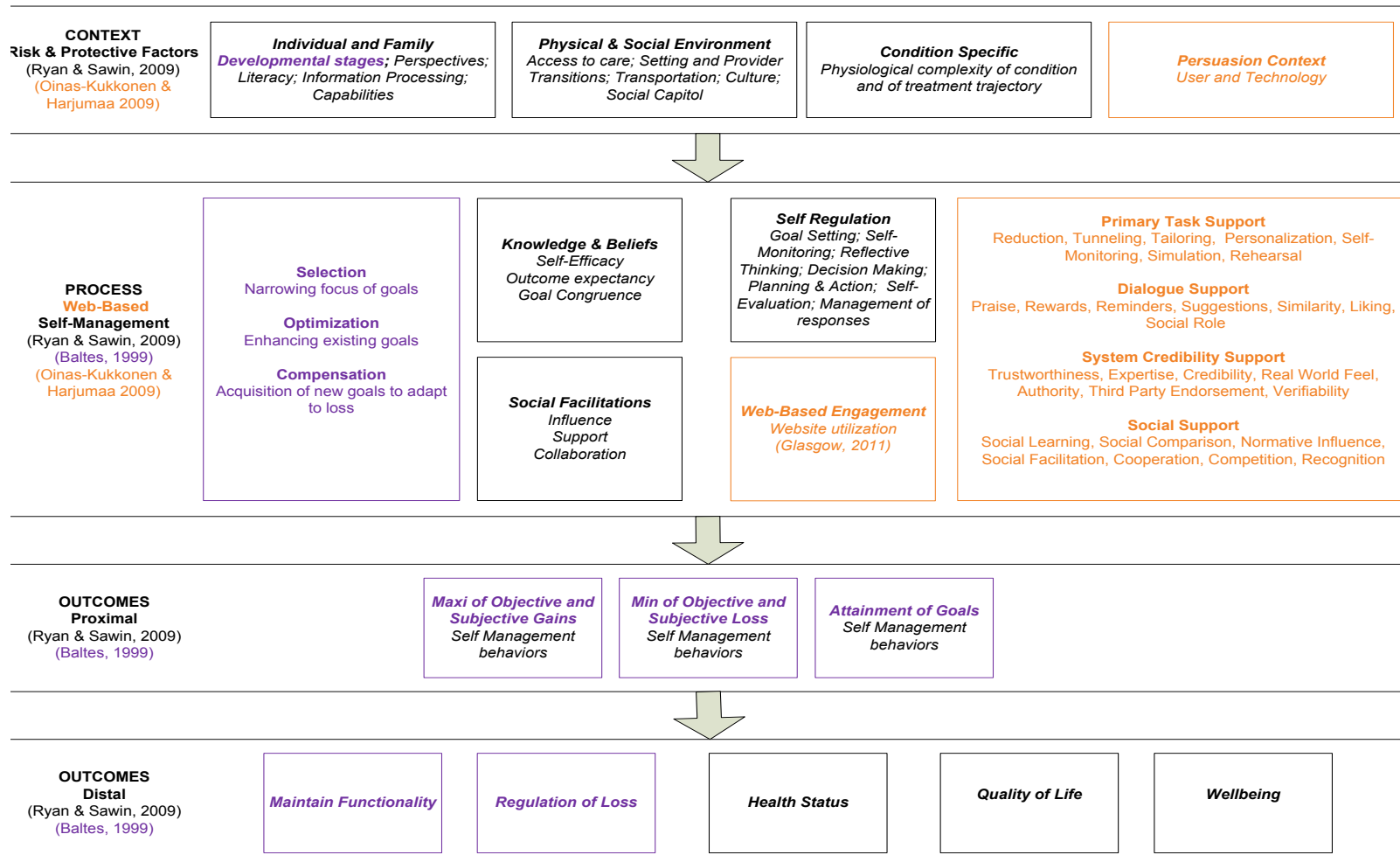


Figure 3. A self-management, lifespan, and technology model for web-based SM interventions (Baltes, 1999; Oinas-Kukkonen & Harjumaa 2009; Ryan & Sawin, 2009)

Aging and technology. Increased literature related to older adults, computers and internet usage (Lam & Lee, 2006) illustrates a potential lag in technology acceptance among older adults most often attributed to age-related physical impairments, financial barriers, security concerns, computer anxiety, low computer literacy, reduced self-efficacy, general lack of interest, and reduced benefit ratio (Carpenter & Buday, 2007; Gatto & Tak, 2008; Kim, 2008; Wagner, Hassanein, & Head, 2010). Older computer users tend to be younger-older adults, more educated, have higher incomes and live independently (Carpenter & Buday, 2007; Gatto & Tak, 2008). These users most frequently utilize the internet for finance management, shopping, entertaining, education, travel planning and social contact, particularly with adult children. Concerns about older adults' abilities to use, access, and evaluate online health information have also been raised (Bertera et al., 2007; Bickmore, Caruso, Cloughgorr, & Heeren, 2005; Chu, Huber, Mastel-Smith, & Cesario, 2009; Shapira, Barak, & Gal, 2007). Although older adults potentially have the most to gain through internet health promotion and social media programming, older adults are at greatest risk of being left behind in the adoption of such technologies (Shapira et al., 2007).

Aging and web-based self-management. Although research on the effectiveness and promise of web-based SM is well documented, few specifically target older adults and often lack technology considerations. Studies were identified by searching PubMed, Cochrane Library, EBSCO Host, ACM Portal, PsychInfo, and Google Scholar using search concepts: older adults, elderly, aging, chronic disease manage, web-based, computer-based, internet, online, behavioral interventions. The 353 articles relevant to the search were reviewed for inclusion. Duplicates and unavailable full articles were

excluded. Articles were then narrowed to include only experimental and quasi-experimental publications, yielding 45 papers. The subsequent abstract evaluation reduced the pool to 13 articles; articles that were not specific to older adults, chronic disease management, web-based interventions and those intended for caregivers were excluded. A total of 13 articles representing 11 distinct studies comprised the final pool for review and critique.

Targeted health concerns. Diabetes and heart disease were the disorders most frequently targeted. The remaining studies each focused on chronic pain, COPD, multiple chronic illness, weight loss, hypertension, chronic hip issues, depression, loneliness, or physical activity.

Outcomes evaluated. Generally the studies investigated the effects of treatment on many biological and psychosocial outcome including: healthcare utilization, depression, loneliness, social support, quality of life, self-efficacy, anxiety, disease specific outcomes, activity/functioning levels, diet, exercise, health status, and knowledge. These outcomes are similar to the outcomes identified in the systematic reviews of web-based SM for general populations. Healthcare utilization was simply calculated by the number of visits and admissions to care. Outcomes such as depression, loneliness, quality of life, anxiety and self-efficacy used general or disease specific validated scales. Biological factors commonly included weight, BMI, blood pressure, and cholesterol. Disease specific interests took into account, A1c levels for diabetics, fatigue for heart failure patients, and pain intensity for those with chronic pain and were measured using validated scales and blood draws. Activity and function levels, diet, and exercise were measured through journals, logs, and physical activity tests. Health status

and knowledge were evaluated through disease specific subscales and self-report. Although the use of validated measures and subscales was identified throughout the articles, one article (Castro, Hise, & Finkelstein, 2005) did not clearly specify the measures used for changes in knowledge from pre to posttest.

Methods. The majority of articles were based on randomized control trials (RCT), while only four were quasi-experimental using comparison groups. Of the RCT's, 2 were repeated measures, and one study used a waitlist control group. Univariate analysis of variance, covariance, and linear modeling were the most common statistical approaches followed by t-tests, chi-square, and multivariate analysis of variance. In general the samples were quite small, ranging from 15 to 301 participants, with the majority being pilot investigations of about 25 to 80 participants. Participants were at least 45 years of age: one study sampled participants 45 years and older, two articles studied 50 plus, one looked at those 55 plus, and nine studies focused on those 60 years plus. It is clear that while focusing on older adults, the age range for the population has yet been defined. While 45 years of age appears young, the study using this age criteria had an average sample age of 66.4 years of age, and those using 50 years were published in geriatric specific journals.

Theoretical assumptions. Few articles specified theoretical foundations for the intervention trials. Seven of the thirteen did not specifically identify a theory base; however, of those who did not specify, authors noted theoretical concepts such as health promotion, self-care, and adult learning. Other theoretical frameworks outlined by the articles included a focus on cognitive behavioral therapy, health promotion model, psychological coping, and social cognitive theory. These theories are the foundation of

SM, but lack the comprehensive approach to incorporating technology and aging development.

Key components of the interventions. Using strategies founded in theory, such as cognitive restructuring, behavioral change strategies, relapse prevention, e-therapy, motivation, goal setting, problem solving, educational instruction, and support, these studies used a variety of web-based and computer mediated technologies to administer each web-based SM intervention. Technologies used included: virtual communication (virtual chats, instant messenger, video conferencing, text messaging, and email), online support groups (online group discussions, messaging boards, bulletin boards and email groups), resource portals, educational materials (e-newsletters and electronic articles), educational and learning modules, tracking tools, videos and multiple choice assessment tools. Elements of PSD features are apparent in the interventions, but none of the studies clearly illustrated the comprehensive inclusion of primary task, dialogue, credibility, and social support applications.

Results of the studies. Overall the web-based SM for older adults resulted in positive effects on intervention groups for most outcomes. Similar to the results from web-based SM reviews for general age populations, knowledge was a popular outcome evaluated and was highly successful. Increases in hypertension (Castro et al., 2005), osteoporosis (Nahm, Resnick, DeGrazia, & Brotemarkle, 2009), and heart failure fatigue knowledge (Tse, Choi, & Leung, 2008) was significantly increased after interventions. Disease-specific outcomes were also found to be successful. Chronic heart failure treatment patients had significantly lower fatigue scores and improved activity functioning (Tse et al, 2008). Diabetes treatments resulted in significant reductions in

A1c, weight, and cholesterol levels (Bond et al., 2007), and patients with chronic pain had significant improvements in pain intensity after treatment (Berman, Iris, Bode, & Drengenberg, 2009). Comparable to the general reviews these studies resulted in positive outcomes related to psychosocial factors such as quality of life (Bond et al., 2007; Westlake et al., 2007), anxiety (Berman et al., 2009), depression (Bond et al., 2010; Spek et al., 2007), self-efficacy (Berman et al., 2009; G. E. Bond et al., 2010; Hageman, Walker, & Pullen, 2005) loneliness (Fokkema & Knipscheer, 2007), social support (Bond et al., 2010), and health status (Westlake et al., 2007).

The reviews of web-based SM for general age populations revealed inconclusive evidence regarding the effects on outcomes such as diet and exercise. Of the studies targeting older adults, both Hageman et al. (2005) and Pullen, Hageman, Boeckner, Walker, & Oberdorfer (2008) found improvements in body weight, flexibility, cardio respiratory, and percentage of calories from fat intake after the completion of web-based SM interventions.

Although most of these findings were found positive, Elzen, Slaets, Snijders, and Steverink (2008) found significant reductions in homecare utilizations but were unable to find differences between the intervention and control groups for general practitioner utilization, physical therapy visits, or hospitalizations. Authors note the short duration of the intervention and lack of follow up as a reason for negative results. These studies also come with limitations. Small sample sizes and pilot studies reveal preliminary optimistic findings but not capable of generalization. In addition to small samples, authors note that the short timeframes of the interventions may not maintain identified improvements. Attrition rates and lack of diversity within the samples is also a limitation. For all of the

studies, the majority of participants were white, highly educated, with high socioeconomic status, and included only participants who had access to internet, meaning users were commonly previous computer and internet users.

Researchers call for additional research to support these findings. Future research should include long-term investigation and outcomes with diverse and larger samples sizes. More randomized control trials are needed with the inclusion of testing computer variables such as technology engagement. While these studies suggest web-based SM may be effective in producing positive health outcomes for older adults more research needed focusing on the efficacy and appropriateness of such interventions for older adults.

Research Aims and Research Questions

Based in IFSMT, lifespan, and PSD perspectives, this research addressed specified gaps in the literature related to the efficacy and appropriateness of web-based SM interventions for older adults. The aims of this research were to (a) investigate age-related differences in the contextual factors, technology engagement, SM processes, and outcomes of a web-based SM intervention, (b) explore older adults' experience and perceptions of web-based SM interventions, and (c) explain the relevant components of web-based SM for older adults through mixed methods to inform future design and evaluation. Specifically, this study addressed the following research questions:

Investigate age-related differences in the contextual factors, technology participation and utilization, SM processes, and outcomes of a web-based SM intervention:

Context:

- What are the characteristics of older adults who participated in a web-based diabetes specific SM? Is age related to individual and family, physical and social environment, condition specific and persuasion context factors at baseline?

Technology Engagement:

- Does age predict enrollment and reason for non-enrollment in the web-based SM trial? Does retention in the web-based SM differ across age and reason for disenrollment?
- Is there an effect of age on technology utilization, specifically use of web-site, visits to web-site features, and time spent on the web-site?

Self-Management Processes:

- Is there an effect of age on SM processes, specifically self-efficacy, goal attainment, and self-monitoring?

Outcomes:

- Does age and intervention group effect biological, behavioral and psychosocial outcomes over the course of the intervention?
- Does self-reported satisfaction of the web-based SM differ across age?

Explore older adults' experience and perceptions of web-based SM interventions

- What are older adults' perceptions of the technology context in which they live?

- What elements of SOC and persuasive features support and hinder SM processes and technology engagement among older adults?
- What are important outcomes of web-based SM for older adults?

Explain the relevant components of web-based SM for older adults through mixed methods to inform future design and evaluation:

- How do older adult participants' perceptions of the web-based SM diverge and converge with the quantified findings regarding context, technology engagement, SM processes, and outcomes?

Chapter Three: Methods

Mixed Methods Approach

An explanatory sequential mixed methodology design (Creswell, 2011) was employed to address research questions. The research took place over three phases in sequential order (Figure 4).

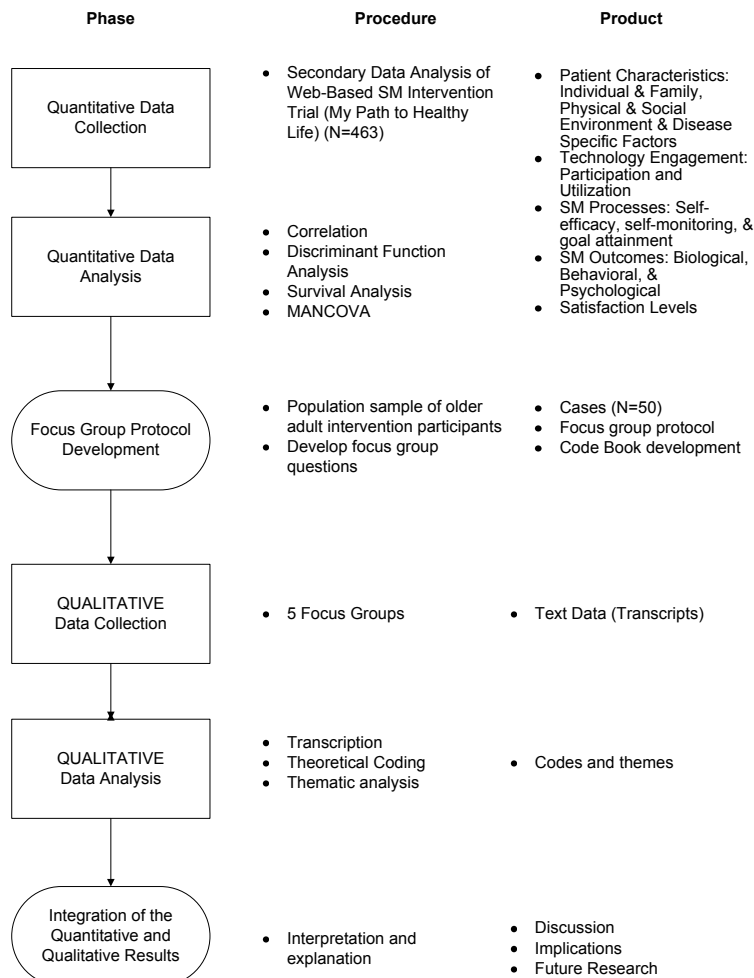
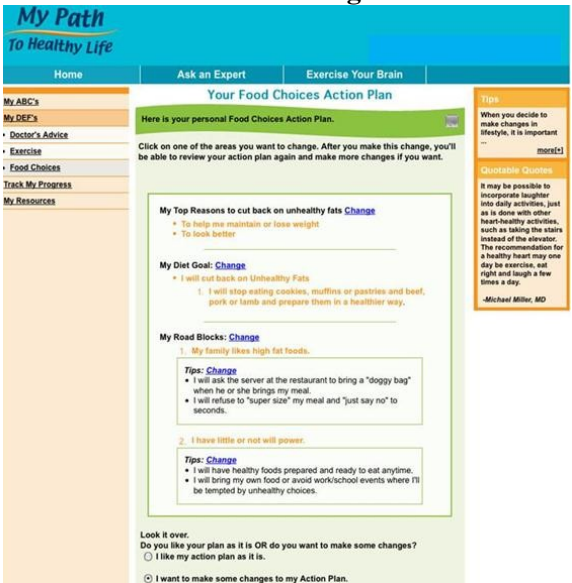


Figure 4. Study design illustrating sequential order

Phase I

The first phase of the study was a quantitative analysis of secondary data from a randomized control trial of a web-based diabetes specific SM intervention, *My Path to Healthy Life/Mi Camino A la Vida Sana (My Path)*, designed to examine an internet SM program compared to an “enhanced” usual care group. My Path was a 12- month self-administered computer assisted self-management (CASM) intervention based on Glasgow’s 5 A’s SM model. The intervention included goal setting and monitoring (Figure 5), progress report and feedback, resources and ask the expert sections, and behavior change activities. The intervention study, which took place between April 2008 and August 2010, was detailed in (Glasgow et al., 2011; Glasgow et al., 2012; Glasgow, Kurz, et al., 2010; Glasgow, Strycker, et al., 2010).

Goal Setting



Monitoring

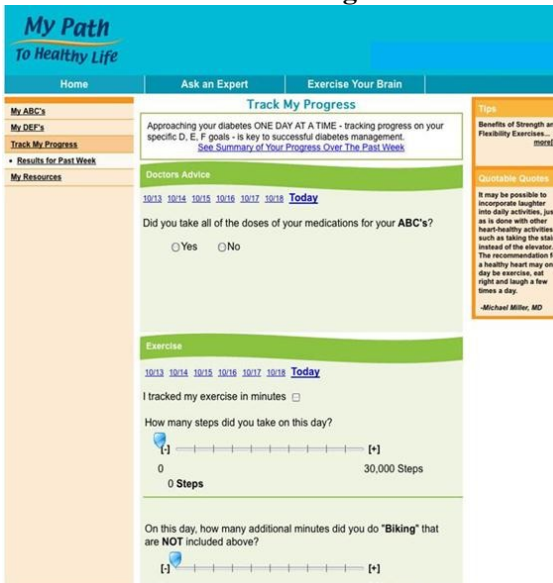


Figure 5. My Path goal setting and monitoring pages

Phase I employed quantitative methods to examine the effects of age on the context, technology engagement, SM processes and outcomes of the My Path intervention (Figure

6). Specifically, this phase addressed the following quantitative research questions:

Context:

- What are the characteristics of older adults who participated in a web-based diabetes specific SM? Is age related to individual and family, physical and social environment, condition specific and persuasion context factors at baseline?

Technology Engagement:

- Does age predict enrollment and reason for non-enrollment in the web-based SM trial? Does retention in the web-based SM differ across age and reason for disenrollment?
- Is there an effect of age on technology utilization, specifically use of web-site, visits to web-site features, and time spent on the web-site?

Self-Management Processes:

- Is there an effect of age on SM processes, specifically self-efficacy, goal attainment, and self-monitoring?

Outcomes:

- Does age and intervention group effect biological, behavioral and psychosocial outcomes over the course of the intervention?
- Does self-reported satisfaction of the web-based SM differ across age?

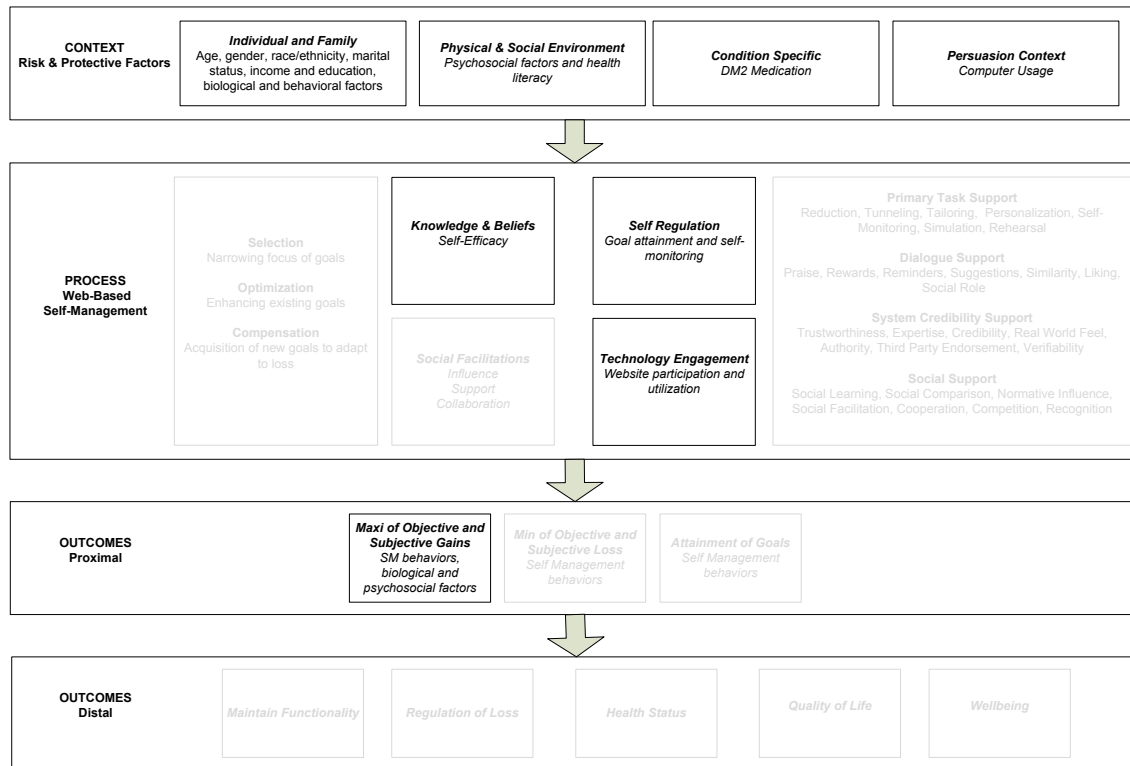


Figure 6. Phase I effect of age: A self-management, lifespan, and technology model using My Path variables

Sample. The trial was conducted within Kaiser Permanente Colorado (KPCO), and enrolled 462 participants with type II diabetes across five primary clinics. The trial contacted 2,604 potential participants. Recruitment procedures and participation rates are reported in Glasgow et al. (2010). Of the 462 enrolled, participant age ranged from 34 to 76 ($M=59.43$, $SD=9.24$), 247 participants enrolled in the study were over the age of 60 at time of recruitment. All potential participants ($n=2,604$) were used for participation analysis, enrolled participants ($n=462$) were used for context and outcome analysis, and only intervention participants ($n=330$) were used for technology engagement and SM processes analysis.

Data collection. Surveys were administered over the course of the trial (baseline, 4 month, and 12 months) to collect behavioral, psychological, and satisfaction measures

(Appendix A). These surveys were completed in pen-paper format during the visit. Enrollment and retention data were collected by research staff at the time of recruitment and completion of program. Technology and SM processes were primarily gathered through the website. Biological and demographic characteristics were captured through the health care system's electronic medical record. The coded de-identified data set from KPCO was then shared with the University of Denver for dissertation-related analysis. All protocols were approved by the KPCO Institutional Review Board, and all data sharing processes were approved by both the KPCO and University of Denver Institutional Review Boards.

Measures. Descriptive information for measures, including internal consistency reliability estimates when appropriate and available, is provided in Table 2.

Context. Participant characteristics including gender, race and ethnicity, marital status, income, education, health literacy measures were collected at recruitment. Health literacy was captured using the three most sensitive items of the short Test of Functional Health Literacy in Adults (S-TOFLA) (Chew, Bradley, & Boyko, 2004). Age was measured as a continuous variable, but for purposes of analysis comparing older participants to younger participants, the variable was also recoded into two categories, (1) participants 59 years and younger, and (2) participant at least 60 years of age. The only condition-specific variable available captured current diabetes medication, differentiating between, oral, insulin, users of both insulin and oral, and those who did not use medications for their diabetes. Computer usage, as a persuasive context variable, measured the number of hours spent on the computer per week, and used a six category ordinal scale ranging from 1 hour or less per week to nine or more hours per week.

Biological, behavioral and psychosocial indicators were also measured and are described as outcomes below.

Technology Engagement. Technology engagement was measured by participation in the trial and utilization of the web-site.

Participation. Enrollment in the study was measured at the nominal level and included four categories: enrolled, those who completed informed consent and randomization; ineligible, those who did not meet inclusion criteria at time of recruitment; declined, those who opted not to participate in the study; and unable to contact, those who study staff were unable to reach. Reasons for non-enrollment for potential participants who fell in the unable to contact, ineligible or declined groups, were also categorical. Due to the variety in responses for non-participation, reasons were summarized into the following major categories: unable to contact, not interested, too busy, opt out, other health concerns, no access to internet, was not type II diabetic, was not a Kaiser Permanente member, was not accessible for 12 months, was a participants in another study, and other. Retention was measured as an event where the participant either selected to no longer participate in the study (dropped) or was unable to contact for follow up (lost to follow up). Reasons for dropping the study included no longer interested in the program, the program was too burdensome, or other. The number of days in the study was calculated from the day of enrollment to the day of study completion or the day of final contact with participant.

Utilization. Technology processes captured participants' use of the web-based SM website. Total number of visits was measured by the sum of all web-site log-on for the participant. The amount of time spent on the site was measured by the sum of minutes

spent on the site for all visits. Use of website features was measured by the number of times a participant visited particular sections of the site, including the “ABC” page which displayed A1c, blood pressure, and cholesterol lab results, the “Ask the Expert” section, which was a moderated forum where participants could ask questions and review responses from a dietician, diabetic nurse, or doctor, and the community resource section, which was a library of resources related to eating exercise and diabetic medications. Due to dramatic decreases in website utilization in the later months of intervention participation, the number of site visits and time spent on the site was calculated only for the first 6 months of participation.

Self-management processes. SM processes captured participants’ SM, including self-efficacy, self-monitoring, and goal attainment. Self-efficacy, collected at baseline and both follow up visits, was assessed using the eight item Diabetes Self-Efficacy scale in which the participant rates confidence in their ability to plan and eat healthfully, exercise regularly, and control their diabetes on a scale of 1 to 10, with higher score indication greater self-efficacy (Lorig et al, 1996). Self-monitoring was calculated by the number of times a participant entered diet, exercise, and medication tracking information into the website. Goal attainment was then calculated by the number of times a diet, exercise, or medication taking goal was met. Due to dramatic decreases in self-monitoring in the later months of intervention participation, self-monitoring and goal attainment was calculated only for the first 6 months of participation.

Outcomes. Several measures were used to capture biological, psychosocial, and behavioral outcomes at baseline, 4 months and 12 months.

Biological. Body Mass Index (BMI) which is an indicator of body fat was measured through weight and height calculation. Normal weight is categorized by a BMI of 18.5-24.9, over-weight between 25-29.9, and obese 30 or greater. Cholesterol was measured using Modular chemistry analyzer from Roche Diagnostics through a modified version of the Abell Kendall method at the KPCO clinics. Total cholesterol was used to assess the amount of lipid in milligrams per deciliter of blood (mg/dL). Healthy total cholesterol levels are under 200mg/dL. Hemoglobin A1c which measures an average percentage of blood glucose levels over a 2-3 month period was measured using Bio-Rad Variant II Turbo liquid by high-pressure liquid chromatography at the KPCO clinics. Patients with type two diabetes are encouraged to have an A1c level below 7%. Blood pressure was measured by the mean arterial pressure, which is normally between 70-110mmHg.

Behavioral. Eating behaviors were assessed using the Starting the Conversation scale, found to be sensitive to change for assessing healthy eating patterns (Ammerman et al., 1991; Fernald et al., 2008; Paxton, Strycker, Toobert, Ammerman, & Glasgow, 2011). Starting The Conversation items were averaged to calculate a total score (ranging from 1-3), where lower scores demonstrate most healthful dietary practices. Estimated fat intake was assessed using the NCI Percent Energy from Fat Screener (Thompson et al., 2007). Percent energy from fat is calculated from a formula converting frequencies to average daily number of times consumed for 15 items, and applies regression coefficients to each food item, after estimating how much of the fat added to foods is regular fat. Recommended percentage of calories from fat should range between 20-35%. The Community Healthy Activities Model Program for Seniors (CHAMPS)

instrument was used to estimate total weekly caloric expenditure through physical activity, which is recommended to be between 1,000-3,000 kcal per week for substantial and extensive health benefits (Stewart et al., 2001). Calories expended per week in physical activity is calculated as the sum of 28 different physical activity items, weighted by duration and frequency of activity, converted to metabolic equivalent task (METs), and incorporates individual body weight. Adherence to diabetes, blood pressure, and cholesterol medications was assessed through the medication-taking items of the Hill-Bone Compliance Scale that determines how often and why respondents missed taking medications, in which higher scores indicate greater adherence (Krousel-Wood, Muntner, Jannu, Desalvo, & Re, 2005).

Psychosocial. Use of problem solving skills was assessed by six items on the dimension of Positive Transfer of Past Experience from the Diabetes Problem Solving Scale of Hill-Briggs, with higher scores indicating improved problem solving skills (Hill-Briggs, 2003). Use of supportive resources was measured using nine of the 22 items from the Chronic Illness Resources Survey (CIRS) to assess utilization of social-environmental resources supportive of diabetes SM, where higher scores also indicate higher levels of resource utilization (Glasgow, Strycker, Toobert, & Eakin, 2000). General health status was measured using a visual analog scale from the EuroQol health status instrument (Brooks, Rabin, & DeCharro, 2003), on which participants rate “how good or bad is your own health today?” from 0 (worst) to 100 (best). The Diabetes Distress Scale (DDS) was used to assess diabetes –related quality of life capturing the degree to which common diabetes situations are currently problematic for a participant in which higher scores indicate higher levels of distress (Polonsky et al., 2005).

Satisfaction. Intervention satisfaction was assessed using 12 items measured on a 5-point Likert scale inquiring about My Path website utilization and helpful program features. A total score was calculated by averaging the 12 items together. Open ended questions on the prevention of program use, most and least favorite program features and recommendations for improvement were also included and coded by three separate coders (average Kappa=.8) into a total of 32 categories.

Table 2. *Phase 1 variable descriptions and reliability coefficient*

Variable	Definition	Descriptive ^a Skew, kurtosis, α		
Context				
Participant characteristics	Gender, race/ethnicity, marital status, income, education	categorical		
Age ^b	Continuous/ Categorical (<59; 60+)	-.43	-.32	--
Diabetes Medication	Type of medication including: oral, insulin, both or none	categorical		
Computer Usage	Number of hours spent on the computer per week	categorical		
Health Literacy	Test of Functional Health Literacy in Adults (S-TOFLA)	-2.74	8.3	.57
Technology Engagement				
<u>Participation</u>				
Enrollment	Enroll, Ineligible, Decline, Unable Contact	categorical		
Non-participation Reason	Categorical explanation for non-enrollment	categorical		
Retention	Number of days in the study	-1.68	1.41	--
Disenrollment Reason	Categorical explanation for disenrollment	categorical		
<u>Web-Site Utilization</u>				
Total # of Visits	Sum of all web-site log-ons	1.55	1.79	--
Time on Site	Sum of minutes on the site for all visits	1.75	3.88	--
Use of Features	Number of times sections visited:			
	ABC Section	-.10	-1.34	--
	Ask the an Expert Section	-.24	-1.13	--
Self-Management Processes				
Self-Efficacy	Diabetes Self-Efficacy Scale	-.41	-.40	.99
Self-Monitoring	Number of times participant tracked	.34	-1.55	--

Goal Attainment	Number of time goal was met	.61	-.99	--
Outcomes				
<u>Biological</u>				
Body Mass Index (BMI)	Height weight calculation	.95	.99	--
Cholesterol Total	Roche Diagnostics method	.93	1.64	--
Hemoglobin A1c	Bio-Rad Variant II Turbo Liquid	1.47	2.82	--
Blood Pressure	Mean atrial pressure	.69	1.66	--
<u>Behavioral</u>				
Eating Behaviors	Starting the Conversation	-.08	-.28	.52
Fat Intake	NCI % Energy from Fat Screen	2.38	11.71	--
Caloric Expenditure	CHAMPS	2.40	8.62	--
Medication Adherence	Hill-Bone Compliance Scale	-3.44	18.30	.78
<u>Psychosocial</u>				
Problem Solving Skills	Positive Transfer of Past Experience	.07	-.19	.86
Supportive Resources	Chronic Illness Resources Survey	.90	.618	.71
Health Status	EuroQol	.52	-.15	.61
Disease Specific Distress	Diabetes related quality of life	.35	-.58	.69
<u>Satisfaction</u>				
Intervention Satisfaction	Study specific scale	-.46	-.17	.88

^aMean and standard deviation is provided in Chapter 4

^bAge is used as a continuous and categorical variable based on analysis

Analysis. To address all of the specific research questions for Phase I, a combination of analysis were conducted, including correlation analysis, discriminant function analysis, survival analysis, multivariate analysis of variance (MANOVA) and multivariate analysis of covariance (MANCOVA) depending on the model needed.

Context. To determine the characteristics of older adults who participated in the web-based SM trial, a descriptive analysis was completed for demographic, biological, and psycho-behavioral variables collected at the initial visit. Descriptive statistics were calculated for the younger participant group, the older participant group, and the total sample. Independent samples t-tests and chi-squares analysis was used to examine possible differences between the younger and older age groups. To identify if age was

related to bio-psycho-behavioral factors at baseline, Pearson correlations were conducted with continuous baseline variables while Spearman's Rho was used with the ordinal variable of computer use per week. Scatterplots of indicator variables by age did not indicate non-linear relationships. Due to normality issues, the analysis was run with the full and trimmed data sets. Trimmed data sets excluded values with a standardized value (z-score) greater than 3 standard deviations. Results were not impacted by the inclusion of outliers and non-normal distributions, therefore results presented (Chapter 4) include all data points.

Technology engagement. To determine if age predicted enrollment in the web-based SM trial, a discriminant function analysis (DFA) was conducted using age as a continuous variable and enrollment (enrolled, ineligible, unable to contact, or refused) as the outcome. Age was normally distributed for each of the enrollment groups and homogeneity of variance can be assumed ($F = 1.256, p = .21$). Of those contacted to participate in the study, only 1% of the age distribution was detected to be outliers. These individuals were on average 31 years old and as young as 25. Because so few outliers were identified, they were included in the analysis. The overall sample and group size was sufficient for the number of predictors in the model. Because only one predictor variable was used for the model, multicollinearity was not problematic. The reason for non-enrollment was then examined, using DFA, to determine if reason for ineligibility, unable to contact or refusal differed by age. Again, age was normally distributed for each of the non-enrollment reason groups and homogeneity of variance was assumed ($F = 1.466, p = .15$). Of the 2,142 potential participants not enrolled in the trial, no extreme outliers were identified. Accurate levels of measure (continuous

independent and categorical dependent variables) were used and the overall sample size was sufficient for the number of predictors in the model. Over 16 reasons for not participating in the study were recorded. Due to group size requirements for DFA, smaller categories were combined to create one “other” category. Because only one predictor variable was used for the model, multicollinearity was again non-problematic.

To test if retention in the web-based SM differed across age and reason for disenrollment, survival analysis was used. First, the mean and median survival times in the study were obtained using Kaplan Meier analysis. A Kaplan Meier comparison analysis was then used to model survival times by age group, adjusting for computer usage and biological indicators.

To examine the effects of age on web-site utilization over the course of the study, a two group between-subjects multivariate analysis of variance (MANOVA) was conducted on the two dependent variables, time spent on the website and the number of total visits to the site. The independent variable was categorical participant age group. There were no missing data for use and time spent on the website, however, normality was a major concern for the visits to particular portions of the site, due to the majority of participants visiting these section approximately 0-4 times over the course of the study. As such these variables (i.e., visits to the ABC page, Ask the expert posts and visits) were removed from the planned analysis and examined individually using chi-square. Total number of visits to the site was normally distributed, however the total time spent on the site was leptokurtic for the younger participant group (Skewness = 2.06, Kurtosis = 5.44). Outliers were then examined. Nearly 3% of univariate outliers were identified for number of visits and total time spent on the site. Using Mahalanobis distance, 3% of the

participants were significant multivariate outliers ($X^2_{\text{crit}} = 13.816, p < .001$). Once the outliers were removed, both time and visits on website were normally distributed for each age group, and analysis was performed with ($n=330$) and without the outliers ($n=320$). Using scatterplots for each variable, pair linearity was assumed. The untrimmed analysis posed an issue of heterogeneity of covariance (Box's $M = 13.62, p = .004$), yet sphericity was met indicating sufficient similarity in correlations between dependent variables for both analyses. The overall results of the analyses were not impacted by these violations of assumptions, therefore results presented (Chapter 4) include all data points ($n=330$). However, Pillai's trace was used due to the violation of homogeneity of covariance.

Self-management processes. A factorial multivariate analysis of covariance (MANCOVA) was used to test the effect of age on SM processes. The independent variables included self-efficacy (at 4 months), self-monitoring, and goal attainment, while categorical age group was used as the independent variable controlling for baseline self-efficacy. Due to attrition and low SM monitoring at the final study months, only complete data for the first 6 months of the study and 4 month self-efficacy were used for SM processes analysis. Normality was met at both the univariate level and for each of the participant age groups. Only one of the participants was identified as a significant multivariate outlier ($X^2_{\text{crit}} = 16.26, p < .001$) and was retained for the analysis. Based on scatterplots of each variable, pair linearity was assumed. Both the assumptions of homogeneity of covariance (Box's $M = 3.17, p = .793$) and sphericity ($X^2 = 2681.49, p < .001$) were met. Non-significant ($p < .05$) Levene's tests indicated homogeneity of variance for self-efficacy, self-monitoring, and goal attainment across age groups.

Outcomes. A factorial multivariate analysis of covariance (MANCOVA) was used to test the effect of age on biological, behavioral and psychosocial outcomes for each time point, 4 and 12 months, controlling for baseline biological, behavioral and psychosocial measures respectively. Due to attrition rates, only complete data for each time point was used for the outcomes analyses, and the sample size for each MANCOVA is presented with the results. In each case the categorical variables of age and treatment group were the independent variables, using the baseline levels as covariates.

For the biological outcomes, the dependent variables included BMI, A1c, blood pressure, and cholesterol. Multivariate normality was an issue. Only five participants were identified as significant multivariate outliers ($X^2_{\text{crit}} = 18.46, p < .001$) however, when these outliers were removed, kurtosis remained a concern for BMI at all-time points and cholesterol at 12 months. For these items, standardized scores were used to identify participants with scores great than 3 standard deviations from the mean. Once removed, normality was assumed for all variables, and analysis was performed with and without the outliers. Based on scatterplots of each variable, pair linearity was assumed. Sphericity was met at both 4 and 12 months; however, homogeneity of covariance and homogeneity of variance for hemoglobin A1c at either time point. As such, Pillai's trace was used for interpretation for these models. Due to the violations of assumptions and differences in overall results, only the results of the trimmed data for 4 month (n=261) and 12 month (n=326) outcomes are presented in Chapter 4.

For the behavioral outcome, the dependent variables included healthy eating, fat intake, caloric expenditure, and medication adherence. Univariate and multivariate normality was a major issue with extreme leptokurtic distributions for caloric intake,

exercise, and medication taking at both 4 and 12 months. Approximately 5-10 participants were identified as univariate outliers for each variable, and 3-3.5% of the participants were identified as significant extreme outliers ($X^2_{\text{Crit}} = 18.46, p < .001$). In order to address the severe normality issue, outliers were excluded from analysis; therefore, 344 individuals at 4 months and 293 at 12 months were retained for the analysis. Based on scatterplots of each variable, pair linearity was assumed. Sphericity and homogeneity of variance were met at both 4 and 12 months, however, Pillai's trace was used for the 4 month model due to violations of homogeneity of covariance (Box's $M = 95.28, p = .002$).

For the psychosocial outcomes, the independent variables included problem solving, use of supportive resources, general health, and diabetes-related quality of life. Each of these variables were normally distributed at the age and treatment group level, and only one extreme multivariate outlier ($X^2_{\text{Crit}} = 18.46, p < .001$) was identified and it was retained for analysis. Based on scatter plots of each variable, linearity was assumed. Sphericity and homogeneity of variance were met at both 4 and 12 months. The final sample size at 4 months was 373, and 290 at 12 months.

To test the relationship of age and self-reported satisfaction of the web-based SM, a Pearson correlation was computed on the overall satisfaction score. Both age and overall satisfaction were normally distributed, and scatter plots indicated a linear relationship. Chi-square analysis was completed to test differences in age groups across previously coded satisfaction comments.

Phase II

Phase II used qualitative methods to explore older My Path participants' experience and perceptions of web-based SM (Figure 7). Specifically, this phase addressed the following research questions:

- What are older adults' perceptions of the technology context in which they live?
- What elements of SOC and persuasive features support and hinder SM processes and technology engagement among older adults?
- What are important outcomes of web-based SM for older adults?

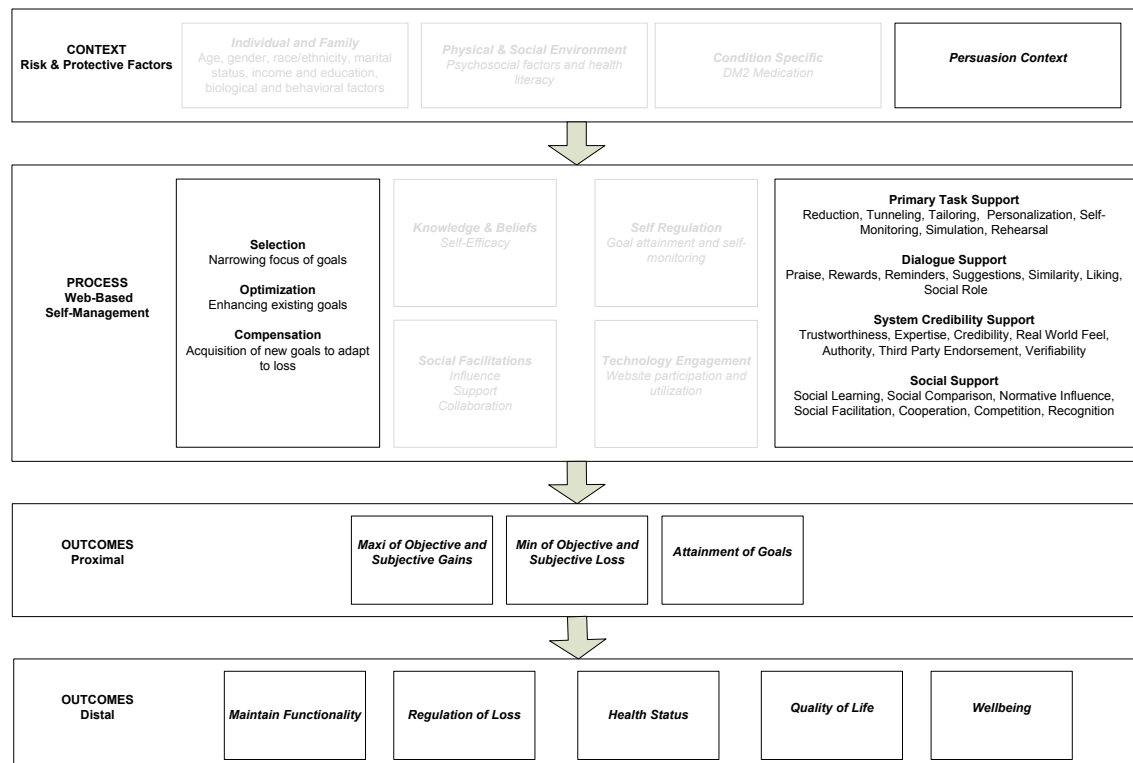


Figure 7. Phase II concept model examining lifespan and persuasive technology in web-based SM

Sample. Older participants in the My Path web-based SM trail were contacted for the qualitative phase. English speaking participants who completed the study and were currently at least 60 years of age were contacted by phone and invited to participate in a focus group (Appendix B). If interested, potential participants were scheduled for a focus

group at their convenience. A post card was mailed upon recruitment and a phone call was made the day prior to remind each scheduled participant of the focus group. One hundred and sixty-six older intervention participants were contacted for the focus groups, of which 67 agreed to participate. Approximately 11-15 people were scheduled for each of the focus groups. Of those who did not participate, the majority were unable to contact, while others declined or were identified as ineligible. A total of 40 participants attended a focus group (Figure 8).

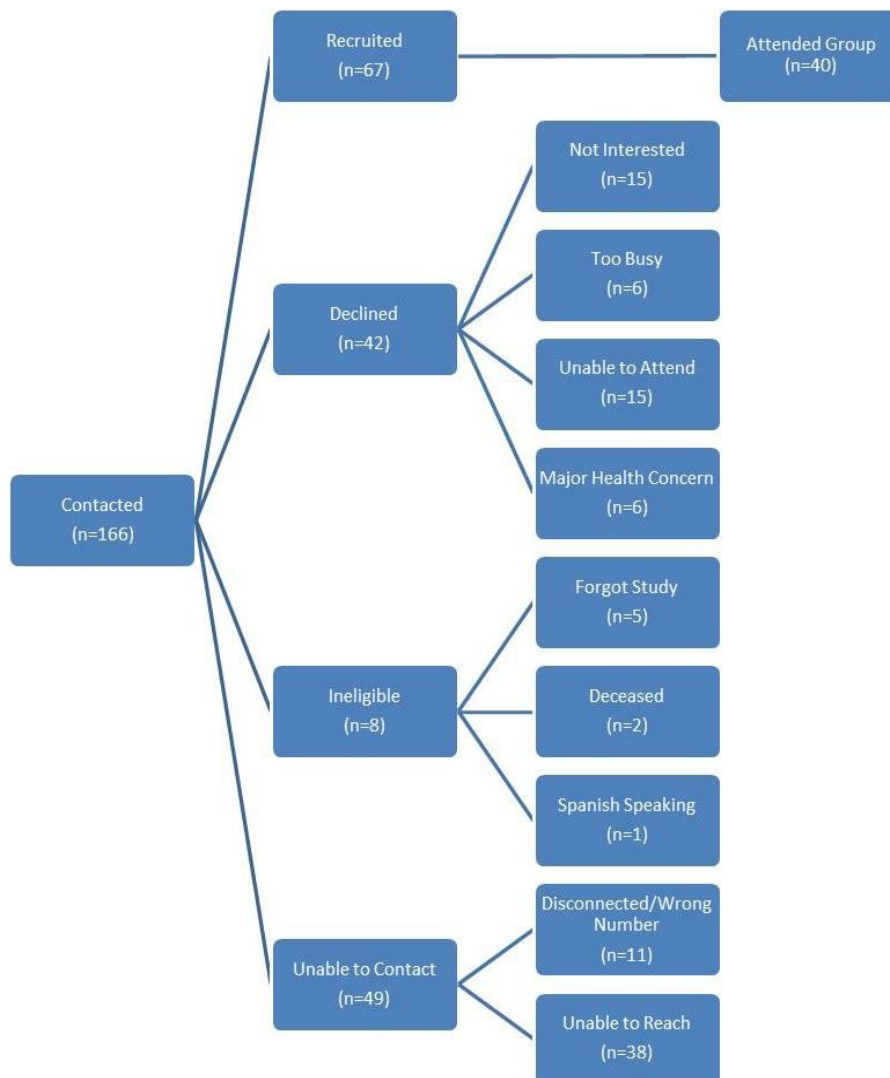


Figure 8. Flow chart for recruitment in focus groups

Data collection. Five ninety-minute focus groups were conducted to address research questions. Each of the focus groups was held at one of the KPCO clinics used for the initial web-based SM trial. The group was led by the investigator. The group began with a verbal review of the informed consent form (Appendix C); formal consent was obtained from each participant and copies of the signed consent were provided. Each focus group was audio recorded for accuracy in data collection. Light diabetic-healthy refreshments including almonds, *Kashi* bars, and bottled water were provided. To thank individuals for participation, participants received a \$10 gift card and a Kaiser Permanente canvas grocery bag.

Measures. The focus group was designed to be an integrative discussion reviewing Phase I results and collecting thoughts and opinions about the results and experiences. The focus group guide was created after the completion of Phase I analysis (Appendix D) and used the results to inform interview questions and activities.

A projector was used to display PowerPoint images on large poster paper of tables and lists that would be completed as a group through various activities. The first activity asked each participant to introduce him/herself and make a general statement about the My Path program. After learning more about individual experiences in My Path, the group was asked if they felt the program could be improved. The group was then lead to discuss the technology context, supports and barriers to SM processes and technology engagement, and personally meaningful outcomes.

An overview of the quantitative results was provided, focusing on differences identified between older and younger participants. The group was then asked how they felt about these findings, specifically about lack of access to the internet and low

computer usage. This fostered the group to then share a recent experience of using a new technology to better capture older adults' perception of the technology context in which they live. The benefits and challenges of these experiences were summarized on the poster paper.

A slide was then presented describing technology engagement and SM processes. Again the group was asked to reflect on these findings. The next activity used a table outlining the supports needed for web-based SM. The group was asked about the specific supports that helped them use the website, and what supports could be improved. This process was then carried out again, but focusing on supports for managing their health.

The final activity focused on outcomes. Before presenting the outcome results from Phase I, the groups were asked to write down 2-3 results they wanted to achieve from My Path. Once the group had created their lists, each person shared their items to compile one large outcome list. The results from Phase I were then presented, fostering a short discussion comparing researchers' objectives with that of the participants.

Analysis. The audio files of the focus groups were transcribed by a professional transcriptionist. For purposes of analysis, a participant's response or completion of one thought was used for the unit of analysis. Depending on the length of the response units varied from one line to one paragraph. A theoretically driven content analysis (Miles & Huberman, 1994) of the transcripts was used to analyze the focus group discourse. A theoretical code book (Appendix E), founded in IFSMT, lifespan, and PSD perspectives, was developed based on the qualitative research questions focusing on persuasion context, PSD features, SOC factors, and outcomes. A definition and code example were provided for each element of the theoretical code book to assist in consistent coding.

Any non-theoretically relevant discourse was coded as “no-code” and removed from this specific analysis.

Before formal coding began, a section from each group’s transcript was randomly selected to create one reliability transcript. The reliability transcript was then reviewed by an outside party using the code-book to ensure the codes were appropriate for the discourse. The investigator then coded the first half of the reliability transcript. Using this as a guide, the second coder was trained to code. The second half of the reliability transcript was coded individually, establishing a moderate coder reliability ($Kappa=.68$). To improve reliability in coding methods, discrepancies between the two coders were identified and addressed one by one. The moderate agreement was due in part to differences in specific codes but was consistent across theory components. Clarification to descriptions and examples were then made before re-coding. Disagreements were also identified in the coding unit itself. As the unit varied from one line to a paragraph, the investigator provided each coding unit to the second coder for final coding. Once perfect agreement was achieved on the reliability transcript, final coding analysis on the remaining transcripts was completed independently. Inter-rater reliability was then assessed at excellent agreement ($Kappa=.94$) and disagreements in codes were discussed on-going.

Using an elaborative analysis (Auerbach & Silverstein, 2003; Saldana, 2009) approach, the theoretical constructs, including user and technology contexts, SOC components, persuasive features and outcomes, were enhanced and fully described from the perspective of older participants. First, a list of all codes with the attached quotations was examined for repeating ideas. These repeating ideas developed meanings and

themes within each theoretical construct and are presented in Chapter 4. Uncommon and infrequently identified codes were also documented and reviewed.

Phase III

The third phase mixed the quantitative and qualitative findings for overall interpretation. Here, the quantitative and qualitative results were examined to explain the relevant components of web-based SM for older adults to inform future design and evaluation. Specifically, this phase addressed the following research question:

- How do older adult participants' perceptions of the web-based SM diverge and converge with the quantified findings regarding context, SM processes, technology engagement, and outcomes?

Sample. Sampling procedures for Phase I and II are described above. Phase III quantitative analysis regarding, context, SM processes, and technology engagement focused only older My Path participants (n=160), those 60 years of age and older. All Phase II participants were included in Phase III qualitative analysis regarding context and technology utilization. It is important to note that no additional Phase III analysis was conducted related to outcomes.

Data collection. Data collection procedures for Phase I and II are described above. Two additional variables were added to the secondary dataset for purposes of Phase III quantitative analysis specific to PSD social support and expertise features offered by My Path. These data were shared based on Phase I data collection protocols. While no additional qualitative data was collected during Phase III, additional qualitative analysis used two specific sets of focus group transcripts: 1) analysis regarding context

used transcripts ascribed a “no code” during Phase II coding; and 2) analysis regarding technology engagement used transcripts from the first activity which asked each participant to introduce themselves and make a general statement about the My Path program.

Measures. Measures for Phase I and II are described above. Table 4 provides a summary of quantitative measures used in Phase III. As previously noted, two additional quantitative variables were added to the dataset. The My Path social support feature refers to a participant’s attendance at My Path social support groups. Intervention participants were invited to three in-person support groups focusing on nutrition, healthy behaviors, and health provider communication. The My Path social support variable calculates the number of social support groups attended by the participant while in the My Path program. The My Path expertise feature refers to primary care visits in which My Path information (including participant goals and monitoring reports) was sent to the primary care physician (PCP) prior to the visit with the intention to initiate a patient-doctor communication regarding SM. The My Path expertise feature is a dichotomous variable indicating if information was sent to a participant’s PCP prior to a visit.

Table 3. Phase III variable descriptions and reliability coefficient for older participants (n=160)

Variable	Definition	Descriptive Mean(SD)/Group, Skewness and Kurtosis/%			
Persuasive Context					
Computer Usage	Number of hours spent on the computer per week	Never/<1 hour per week			3.8
		2 to 2.5 hours per week			14.4
		3 to 4.5 hours per week			15.6
		5 to 6.5hours per week			6.3
		7 to 8.5 hours per week			9.4
		9 or more hours per week			50.6
My Path PSD Features					
Social Support	Number of social support groups attended	0 groups			70.0
		1 group			6.9
		2 groups			11.9
		3 groups			11.3
Expertise	My Path information sent to PCP	Link to Doctor			11.9
		None			88.1
Self-Management Processes					
Self-Efficacy	Diabetes Self-Efficacy Scale	7.17(1.83)	-.48		-.43
Self-Monitoring	Number of times participant tracked	116.10(119.80)	.40		-1.49
Goal Attainment	Number of time goal was met	80.42(87.55)	.66		-.89
Technology Engagement					
<u>Web-Site Utilization</u>					
Total # of Visits	Sum of all web-site log-ons	30.48(31.83)	1.2 9		.76
Time on Site	Sum of minutes on the site for all visits	195.19(163.43)	1.1 6		1.21
Outcomes					
<u>Satisfaction</u>					
Intervention Satisfaction	Study specific open ended questions	Not applicable. Note that only n=120 older participants completed the satisfaction survey			

Analysis. The data were first juxtaposed to merge major findings from Phase I and II (Creswell, 2011); convergence and divergence of this data was identified. To further investigate these differences and/or similarities of merged data, Phase III analysis included both additional quantitative and qualitative analysis. Phase I results informed additional a priori investigation of the qualitative data, while Phase II informed supplementary quantitative analysis resulting in meta-inferences.

Phase II informed quantitative analysis comprised descriptive and bivariate analyses, including: t-tests, one-way analysis of variance, chi-square and correlation analysis, as appropriate. Phase I informed qualitative analysis adopted two *a priori* approaches. For analysis related to the context, magnitude coding (Saldana, 2009) was employed to indicate the prevalence of discussion related to diet, healthy foods, and nutrition. The coding structure including: present, absent, unclear and was applied to each “no code” unit. The total units coded “present” were then summed. For analysis related to technology engagement, provisional coding (Saldana, 2009) was conducted using a predetermined list to expand the understanding of participants’ opinions about My Path. The code list was developed during the focus groups as the first activity table was completed and then compiled across all five groups (for more information see Phase II measures). The codes were then combined with Phase II themes. The My Path statement codes are listed below:

- Learned
- Good review
- Lab work follow up
- Provided resources and information
- Increased awareness
- Tracking (pedometer/steps)
- Kept on track
- Reminders
- Staff support
- User friendly

Chapter Four: Phase I Results

Context

Older participant characteristics. Older adult participants (n=227) were on average 66 years of age. Approximately the same number of men and women participated, although there were more male participants than females in the older group. The older participants were primarily married, highly educated, Caucasian English speakers, with the majority reporting incomes of \$30,000-\$50,000 annually. Although the majority of older participants stated they used a computer more than 9 hours per week, nearly 33% used a computer less than 4.5 hours per week. Participants reported high levels of health literacy, and nearly all (92.4%) were taking medication to control their diabetes. On average, older adults were overweight (BMI>25) and had uncontrolled hemoglobin A1c levels (>7). However, both total cholesterol (<200) and mean atrial blood pressure (70-105) were considered normal. While reporting guideline appropriate percentages of intake calories, exercise, strong problem solving skills, and excellent medication adherence, participants reported unhealthy eating habits, low usage of supportive resources, poor general health status, and moderate levels of diabetes-related distress. See Table 4 for a summary of context descriptive information.

Differences by age group. Using independent samples t-tests and Pearson chi-squares, several differences were identified between the groups of older and younger participants (n=235). There were fewer Hispanic/Latino participants in the older cohort,

$\chi^2(1) = 22.31, p < .001$, who were more likely to be English speakers, $\chi^2(1) = 7.02, p = .008$. The older group had fewer single participants not in a relationship and were more likely to be widowed ($\chi^2(5) = 17.30, p = .004$) than the younger group. The older group was more likely to report an income between \$10,000-\$20,000 and less likely to be in the higher income bracket of \$90,000 ($\chi^2(5) = 18.90, p = .002$) than the younger group. Higher frequencies of weekly computer use were found among the younger cohort ($\chi^2(5) = 14.09, p = .015$). On average, the older cohort had lower BMI ($t(453.20) = 3.93, p < .001$), A1c ($t(404.30) = 4.2, p < .001$), cholesterol ($t(438) = 2.4, p = .017$), and blood pressure ($t(458) = 2.53, p = .012$) than the younger group. They also reported healthier eating habits ($t(460) = -2.45, p = .015$), higher levels of problem solving skills ($t(459) = -2.539, p = .011$), better general health ($t(460) = -2.89, p = .004$), improved medication adherence ($t(444.7) = -4.17, p < .001$), and decreased diabetes-related distress ($t(460) = 4.73, p < .001$) compared to the younger group.

Table 4. *Participant Characteristics*

Characteristic	<60 Year Old (n=235)		60+ Years (n=227)		Total (n=462)	
	% or M	(SD)	% or M	(SD)	% or M	(SD)
Treatment group						
Usual Care Control	27.7		29.5		28.6	
CASM Group	72.3		70.5		71.4	
Individual & Family						
Age	51.17	(6.48)	65.9	(4.34)	58.4	(9.2)
Gender						
Male	48.5		52.0		50.2	
Female	51.5		48.0		49.8	
Hispanic/Latino***	31.0		12.6		21.8	
Ethnicity						
Caucasian	67.1		76.4		71.8	
African American	16.7		14.1		15.4	
Asian	.9		2.3		1.6	
American/Alaskan	9.7		3.6		6.7	
Native	5.1		3.6		4.4	
Hispanic/Latino	.5		--		.20	
Unknown						
Language**						
English	94.9		99.1		97.0	
Spanish	5.1		.9		3.0	
Marital Status**						
Married	59.7		64.2		61.9	
Divorced	13.7		15.0		14.4	
Single No Relationship	15.0		7.1		11.1	
Single in Relationship	8.1		4.4		6.3	
Widowed	2.1		8.0		5.0	
Separated	1.3		1.3		1.3	
Income**						
>9,999	1.3		1.0		1.1	
10,000-29,999	11.1		21.9		16.3	
30,000-49,999	28.0		31.9		29.9	
50,000-69,999	24.4		21.4		23.0	
70,000-89,999	11.6		12.9		12.2	
90,000+	23.6		11.0		17.5	
Education						
Less than 9 th Grade	1.7		.4		1.1	
Some High School	1.7		1.8		1.7	
High School Degree	15.4		17.2		16.3	
Some College	44.4		39.2		41.9	
College Degree	23.5		20.7		22.1	
Graduate Degree	13.3		20.7		16.9	
Health Literacy	4.79	(.44)	4.73	(.52)	4.76	(.48)
Diabetes Self-efficacy**	6.72	(1.72)	7.19	(1.71)	6.95	(1.73)

<u>Biological</u>						
BMI***	35.98	(6.88)	33.64	(5.87)	34.83	(6.50)
A1c***	8.46	(2.02)	7.75	(1.45)	8.11	(1.80)
Cholesterol**	167.91	(40.64)	158.80	(38.99)	163.35	(40.04)
Blood Pressure**	96.51	(10.56)	94.07	(10.62)	95.35	(10.65)
<u>Behavioral</u>						
Eating Habits**	2.13	(.30)	2.20	(.29)	2.17	(.30)
Fat Intake**	35.63	(6.09)	34.76	(5.88)	35.21	(5.99)
Weekly Cal. Exp.	4624.89	(5006.48)	4290.22	(3965.70)	4459.39	(4519.9)
Medication Ad.***	3.27	(.34)	3.84	(.27)	3.77	(.32)
<u>Condition Specific</u>						
Diabetes Medication						
Oral	62.8		58.3		60.6	
Insulin	6.0		11.2		8.5	
Both (Oral & Insulin)	26.1		22.9		24.5	
None	5.1		7.6		6.3	
<u>Physical & Social</u>						
<u>Psychosocial</u>						
Problem Solving Skills**	2.89	(.72)	3.07	(.78)	2.9	(.76)
Supportive Resources	1.94	(.61)	1.98	(.64)	1.96	(.63)
General Health Status**	1.34	(.29)	1.42	(.29)	1.38	(.29)
Diabetes Distress***	3.32	(1.25)	2.77	(1.22)	3.05	(1.27)
<u>Persuasive Context</u>						
Computer Usage*						
< 1 Hour per week	6.0		4.0		5.0	
2-2.5 Hours per week	8.1		14.5		11.3	
3-4.5 Hours per week	7.2		14.1		10.6	
5-6.5 Hours per week	7.7		6.6		7.1	
7-8.5 Hours per week	5.1		7.0		6.1	
9 + Hours per week	66.0		53.7		60.0	

*p<.05, **p<.01, ***p<.001 Significant group differences by age cohort using Chi-Square and independent samples t-test as appropriate.

Baseline relationships. As seen in Table 5, low but statistically significant correlations were found between age and indicators at baseline for the 462 participants. As participants' age increased, computer use, biological indicators, fat intake, and diabetes-related distress decreased. While diabetes related self-efficacy, medication adherence, problems solving skills, and general health status improved with age, healthy eating habits declined with increasing age.

Table 5. *Relationship between Age and Baseline Indicators*

Variable(n)	<i>r</i>
Computer Use ^a	-.168***
Health Literacy	-.066
Diabetes Self-Efficacy	.158***
Biological	
BMI	-.181***
A1c	-.290***
Cholesterol	-.140**
Blood Pressure	-.158***
Behavioral	
Eating Habits	.144**
Fat Intake	-.102*
Weekly Caloric Expenditure	-.024
Medication Adherence	.243***
Psychosocial	
Problem Solving Skills	.147**
Supportive Resources	.049
General Health Status	.126**
Diabetes Distress	-.302***

* $p < .05$, ** $p < .01$, *** $p < .001$ Significant relationships were tested using Pearson and Spearman Correlation Coefficients as appropriate.

^aSpearman correlation coefficient

Technology Engagement

Participation. The majority of people contacted to participate in the study declined enrollment, while the remaining three groups had fairly equal sample sizes (enrolled, ineligible, unable to contact). Overall, potential participants were on average 60 years old, while those who refused or were ineligible were slightly older (Table 6). A discriminant analysis was conducted to determine whether age significantly predicted enrollment in the web-based SM intervention trial. Significant mean differences in age were observed across the groups, $F(3,2600) = 57.20$, $p < .001$. The overall Wilks's lambda was statistically significant ($\Lambda = .94$, $X^2(3, N=2604) = 168.22$, $p < .001$) indicating that age differentiated among the four enrollment groups: enrolled, refused study, unable to contact, and ineligible (Figure 9). However, the canonical correlation

was weak, showing that only 6.25% of the variance in enrollment group was explained by age and the classification showed that overall 26.40% were correctly classified if prior group probabilities were assumed to be equal.

Table 6. *Age by enrollment group*

Group	Mean(SD)	N
Enrolled	58.4(4.34)	462
Ineligible	62.05(9.96)	519
Unable to Contact	55.08(10.13)	492
Refused Study	61.42(9.67)	1131
Total	60.00(10.58)	2604

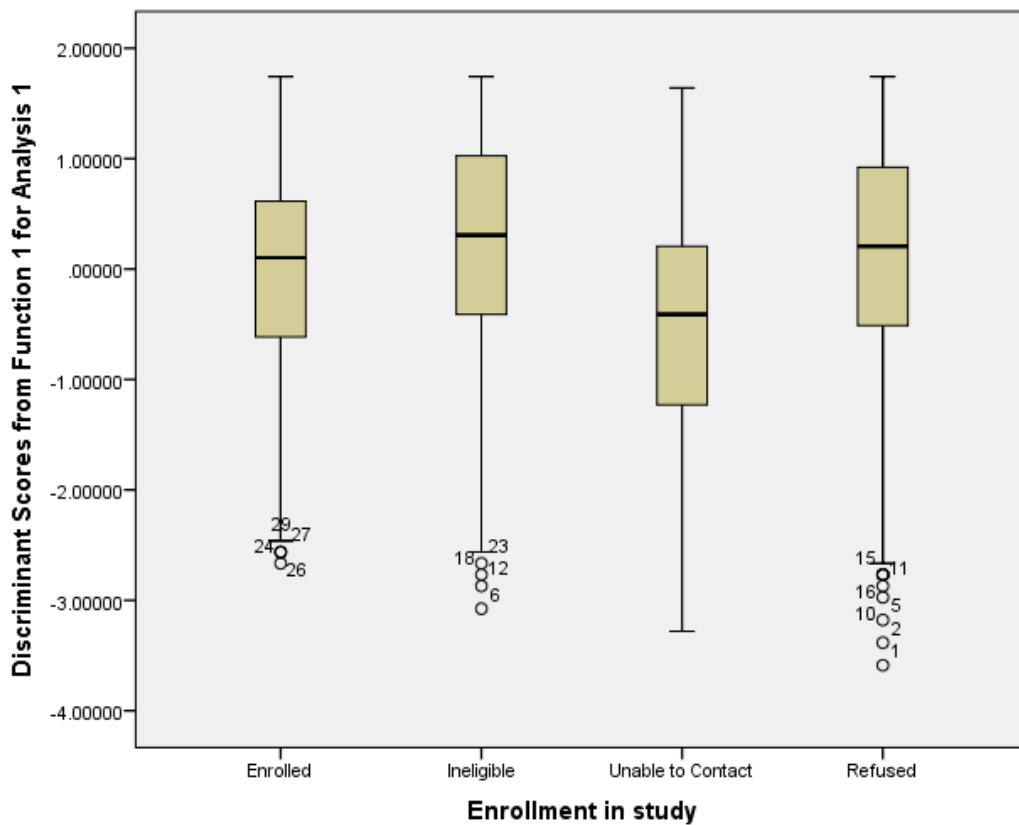


Figure 9. Box plots illustrating the distribution of discriminant scores for enrollment groups

Again, while on average those contacted were 60 years of age, those who actively opted out of the program, had other health concerns, and no internet were slightly older (Table 7). A discriminant analysis was conducted to determine whether reason for non-participation in the web-based SM intervention trial differed by age. Significant mean differences in age were observed across the groups, $F(10,2131) = 30.60, p < .001$. The overall Wilks's lambda was significant ($\Lambda = .87, X^2(10, N=2142) = 285.50, p < .001$) indicating that age differentiated among the reasons patients did not participate in the trial (Figure 10). However, the canonical correlation was again weak, showing that only 12.53% of the variance in non-participation reason was explained by age and the classification showed that overall 17.70% were correctly classified.

Table 7. Age by reason for non-participation

Reason	Age M(SD)	N
Unable to Contact	55.09(10.06)	573
Not Interested	62.34(9.54)	455
Too Busy	58.77(9.53)	281
Opt Out	64.14(8.62)	229
Other Health Concerns	64.40(9.51)	70
No Internet	64.13(8.96)	304
Not Type II Diabetic	60.84(11.19)	25
Not a KP Member	55.51(10.87)	45
Will not be Accessible for 12 Months	60.97(11.19)	31
Participants in Another Study	60.30(9.57)	43
Other	59.67(9.77)	86
Total	60.12(10.23)	2142

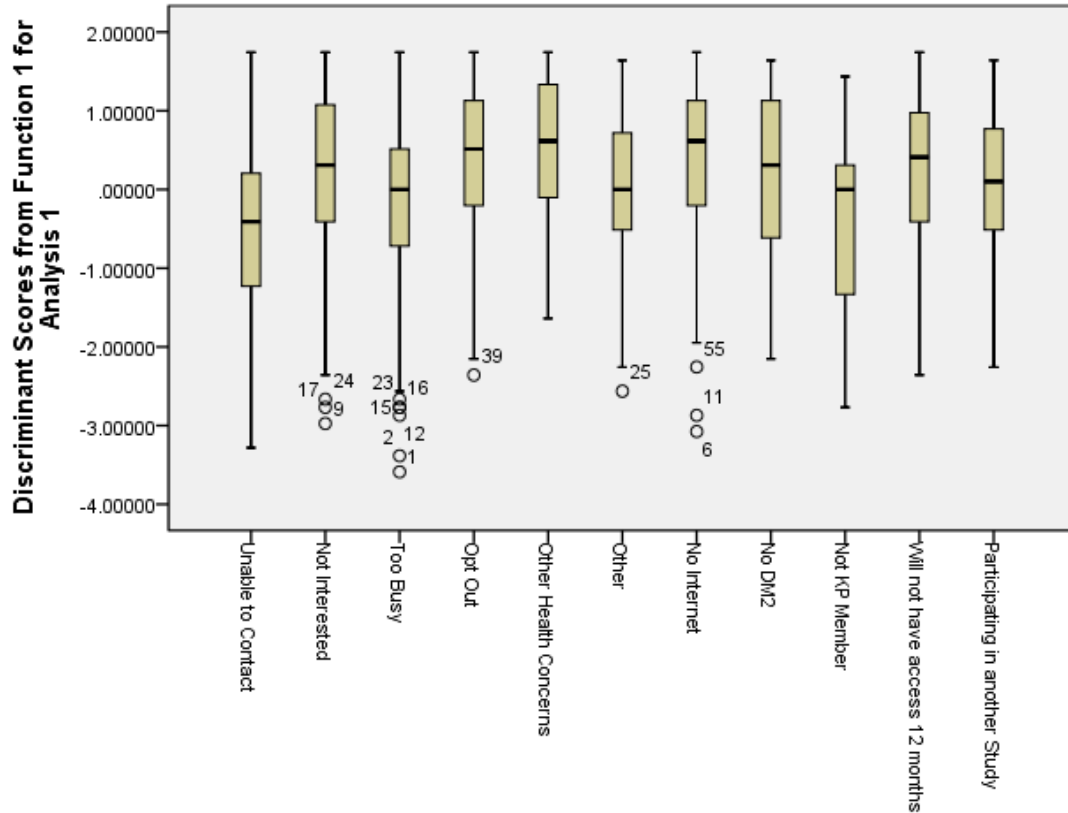


Figure 10. Box plots illustrating the distribution of discriminant scores for non-participation

On average participants stayed in the trial for 387.36(SE = 7.29) days, indicating that the majority of participants completed the program or were lost to follow up at study completion (Table 8). Although the trial maintained a retention rate of 77.5%, it is apparent (Figure 11) that many participants dropped out of the program within the first 6 months of the study.

Table 8. *Kaplan Meier survival analysis*

	Survival Time	Standard Error	95% CI
Mean	387.36	7.29	442.2-459.2
Median	451.55	4.18	442.8-459.2

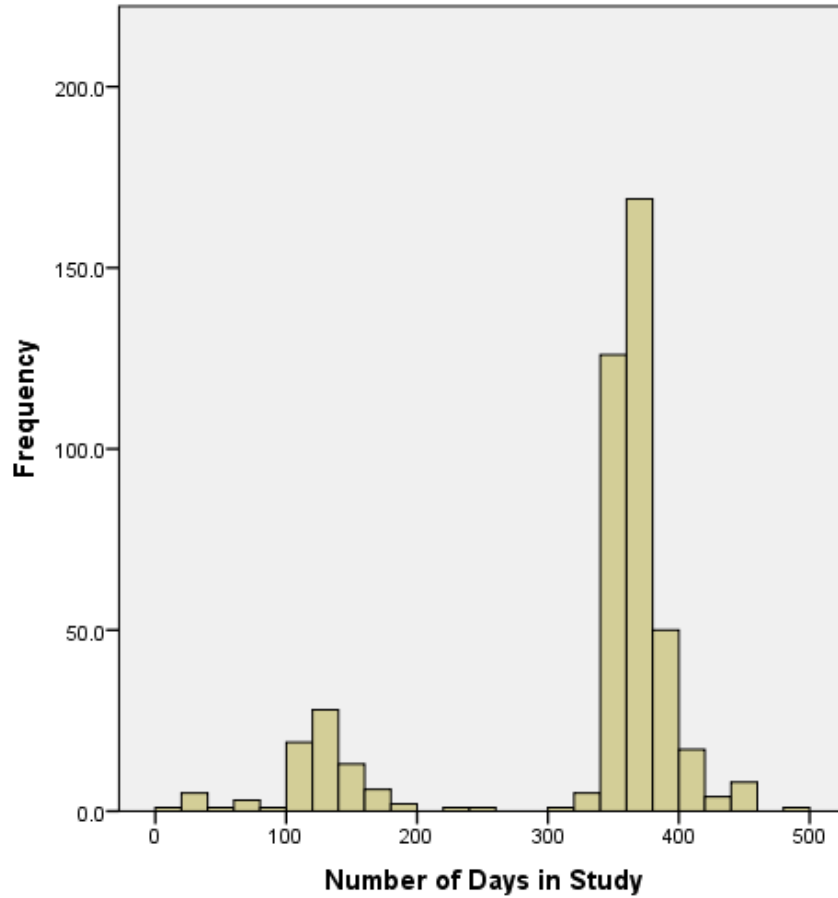


Figure 11. Distribution of survival times

The Kaplan Meier comparison of age groups indicated that 81% of the older cohort completed the study, compared to 74% of the younger group. As seen in Figure 12, the older adult group's mean duration in the study ($M = 409.50$, $SE = 10.83$) was also longer than the younger adult cohort ($M = 377.67$, $SE = 8.90$).

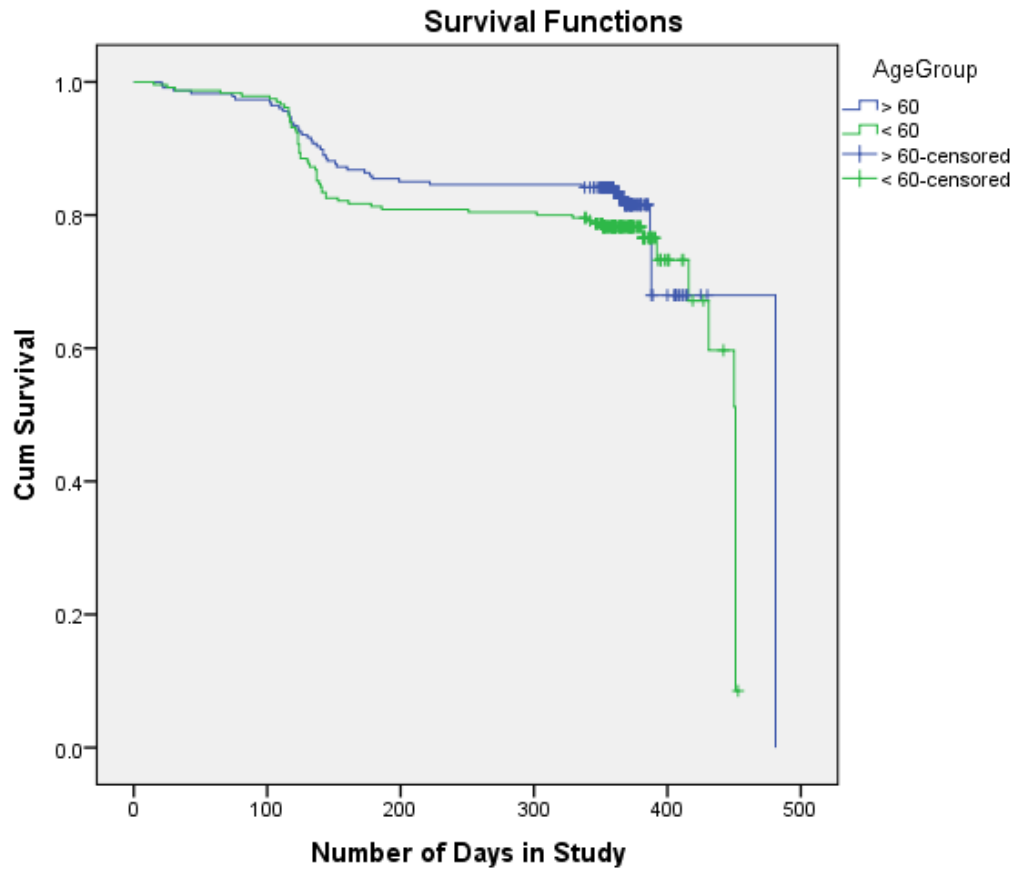


Figure 12. Study survival by age group

As seen in Table 9, after adjusting for computer usage and biological indicators, the estimated hazard of disenrollment from the study decreases by .97 times if a participant was a year older, while the risk of disenrollment for the control group also decreased by 5.46% . Computer use and biological indicators were not significant predictors of retention in the study. Of the older participants who did not complete the study, 30 (69.80%) indicated that they were no longer interested; 5 (11.63%) felt the program was too burdensome, and 8 (18.57%) had other reasons for leaving the program. The majority (n = 55, 90.16%) of younger participants who did not complete the study, did so because they were no longer interested. These differences in reasons for

disenrollment between age groups were found to be significant, $\chi^2(3, N=462) = 10.86, p = .013$. When examining the survival times of older participants by reason for disenrollment (Figure 13), older participants who felt the program was too burdensome left the study within the first 6 months of the program.

Table 9. *Predictor estimates for survival time in study*

	B	SE	Wald	Exp(B)
Age	-.030	.011	7.090	.971**
Treatment Group	-.606	.279	4.718	.546*
Baseline Computer Use	.189	.219	.747	1.208
BMI	-.012	.015	.641	.988
A1c	-.066	.061	1.162	.936
Cholesterol	-.002	.003	.439	.998
Blood Pressure	-.014	.011	1.692	.986

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

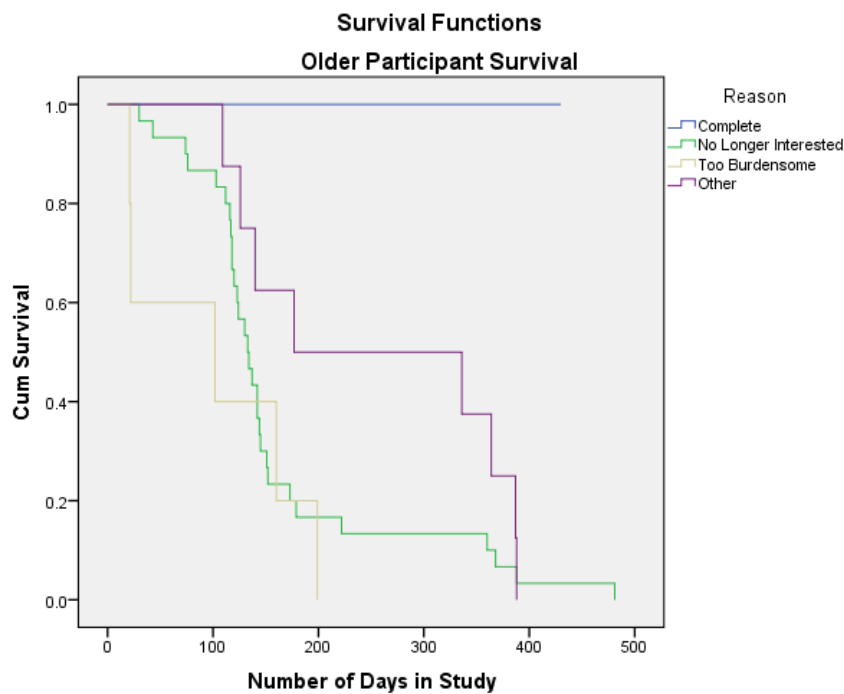


Figure 13. Older participant survival by reason for disenrollment

Website utilization. Using Pillai's trace criterion, the composite of time spent on the website and visits to the site was not significantly affected by age, Pillai's trace = .004, $F(2,327) = .72$, $p = .486$, partial $\eta^2 = .004$. In addition to time spent on the site and number of visits to the site, there were no differences in site feature use between younger and older participant groups. Frequencies of website feature use are described in Table 10.

Table 10. *Visits to website features*

Site Feature	<u><60 Year Old</u> <u>(n=170)</u> %	<u>60+ Years</u> <u>(n=160)</u> %	<u>Total</u> <u>(n=330)</u> %
ABC Visits			
No visits	14.70	21.90	18.20
1-2 visits	28.20	30.60	29.40
3-4 visits	25.30	17.50	21.50
5 + visits	31.80	30.00	30.90
Ask the Expert Posts			
No postings	85.90	86.30	86.10
Posted	14.10	13.80	13.90
Ask the Expert Visits			
No visits	18.20	23.80	20.90
1 visit	44.10	43.10	43.60
2 + visits	37.60	33.10	35.50

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

Self-Management Processes

Using Wilk's criterion, the composite of SM processes was not significantly affected by age, λ , $F(2, 255) = 4.414$, $p = .239$, partial $\eta^2 = .016$. As seen in Table 11, it appears that older participants self-monitored and attained their goals less frequently than the younger participant group. However, these difference were only significant for self-monitoring, $F(1,255) = 4.13$, $p = .043$, partial $\eta^2 = .016$.

Table 11. *Descriptives of SM processes by age group*

	<u><60 Year Old</u> (n=131)	<u>60+ Years</u> (n=127)	<u>Total</u> (n=258)
SM Process	Mean(SD)	Mean(SD)	Mean(SD)
Self-Efficacy	6.93(1.58)	7.31(1.59)	7.12(1.59)
Self-Monitoring	164.31(119.50)	136.85(119.34)	150.79(119.99)
Goal Attainment	111.22(88.43)	94.68(88.01)	103.08(88.45)

Outcomes

Table 12 provides descriptive information for biological, behavioral and psychosocial outcomes at 4 and 12 month by age cohort.

Table 12. *Outcomes by age group and follow up visit*

Outcome	4 Month		12 Month	
	< 60 Years M(SD) (n=158)	60+ Years M(SD) (n=168)	< 60 Years M(SD) (n=123)	60+ Years M(SD) (n=138)
Biological				
BMI	36.47(6.81)	33.12 (5.89)	36.30(6.92)	33.12(5.94)
A1c	8.00(1.63)	7.46(1.05)	8.28 (1.73)	7.54 (1.06)
Cholesterol	161.28(41.79)	152.46(35.84)	162.61(38.67)	150.13(38.87)
Blood Pressure	96.94(11.12)	92.86(9.23)	95.53(10.46)	93.60(10.39)
Behavioral	(n=171)	(n=173)	(n=141)	(n=152)
Eating Habits	2.26(.27)	2.29(.28)	2.29(.28)	2.31(.28)
Fat Intake	34.21(4.88)	33.87(5.87)	33.47(4.04)	32.05(4.35)
Wkly Cal.	5034.45(4485.36)	4234.09(4143.39)	3972.76(5268.00)	3338.20(4114.7
Exp.	3.76(.38)	3.88(.28)	3.83(.19)	6)
Medication				3.90(.15)
Ad.				
Psychosocial	(n=188)	(n=185)	(n=170)	(n=178)
Problem Sol.	3.08(.64)	3.23(.77)	3.22(.66)	3.30(.69)
Supportive	1.99(.64)	2.07(.69)	2.04(.68)	2.05(.71)
Res.	1.35(.31)	1.42(.31)	1.34(.32)	1.41(.31)
General Health	2.92(1.10)	2.46(1.14)	2.81(1.11)	2.38(1.11)
DM2 Distress				

Biological outcomes. At 4 months, the composite of biological outcomes was significantly affected by age, Pillai's trace = .034, $F(4,313) = 2.73$, $p = .029$, partial $\eta^2 = .034$, but not by treatment, Pillai's trace = .020, $F(8,628) = .78$, $p = .624$, partial $\eta^2 =$

.010. Univariate ANOVAs identified blood pressure to be the locus of the multivariate effect, $F(1,325) = 7.58, p = .006$, partial $\eta^2 = .023$. Even when controlling for baseline blood pressure, the older group had lower blood pressure than the younger participant group. No statistically significant age effects were observed for BMI, A1c, cholesterol, or treatment group, nor was there a significant age-treatment interaction at 4 months.

At 12 months, the composite of biological outcomes was again significantly affected by age, Pillai's trace = .052, $F(4, 248) = 3.405, p = .010$, partial $\eta^2 = .052$, but not by treatment, Pillai's trace = .028, $F(4, 248) = .890, p = .524$, partial $\eta^2 = .014$. Univariate ANOVAs identified A1c [$F(1,259) = 6.235, p = .013$, partial $\eta^2 = .024$] and cholesterol [$F(1,259) = 9.01, p = .003$, partial $\eta^2 = .035$] to be the locus of the multivariate effect. Even when controlling for these factors at baseline, the older group had lower A1c and cholesterol than the younger participant group. No statistically significant age effects were observed for BMI, blood pressure, or treatment group, nor was there a significant age-treatment interaction at 12 months.

Behavioral outcomes. At 4 months, the composite of behavioral outcomes was significantly affected by age, Pillai's trace = .068, $F(4, 331) = 6.04, p < .001$, partial $\eta^2 = .068$, and treatment, Pillai's trace = .084, $F(8,664) = 3.69, p < .001$, partial $\eta^2 = .042$. Univariate analyses identified medication taking as the locus of the age multivariate effect, $F(2,342) = .214, p < .001$, partial $\eta^2 = .056$. The older group was better at taking medications than the younger group. Eating habits [$F(2,344) = 12.09, p < .001$, partial $\eta^2 = .067$], caloric intake from fat [$F(2,342) = 3.60, p = .028$, partial $\eta^2 = .021$], and exercise [$F(2,342) = 3.71, p = .026$, partial $\eta^2 = .022$] were significantly affected by treatment group. Based on Scheffé post hoc analyses, the CASM ($M = 2.34, SD = .31$)

treatment group showed significantly ($p = .05$) healthier eating habits than the control group ($M = 2.17$, $SD = .26$). The CASM treatment group showed significantly ($p = .030$) lower caloric intake from fat ($M = 32.99$, $SD = 4.70$) than the control group ($M = 34.68$, $SD = 4.53$) and had significantly ($p = .007$) higher levels of caloric expenditure through exercise ($M = 5026.96$, $SD = 3704.33$) than the control group ($M = 3635.03$, $SD = 3607.67$). At 4 months, there were no age-treatment interactions.

At 12 months, the composite of behavioral outcomes was neither significantly affected by age, λ , $F(10,283) = 2.04$, $p = .090$, partial $\eta^2 = .028$, nor treatment $F(10, 283) = 1.83$, $p = .069$, partial $\eta^2 = .025$. However, univariate analysis identified significant effects of age on medication taking [$F(1,293) = 5.78$, $p = .017$, partial $\eta^2 = .020$] and a significant effect of treatment group on eating habits [$F(2,293) = 4.50$, $p = .012$, partial $\eta^2 = .031$]. The older participant group was again found to take medications better than the younger group. The CASM treatment group again demonstrated healthier eating habits ($M = 2.235$, $SD = .26$) than the control group ($M = 2.22$, $SD = .30$). No age-treatment interactions were found.

Psychosocial outcomes. At 4 months, the composite of psychosocial outcomes was neither significantly affected by age, λ , $F(4, 360) = 1.91$, $p = .108$, partial $\eta^2 = .021$, nor treatment $F(8,720) = 1.652$, $p = .107$, partial $\eta^2 = .018$. However, univariate analysis identified several significant age, treatment, and age-treatment interaction effects. The older group had significantly lower diabetes distress than the younger participant group, $F(1,372) = 4.08$, $p = .044$, partial $\eta^2 = .011$. There was a univariate effect of treatment group on problem solving skills, $F(1,372) = 3.17$, $p = .043$, partial $\eta^2 = .017$, which according to Scheffé post-hoc analysis ($p = .010$) the CASM treatment

group showed better problem solving skills ($M = 3.29$, $SD = .73$) than the control group ($M = 3.15$, $SD = .71$). The significant age-treatment interaction on use of supportive resources, $F(1,372) = 4.57$, $p = .011$, partial $\eta^2 = .025$, required additional follow-up (Figure 14). In opposition to the younger participant group, there was a significant effect of treatment group for the older participant group $F(2,183) = 7.19$, $p = .001$. Scheffé post hoc analysis revealed that among older participants the CASM treatment group used more supportive resources ($M = 2.29$, $SD = .71$) than the control group ($M = 1.86$, $SD = .62$) at 4 months. At 12 months, there were no age or treatment group effects on psychosocial outcomes at either the multivariate or univariate level.

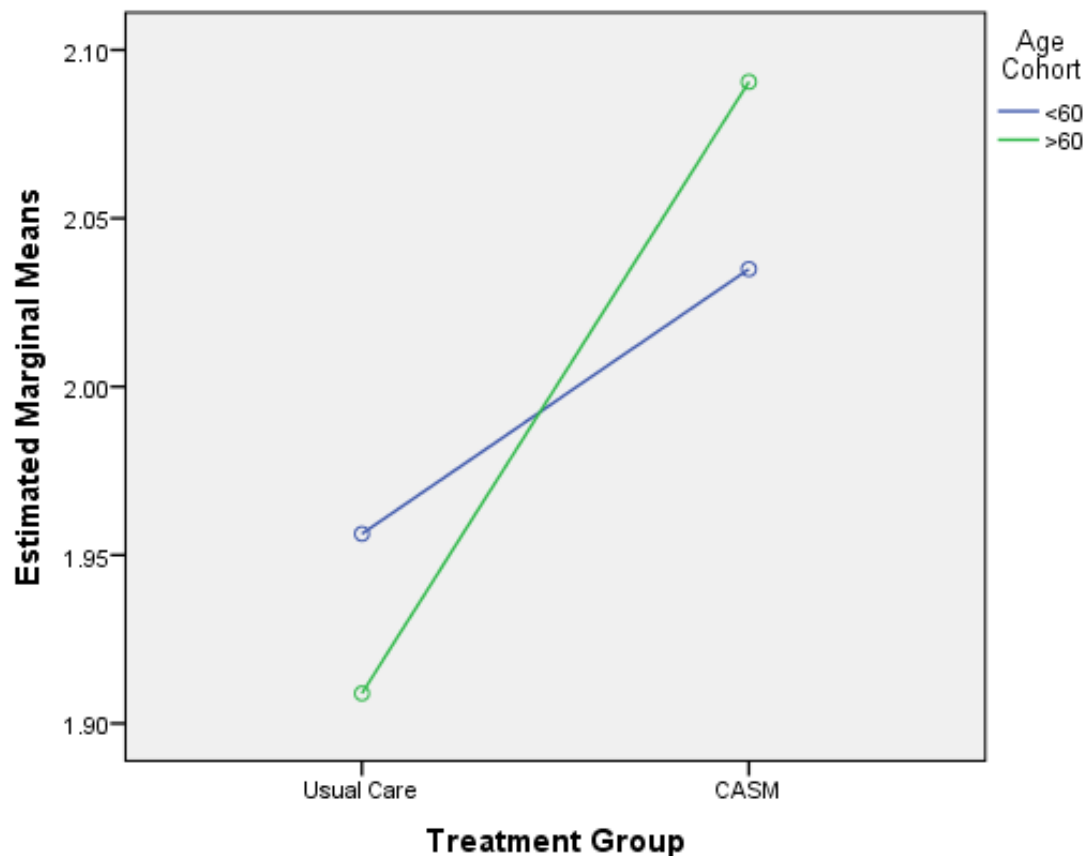


Figure 14. Age by treatment interaction on the use of supportive resources

Satisfaction outcomes. The correlation between satisfaction and age was found to be nonsignificant, $r = -.007$, $p = .910$. When asked if anything interfered with participants' abilities to participate in the My Path program, older participants most frequently noted health problems, technology and access problems, and conflicting priorities as reasons for impeding participation. However, this did not significantly differ from the younger cohort, $\chi^2(15) = 17.349$, $p = .298$. Older participants stated that the in-person visits, healthy encouragement from the program, and a user friendly design of My Path were the best aspects of the program. However, their least favorite aspects included goal setting capabilities, the interactive voice response system (IVR), and usability issues. Older participants also frequently noted the program was burdensome. The satisfaction aspects of the program did not statistically differ by age cohort regarding these areas ($\chi^2(1) = 21.325$, $p = .212$; $\chi^2(25) = 25.486$, $p = .435$ respectively). Older participants suggested the increased in person support and personalization in the program would improve My Path. This feedback also did not differ by age group, $\chi^2(22) = 17.412$, $p = .740$.

Phase I Summary

Phase I results indicated several age effects in terms of the context, technology participation and utilization, SM processes, and outcomes of the web-based SM, My Path to Healthy Life. Older participants had lower incomes, better health status, improved medication adherence, healthier eating habits, and lower computer utilization than younger participants. Older adults contacted for the study indicated decreased interest in the program and inability to participate due to the lack of internet access. Although there

were no age differences in web-site use, older adults who did not complete the study did so because they were no longer interested or the program was too burdensome. Older participants who felt the study was too burdensome also dropped out of the program within the first 6 months of the study. Older participants demonstrated higher confidence levels in their ability to self-manage their diabetes at baseline, were more successful in medication taking, but less successful in self-monitoring. In terms of outcomes, older adults used more supportive resources and had higher medication adherence at the completion of the study.

According to these results, there is evidence that older adults may not have the technology or interest in technology to participate in web-based SM. However, once enrolled, there were no differences in technology utilization. The older participants included were primarily white, middle class, well educated, English speakers with internet access, raising concerns about the applicability of web-based SM for a diverse older population. Older participants had better medication adherence at all times points, but self-monitored less frequently. Improved tools and features to support monitoring may be needed. There were few effects of lifespan found on outcomes of the intervention. Older participants were healthier at every state, indicating that these may be difference populations with different SM needs. Phase II used the experiences and perceptions of older My Path participants to better understand the mechanisms of these age-related differences.

Chapter Five: Phase II Results

Focus Group Participants

Forty older My Path participants attended a Phase II focus group (Table 13). On average participants were 70 years old, and mostly male. Participants were primarily white, married, and well educated. While most were taking some form of diabetes medication, participants showed high levels of diabetes self-efficacy and health literacy. Computer usage varied, but on average participants visited the My Path site 40 times and spent 258 minutes on the website. Five participants had not used the program while in the trial. No differences in biological, behavioral, and psychosocial indicators were found between focus group attendees and older My Path participants. However, focus group participants did spend more time on the My Path website $t(123)=2.3, p=.023$.

Table 13. *Focus group participant characteristics (N=40)*

Characteristic	% or M	(SD)		
Age	69.8	(5.86)	Diabetes Medication	
Gender			Oral	67.5
Male	62.5		Insulin	5.0
Female	37.5		Both (Oral & Insulin)	17.5
Hispanic/Latino	7.5		None	10.0
Ethnicity			Diabetes Self-Efficacy	7.37 (1.82)
Caucasian	80.0		Computer Usage	
African American	10.0		< 1 Hour per week	10.0
Asian	5.0		2-2.5 Hours per week	17.5
American/Alaskan Native	5.0		3-4.5 Hours per week	10.0
Marital Status			5-6.5 Hours per week	2.5
Married	72.5		7-8.5 Hours per week	5.0
Divorced	5.0		9 + Hours per week	55.0
Single No Relationship	5.0		Visits to Site	40.17 (35.23)
Single in Relationship	7.5		Time on Site	257.74 (161.169)
Widowed	10.0		Biological	
Separated	1.3		BMI	32.79 (6.81)
Income			A1c	7.56 (.99)
10,000-29,999	17.9		Cholesterol	160.90 (43.49)
30,000-49,999	20.5		Blood Pressure	94.87 (8.87)
50,000-69,999	28.2		Behavioral	
70,000-89,999	10.3		Eating Habits	2.16 (.27)
90,000+	23.1		Fat Intake	34.35 (6.68)
Education			Weekly Caloric Expenditure	3758.09 (2966.09)
Some High School	5.0		Medication Adherence	3.86 (.23)
High School Degree	15.0		Psychosocial	
Technical School	37.5		Problem Solving Skills	3.02 (.70)
College Degree	20.0		Supportive Resources	2.03 (.61)
Graduate Degree	22.5		General Health Status	1.38 (.26)
Health Literacy	4.81	(.41)	Diabetes Quality of Life	3.02 (1.26)

Older Adult's Perception of the Persuasion Context

Participants had varying attitudes about technology. While some participants were enthusiastic about technology in general, negative perspectives were commonly reported. Those who were optimistic about technology in general described their positive attitude in relation to new opportunities technology provides. As seen in Table 14, participants expressed that technology afforded innovative abilities and advances particularly related to communication and access to information.

In opposition to these ideologies, participants also expressed negative attitudes toward technology usage, experience, and apprehension. Regarding use in technology, participants noted that many older adults lacked interest, and others stated interest

generally declined with age. Some participants stated they were forced to use technologies, such as computers for work or to communicate with family. However, participants expressed that utilization was based in personal experience, indicating that individuals raised or educated with technology skills were more likely to use technology compared to those who had little experience. Participants felt that they were inadequate users of the technologies, suggesting they could not use the technologies properly or as well as younger generations. Utilization difficulties resulted in fear and frustration with specific features and technology in general among many participants.

Participants had strong opinions related to the consequences of technology on society and younger generations. Participants felt that younger groups were dependent on technologies, lacking basic skills. Concerns about the negative impact of technology on social, communication, and learning skills were frequently noted. One participant felt that the obesity epidemic was directly related to the rise and dependency of younger people on technology.

Table 14. *Elaboration of user context*

Elaboration	Quotation
<u>Positive</u>	
Opportunity	“(Technology) is something fantastic. And I wish I were four years old today. Because the opportunity for the young people is so tremendous. We don’t have to sit there and play with dominoes, and we don’t have to sit there and play Monopoly, because these times are over. Today we watch the ISS, the International Space Station!”
	“Well, I like the new technology because, for me, it opens up the world. It’s a totally new freedom, right.”
<u>Negative</u>	
Not Interested	“There are some people that are just not interested. I don’t care what you do. You could take the class to their house. You could give them a computer. The bottom line is, there are some people that are just not interested, point-blank, no matter what you do.”

Experience-Based Use	“You know, if you and I had been brought up on this technology, we’d be able to do the same thing.”
Inadequate Users	“And he says (participant’s husband), ‘My fingers are so big, I keep hitting-‘ you know, he has gotten on it a couple of times. And he says, ‘I keep hitting the wrong key because my fingers are so big’. And he does have big hands, I mean.”
Fearful	“It took me a year to just figure out that I’m not going to - if I do something wrong, it’s not going to burn my computer up. That’s what I was afraid of.”
Frustration	“I think as I get older, I have - I have more of a tendency to get frustrated about technical stuff.”
Negative Consequences	<p>“Now, our kids and our grandkids, they can’t write, they can’t read, because everything’s done on the computers.”</p> <p>“That’s why there’s so many of the kids that are getting fat is because they’re - that’s what I have against computers and the texting and all this.”</p> <p>“They don’t need anyone. They don’t really know how (to) go look somebody in the eye and talk to them. It’s getting bad.”</p>

In addition to perspectives related to technology in general, participants varied in opinion about specific technology features. As seen in Table 15, both negative and positive aspects of technology features were described. Features identified by participants included mobile phones, computers, internet, email, specific websites, software programs, work specific technologies and the My Path program specifically. In terms of negative opinions regarding these types of technology features, older participants expressed frustration in learning how to use the feature and described specific challenges and barriers they experiences with the features. For instance, participants highlighted the challenges in learning to use new cell phones. In their

attempts to sync information or text message, participants were unable to make the features work as desired. Once a barrier was encountered with a feature, participants indicated they would simply stop use of the feature or use it in a manner that suited their abilities.

While facing challenges with features, there were specific positive opinions regarding technology features. Participants spoke highly about technology features that were user friendly, or simply easy to use. I-pads and tablets were highlighted as simple devices that were easy to decipher. Technology features that assisted or helped participants in everyday life were also popular. Online shopping, online banking, e-health information, prescription telemedicine, communication via Kaiser Permanente's website (kp.org), phone navigations systems, and online communication were documented as positive features. Participants felt that online services such as banking and shopping saved time and money. Communication with doctors and pharmacists was improved through kp.org, and Skype could be used to see family members living far away. Using features for fun and entertainment were also common. One participant shared her story of using a smart phone's navigation system for directions and restaurant suggestions on a road trip. Participants stated they enjoyed using the computer for games, and improved TV services/devices allowing them to watch or record films and television of their liking. E-readers, such as Nooks and Kindles, digital cameras and photograph applications were also popular among participants.

Table 15. *Elaboration of the technology context: Technology features*

Elaboration	Quotation
<u>Positive</u>	
User-Friendly	“Well, they’re starting to simplify the computers, in the first place, you know. The keyboards are not as complicated. They don’t have all the - like yours, all those lights across there. They don’t have that anymore. It’s just a plain keyboard, and it’s used for what you need to use the keyboard for. And I love the new laser mouse technology. It’s much, much better than the old roller balls. It would get slanted and you’d have to clean it out and all that.”
Assistance/Helpful	<p>“I pay my bills online. I didn’t like having to go to the credit union all the time in order to know whether I had money in my account or not. I can go right onto the computer and look and say, “Oh, whoa!” I can - I can do that in an instant now.”</p> <p>“Skype is another one that’s really great, if you’re on Skype. I was talking to one of my girlfriends in Italy last night on Skype, face to face. And it’s face to face. I mean, the little thing on the computer is a camera, and we’re talking face to face. She’s showing me stuff she’s doing in Italy. I didn’t have to sit on a plane for 12 hours to go see her. There she was. It’s marvelous!”</p>
Fun/Entertainment	“Now, right now, I like to play chess. I am - every morning, I play about 45 minutes to an hour, chess on the computer. And it stimulates my mind.”
<u>Negative</u>	
Challenges to Use	“So not mad-mad, I mean, I knew it was going to happen and sure enough it did. Well! iPhone doesn’t like change e-mail addresses so I’m now going at odds with iTunes and iCloud and some of the other stuff because I put everything in with the old address and now, I’m trying to change. Some things change easily; many do not. So it’s just about the time you think you’ve got something down, the little barriers pop up.”
Stopped/Limited Usage	“But this one (mobile phone), I can’t figure out how to find out who’s calling me - caller ID - I haven’t figured that one out yet. I’ve just had this phone now, I think, two weeks, so - but I haven’t figured out how to see who’s calling me so I have to go my office and get the (old) phone and look and see who’s calling me. And so, I’ll keep working at it and eventually, I’ll either get it or I’ll take it back and get a different one. That probably what I’ll do, what’ll happen.”

Table 16 summarizes the participants' positive and negative opinions about requirements for using technologies. Participants explained they had particular difficulties with passwords and technology maintenance. Participants felt there was an overuse of passwords required for websites, applications, and other features. Remembering the multiple passwords was in general a challenge. Maintenance of technologies, including repair and upgrade, were unpopular among participants as these required time and upgrade knowledge about the feature. Considerably, the strongest dislike of technology requirements related to cost. The expense of purchasing devices and service packages for television and phone services was a significant burden. In many cases, participants gave up services such as cable and smart phone access to save money. While providing examples of technology requirements that hindered use, few positive references were made by participants regarding requirements of technology. However, one participant expressed his excitement about the amount of memory allotted on his computer. Another enjoyed access to Apple applications, while a third participant enjoyed faster connectivity after a computer upgrade.

Table 16. *Elaboration of the technology context: Technology requirements*

<u>Positive</u>	
Positive Technology Requirements	One of the benefits (of the iPad) is that I have a program downloaded. Apple has a total of 225,000 apps.
<u>Negative</u>	
Passwords	"Remembering your login password. A lot of times you can't remember it, and you say the hell with it."
Expense	"Because maintaining a computer is expensive. Your average person probably spends \$600 to \$700 a year on the computer or on the Internet. That's a lot of money."
Maintenance	"If the computer goes down and you need to take it over for repair, then you're missing out on your weekly programs because you can't get in the computer."

SOC, SM Processes and Technology Engagement

After examining the persuasion context it was evident that the user and technology context influenced SOC processes, in turn web-based SM processes among participants. Selection, or the narrowing use of technology, was supported by various elements of the persuasion context. Interest in technology, technology self-efficacy and technology perceptions often deterred older participants from engaging in technology. When participants felt that they were unable to use a technology properly or if they lacked interest, they would disengage from these technologies. Cost and maintenance were major barriers to technology engagement, and participants selected features that were individually applicable and appropriate to their needs and objectives.

After selecting the use of a technology, older participants indicated that continued utilization required three major components: benefits, ease of use, and assistance. Participants would maximize use when they perceived a benefit. One participant noted that she continued use of the My Path program because she was losing weight. This perceived benefit motivated her to engage in the program. Repeatedly, ease of use was important for older participants. Reduced barriers and challenges in technology use resulted in maximized utilization of My Path. However, when problems did arise there was an essential need for assistance. If an older participant is able to address a concern or barrier quickly, program utilization will also continue. Many participants noted that they used younger family members, including children and grandchildren, for this support.

Older participants commonly used technologies and features to compensate for losses. Participants indicated the major reason for using technology in general was to communicate with friends and family or to compensate for the loss of in-person social

communication. This was evident in the use of cell phones, email, and Skype. Specific features, such as text messaging, were used to compensate for physical losses. One participant indicated that he used text messages because he was unable to hear a conversation on the phone with his hearing aids. Interestingly, participants also provided examples of using technology to compensate for losses in cognitive processes to continue use of other technologies. For example, many participants found it difficult to remember passwords to website and applications. In order to address this challenge, older participants developed systems for tracking passwords. One participant used a computer program, Pass Key, to store and save all his passwords. Table 17 provides a summary of the influence of SOC on technology engagement. Although the connections between SOC and technology engagement was identified in the data, discussions regarding elements of SOC that support or hinder specific SM processes was not identified.

Table 17. *Influence of SOC on technology engagement within the persuasion context*

	<u>Selection</u>	<u>Optimization</u>	<u>Compensation</u>
User Context	<u>Interest in Technology, Technology Self-Efficacy & Perceptions</u> “I don’t care to use the computer when I get home. I don’t want to use. I’m like you; I’ve got too many things to do, and I’m so limited, that I don’t want to use it. I like the stuff you send in the mail.”	<u>Beneficial Technology</u> “The other part of it (My Path): I loved the computer. I loved the keeping track. I loved the diets. It was all very good, and yes, I’m continuing to lose weight. I’ve lost 80 pounds.”	<u>Reason for Technology Use</u> “Well, I changed phones, and it has a keyboard, so now I can text my kids. It slides up, but it’s got the actual word. If you want to say hi, you type the “H” and the “I”.
Technology Features	<u>Individually Applicable</u> “What I’m - what I’m saying, though, is that you’ve got to use the computer. And I’m not a big user, because of other problems. But if you use the computer to what you need and get one that will do what you want, that’s all that counts.”	<u>Ease of Technology Use</u> “No, I deal with computers all the time, so I don’t have any problems.”	<u>Specific Compensation Features</u> ““Okay, now I can do text messages.’ I can’t hear on it! I got a new telephone I can’t hear on! It doesn’t work with my hearing aids! So it’s great because it provides you something new.”
Technology Requirements	<u>Cost & Maintenance</u> “It’s really a question of income and saying, “This phone, which gives me phone calls and even a modest amount of Web surfing, costs me \$100 a year, versus your smartphone, which is at least \$100 a month.” And that’s a real difference. On the other hand, there are enough smartphones in this room that, if there was a question that needed to be answered somebody else would be perfectly happy to come up with it. We could all Google it.”	<u>Technical Assistance</u> “When I have troubles, I have to go get my kids to do it. They’re all engineers and teachers and everything else. They use it daily and program it. Hell, I can’t figure that out.” “My grandkids try to show me how to do it, but that don’t happen. I have to have the manual. Oh, so learning from a written or a visual way. I think that could very well be an age-particular situation.	<u>Technologies Compensate</u> “Well, now, what I used to do is write down all my passwords. I don’t do that anymore. I learned one master password, and I have a little program called Pass Key. And if I need to use a password, I go into Pass Key, get my password out of there, copy it and paste it back into my program or the website or whatever it is that I need to use. And I only have to learn one password for everything.”

Persuasive Features, SM Processes and Technology Engagement

Older adult participants highlighted examples of primary task supports that helped, or would have helped if available, with SM processes and technology engagement. Reduction, tailoring and personalization supports were reported to impact SM knowledge and beliefs. Reduction techniques reduced complex health information into manageable pieces, allowing participants to focus. This in turn improved individual confidence, or self-efficacy, related to the focus. For example, one participant stated that within a healthy eating resource section, it would be important to include simple information such as “the worst carbohydrates” or “the best vegetables” to eat. In addition to simplifying complex information, tailoring techniques can be used to target information specific to illness, age, and persuasion context, again allowing participants to focus on goals, improving confidence and motivation. Personalization would then provide the addition of individualized materials and options. Because disability and comorbidities increase and vary with age, participants felt it was important to personalize programs to the individual. For example, one participant stated the need for an individualized exercise program. While having exercise information available was helpful, having a plan he could carry out without fear of injury based on his specific condition was necessary.

Self-monitoring, simulation and rehearsal supports were shown to impact self-regulation processes. Self-monitoring was commonly discussed as the My Path program targeted self-monitoring behaviors. Participants provided examples of devices, applications, and computer programs that were used to monitor their behaviors, including walking, caloric intake, water consumption, and glucose readings. Although evidence of

simulation and rehearsal supports were less common, participants felt that providing tools linking consequences to behaviors prepared them to take healthier action. For example, one participant noted she used the internet before eating out or preparing a meal to investigate nutrition information. She was then able to make healthier orders at restaurants or use healthier ingredients. These techniques improved reflective thinking and decision making processes. Table 18 provides a summary of these primary tasks.

Table 18. *Persuasive primary task supports, SM processes, and technology engagement*

Support	Elaboration	Quotation	Web-based SM Processes			
			Knowledge & Beliefs	Self-Regulation	Social Facilitation	Technology Engagement
Reduction	Reducing Information	“So if we’re going to use the website and the website would regularly give you a focus one thing. This business about the effect of protein on carbs and then you do a few paragraphs on that, or what are the 25 lowest carb groups or best choice vegetables or things like that. Then you don’t have to - you’re getting your information in chewable chunks and it’s not so overwhelming. It’s something you can hang on to.”	X			
Tunneling	Not Identified					
Tailoring	Targeted Information	“The website helped narrow down - that information that I took out and put it in a notebook, I just decided, I will look at this. I’m not looking at anything else. I am ignoring the glycemic index because I don’t care and it’s too much information. It’s too much information and it wasn’t helping and so over the years, I’ve learned how to eat. I just have to keep doing it consistently. But that, at least I felt, like, with the website the information was narrowed down and it helped me get more confident and more motivated because I wasn’t so overwhelmed with information.”	X			
Personalization	Individualized Material and Options	“Learn to eat properly through nutrition classes. I need an exercise program for the disabled, an exercise program for not just the able, but the disabled.”	X			

Self-Monitoring	Tracking Behaviors	“Oh. Get yourself a pedometer, attach it to your shoe, and you’d be surprised how many steps a day you take.”	X
Simulation	Consequences for Behaviors	“But I think a lot of people are visual learners, and so, if you could have that, ‘Wow, am I going to have this Snickers bar, or am I going to have a nice salad with maybe some grilled chicken that’s going to really actually fill me up?’ Or, if I have this pint of ice cream, that’s it. I can’t - I actually can’t eat anything nourishing for the rest of the day- because my calories, you know, trying to stick to a 1,500-calorie diet, not much left! So I think some kind of comparison, 15 or 20 minutes to put something on the shelf that says, ‘Hey, if you’ve got to choose, okay, this is the consequence of you’re making this choice.’”	X
Rehearsal	Preparation for Healthy Action	“And so, you know, if I’m eating a different type of food, I’ll get up on the Internet and find what is the calorie count of this. And many times I make the decision that this is not something that I should order, or this is not something I should buy. So I have used the Internet as a tool to kind of help me prepare better meals and to also make better selections when I go out to eat with my friends.	X

Dialogue supports including praise, rewards, reminders, suggestions, and liking were discussed among participants; however, elements of similarity and social role were not identified. These techniques primarily supported self-regulation processes, while liking and reminder techniques were found to support technology engagement. Praise, described as positive reinforcement, and reward features, specific to positive feedback upon explicit success, were important for informing participants of their progress and influencing their self-evaluation and monitoring. Reminders were popular among participants to encourage self-monitoring and technology engagement. However, participants felt reminder systems should be individually selected based on preference, as over utilization was considered a burden. Similar to praise and rewards, suggestion features provided participants with feedback and tips for encouraging healthy behaviors. Providing alternative options and new ideas offered participants creative solutions for maintaining healthy behaviors. One participant stated she appreciated My Path's options for healthy eating to curb her hunger. Liking supports, or an appealing program, were essential to technology engagement. If the program lacked fun, cutting edge designs, participants felt they were less likely to engage. A summary of dialogue features and the interaction with web-based SM processes is provided in Table 19.

Table 19. *Persuasive dialogue supports, SM processes, and technology engagement*

Support	Elaboration	Quotation	Web-based SM Processes			
			Knowledge & Beliefs	Self-Regulation	Social Facilitation	Technology Engagement
Praise	Positive Reinforcement	“Yeah, (something) that says to me, ‘Okay, this is - this is the right direction you’re going.’”		X		
Rewards	Positive Feedback on Success	“It’s a feedback that says, you know, ‘Hey, you’re doing good.’” “Something that lets me see my success.”		X		
Reminders	Reminders but Not Overuse	“I don’t want it to persist in asking me and asking me and why didn’t I do - No, just remind me.” “So maybe an option of some sort is not a - maybe some people want a reminder every day, and some don’t. And some people want a reminder weekly. I don’t want it to be painful.”		X		X
Suggestions	Feedback and Tips	“The thing I did like about the program when I went through it was showing you different ways to eat so that you never felt hungry.” “If that program had been set up, and if you entered what you ate and somebody responded and said, you know, ‘You ate too many whole grains that day, and, You ate too much fruit, and, You might want to watch this.’ I mean, just to sort of get feedback.”		X		
Similarity	Not Identified					
Liking	Appealing Program	“It’s got to be fun, if we’re doing it.” “That same-old, same-old is not going to cut it.”				X

Credibility supports including trustworthiness, expertise, credibility, and authority were important to older adult participants. These support features influenced knowledge and technology engagement. Participants expressed the importance of valid and reliable information. With an overwhelming availability of health information, particularly on the internet, participants wanted access to valid information they could trust. They also expressed the importance of linking information to reliable sources. Participants explained that much of the information in media today was not well supported. The lack of documentation and publication of sources left participants questioning the integrity of the data. When participants felt they could trust the information they were more likely to engage in the program and accept the health information.

Credibility, originally defined as having a reliable design, was elaborated to mean the provision of interpretable information from the perspective of older participants, and was found to influence self-regulation processes. When information is displayed, it is essential that it can be understood by the participant. If an older adult is unable to comprehend health graphs and results provided, they were unable to use the feedback for self-regulation. In addition to having trustworthy, reliable sources provided in a meaningful way, expertise was extremely important regarding knowledge, self-regulation and technology engagement. Participants believed that if the program was connected to their doctor's office they would be more apt to utilize tools, improving both self-regulation and technology engagement. They also assumed that information provided by experts was preeminent. Real world feel, third party endorsement, and verifiability features were not identified in the data. Table 20 provides a summary of credibility supports and outlines the web-based SM processes influenced by these technique

Table 20. *Persuasive credibility supports, SM processes, and technology engagement*

Support	Elaboration	Quotation	Web-based SM Processes				
			Knowledge & Beliefs	Self-Regulation	Social Facilitation	Technology Engagement	
Trustworthiness	Valid Information	“I really liked having information that I did not have to go out and find and then wonder if it was valid. That’s what I liked. That’s what got me on there. It was easy to find and you knew it was - I don’t remember what the word was you used, but it was professional information that had been screened, versus - I do not want to get out on the Internet or go find a book”	X				X
Expertise	Connection with Experts	“Somebody mentioned earlier that if My Path was connected to the doctor more...I’d feel a lot more comfortable.” “I’d also keep the part where you could - what is called? Where you could key in a question and after a few days, you got an expert - That was what it was - and it was actually someone from Kaiser who was a medical - it wasn’t just a forum. It was a med-, and they said who they were. You know, ‘I’m Donna, an R.N.’ or ‘I’m Dr. So-and-so.’ That was really - I only asked two questions but it was really good. They were experts. It wasn’t some forum thing online. Where you were getting good information. That was really good.”	X	X			X
Credibility	Interpretable Information	“In order to understand my labs, I actually would send them to her and say, “Okay, what the hell is this?” Because it’s okay for them to give us all the numbers, but if they don’t tell us really what it means, what good is it?”		X			X
Authority	Reliable Sources	“And you don’t go to the dairy council and inquire about soda pop. You know, they’re going to promote what they want. Just like TV: the lousiest source of information because anything you see on TV today about this new study, they never tell you who did the study, but this new study says that such and such is bad for you. Who sponsored it? And who’s their sponsor? “	X				X

From participants' discussions, social support features were perhaps the most important for influencing all elements of SM and technology engagement processes. Specific examples were provided illustrating the impact of social learning, social comparison, normative influence, social facilitation, and social cooperation, although using competition and recognition were not identified in the data. While competition was not specifically identified in the data, participants felt that social comparisons were beneficial in informing participants of their status in association of other people.

Participants shared experiences of learning from others' healthy behaviors. One participant shared she learned new recipes from a healthy, fit friend. Many participants shared stories of learning from others who share in the same experience of having diabetes. Sharing stories with other people with similar health conditions created a forum for the exchange of ideas and empathic understanding of the experience.

Normative influence was described by participants as accountability to other people. Participants felt when making a goal arrangement with a family member or health provider, they were then obligated to hold up their end of the agreement. In general participants felt that cooperation from friends, family and medical teams made it easier for them to self-manage and engage in technology. Contacts with friends, family and health providers were essential to the SM processes and technology engagement success of older participants. Table 21 provides an overview of social support features.

Table 21. *Persuasive social supports, SM processes, and technology engagement*

Support	Elaboration	Quotation	Web-based SM Processes			
			Knowledge & Beliefs	Self- Regulation	Social Facilitation	Technology Engagement
Social Learning	Learning from Others' Healthy Behaviors	"And my driver, man, she uses it (mobile phone app) for everything. I mean, she checks all the recipes, what she's going to have for that night. And so, whatever she's going to have, usually that's what I would try to have...because she's a health nut."	X	X	X	X
Social Comparison	Comparison to Others	"To know that I might be doing almost as good as somebody else or not as bad as somebody else."	X	X	X	X
Normative Influence	Accountability	"And what I liked about it (My Path), for me, is I'm the kind of person that, if I make a commitment to something and I'm accountable to somebody else, then I will follow through and not fool around with it."	X	X	X	X
Social Facilitation	Sharing Experiences with Others	"That there was - on that website. So, you know, you just - you're sharing experiences with people that are going through the same thing you're going through."	X	X	X	X
Cooperation	Cooperation with Family, Friends, and Medical Team	"And it's good to have somebody get involved with you. Makes it easier."	X	X	X	X

Important Outcomes of Web-Based SM for Older Adults

Achieving objective SM outcomes, including biopsychosocial and behavioral indicators used in Phase I, were important results of web-based SM for older participants. However, the participants outlined subjective outcomes related to minimization of loss and maintenance of function, attainment of goals, health status and quality of life (Table 22). Subjective outcomes focused on the individual and stressed the personalization of expected results. Participants emphasized the importance of reducing risk and slowing the progression of diabetes. Maintaining current function was particularly relevant to avoid eye damage, neuropathy and amputations.

Attainment of goals was again personalized to the individual and focused on areas of healthy eating, health knowledge and making healthier choices related to diet and exercise. For example, regardless of weight loss achievement, older participants wanted to know more about reducing caloric intake and set goals, not specifically to lose weight, but to reduce portion sizes and avoid unhealthy food groups. Another participant explained that he may not workout at the gym every day to improve exercise, but instead parked long distances to increase walking. Developing knowledge regarding illness prognosis, exercise and diet were clearly important intervention goals.

Improved quality of life and health status were crucial SM outcomes. Participants wanted to feel better and have more energy. Management of their diabetes meant a better lifestyle in general. Older participants wanted to improve glucose control, reverse their diagnosis, reduce medications, and gain control over their weight and health. Participants were often frustrated with glucose control pointing to erratic numbers and reading fluctuations regardless of behavior. Some participants noted a specific glucose number

they wanted to maintain, while others felt they simply wanted the ability to predict current levels based on activity. Sustained weight loss was also a challenge for participants. Participants were interested in losing small amounts of weight and/or sustaining weight loss rather than reaching a healthy BMI. Reversing diabetes and reducing diabetic medication were popular outcomes. Because many participants were taking multiple prescriptions daily, there was a desire to reduce the amount or eliminate diabetes medication. Participants were unclear if reversing diabetes was possible, but felt it was the most desirable outcome they could achieve from SM.

Table 22. *Important outcomes of web-based SM for older participants*

Subjective Outcome	Elaboration	Quotation
Minimization of Loss/Maintain Function	<ul style="list-style-type: none"> • Reduce risk of complications • Slow progression of DM2 	<p>“Just real quick was just the awareness of some, you know - you could lose your legs or the eyes, sight and things like that. Just basically, awareness to keep it under control.”</p> <p>“No complications. I live in fear of complications. The only reason I behave at all is fear of complications. And that’s sad, but that’s true. Eyesight. Oh, yeah - The whole list. - neuropathy. Amputations.”</p>
Attainment of Goals	<ul style="list-style-type: none"> • Reduce caloric intake • Make healthier choices • Diabetes knowledge • Exercise/nutrition knowledge 	<p>“Well, certainly it’s to lose weight. Give you some idea of what you need to eat to get that nutrition. I want to learn to eat properly.”</p> <p>“Diets are good, but what to eat - I think that’s the hardest thing: what to eat and not to eat. And I said knowledge is power.”</p> <p>“I just want - the main thing, I want to know how much exercise really helps. That’s just really important because I get a ton exercise. I rode my bike to yesterday, 34 miles.”</p>
Health Status	<ul style="list-style-type: none"> • Blood glucose/predictable • Sustained weight loss • Reduce/get off medications • Reverse diabetes • Gain control over health 	<p>“I just want to know how to control the glucose. That’s, for me, the most important thing.”</p> <p>“Just some sustained weight loss. I always manage to get ten or 15 pounds off and then - and be happy with, if it’s a half a pound a week, you know.”</p>

		“What I want to get out of it is to get my - get the help I need to reverse my diabetes so I can get off the medicine.”
Quality of Life	<ul style="list-style-type: none"> • Feel better/More energy • Live a normal lifestyle • Learn to live with DM2 	<p>“I want to be over it! I don’t want this anchor (managing diabetes)hanging over me”</p> <p>“I’d just like to feel better physically. Whether it’s from weight loss or more exercise, not have my knee hurt, you know”</p>

Phase II Summary

Older participant’s perspectives of the persuasive context varied. While some participants were enthusiastic about technologies, others maintained negative attitudes about technology use and the consequences of technology on society today. Participants shared their experiences with technology ranging from fear and frustration to the excitement of new opportunities technologies afford. Older participants identified a variety of technology features commonly used. While challenges and barriers of technology features resulted in limited use, participants enjoyed features that were easy to use, simplified everyday tasks and entertainment driven. While positive aspects of technology requirements were not well defined in the data, passwords, maintenance and expense were barriers to technology.

Technology interest, self-efficacy, and perceptions effected selection of technology. Engagement was limited to abilities and narrowed individual applicability. Ongoing engagement was influenced by perceived benefits, ease of use and assistance provided. User-friendly programs that efficiently address technology challenges and demonstrated benefits enhanced ongoing utilization in the program. Participants also used technology features to compensation and adapt to changes in abilities to maintain function.

Persuasive features were found to impact SM processes and technology engagement. Primary task features including reduction, tailoring and personalization influenced participants' knowledge and beliefs regarding health, exercise and diet. Self-monitoring, simulation and rehearsal supports provided means to improve self-regulation processes, particularly decision making and reflective thinking. Dialogue features generally supported self-regulation processes, but liking and reminder supports improved technology engagement as well. Credibility features supported knowledge, self-regulation and technology engagement. These features supported the acceptance of information the use of information for self-monitoring, and engagement in technology tools. Social support features were perhaps the most important for influencing all elements of SM and technology engagement processes.

While achieving objective SM and health outcomes through web-based SM was important to participants, the description of desired outcomes was more personal in nature. Participants were interested in reducing diabetic-related complications and maintaining current levels of functioning. They wanted to achieve personal goals related to health, exercise, and diet. These goals were realistic and applicable to the individual; as one participant stated, "Reasonable goals, a little at a time." Improved health status, specific to diabetes, glucose control, and medications, and quality of life were significant SM outcome for participants.

Chapter Six: Phase III Results

Phase III results merged the quantitative and qualitative findings previously reported. This section also discusses the results of additional analysis informed by Phase I and II. A summary of the merged data and Phase III results are summarized in Table 23.

Table 23. *Relevant components of web-based self-management for older adults*

Phase I	Phase II	C	D ^a	Phase III
Context				
Age related differences of individual and family characteristics: specifically lower income and lower computer utilization	Negative user and IT context perspectives: Specifically inadequate users and negative technology cost requirements	X		Lower computer utilization among older black participants Higher self-efficacy among computer users and married participants
On average, older participants were healthier than the younger participants (biological, behavioral, and psychosocial indicators positively associated with age)	Negative user and IT context perspectives: inadequate users, fearful, frustration and stopped usage	X		Cholesterol and A1c levels were higher among higher computer utilizers Older participants, with higher self-efficacy, who consumed fewer calories and increased exercise, self-monitored and attained their goals more often. Older participants who utilized supportive resources had greater goal attainment
Older participants had poor eating habits	Important outcome: Goal attainment to make healthy choices and increase knowledge	X		Importance of diet and healthy eating (quotations)
Self-Management Processes				
Null age differences	Influence of persuasive context on SOC		X	Null self-efficacy, self-monitoring, & goal attainment differences by computer utilization

PSD features not applicable	PSD features impact: Expertise (credibility) supports knowledge and beliefs, and self-regulation		Null self-efficacy, self-monitoring, & goal attainment differences across expertise exposure
PSD features not applicable	PSD features impact: Social learning and facilitation supports knowledge and beliefs, and self-regulation		Null self-monitoring and goal attainment difference across social support exposure Participants who attended 3 social support groups had lower self-efficacy than those who did not attend
Technology Engagement			
Negative relationship between age and participation (not interested, other health concerns & no internet access)	Negative user and IT context perspectives Influence of persuasive context on SOC: Selection based on interest in technology, technology self-efficacy and perceptions, individual applicability, cost & maintenance	X	Barriers to My Path included: No internet access—technology access & usability issues Tech. self-efficacy— computer literacy Individual applicability— conflicting priorities, health problems
Attrition due to program burden	Influence of persuasive context on SOC: Optimization based on ease, benefits and technology assistance	X	Least popular aspects of My Path related to burden. Significant relationship between program satisfaction and technology utilization
Increased retention by age	Influence of persuasive context on SOC: Optimization based on ease, benefits and tech assistance	X	Positive perception (quotations) regarding ease of use, benefits, and tech assistance

Null relationship of computer use and retention	Influence of persuasive context on SOC	X	Significant effect of computer use on website utilization; participants with pre use of 2-2.5 hours per week had increased utilization
PSD features not applicable	PSD features impact: Dialogue (personalization) features support technology engagement		Personalization as most popular feature and recommendation
PSD features not applicable	PSD features impact: Expertise (credibility) features support technology engagement		Older participants with a link to their doctor spent less time on the website
PSD features not applicable	PSD features impact: Social learning and facilitation features support technology engagement		Null technology utilization differences across social support attendance
Outcomes			
Healthier than younger cohort	Important outcome: Health status	X	
Null effect of treatment on outcomes	Important outcome: Minimization of loss & maintenance of function	X	
	Impact of persuasive context and persuasive feature support		

^aC=Converge; D=Diverge

Context

Phase I presented several individual and family characteristics that differed among older adults in comparison to the younger study cohort, including race/ethnicity, spoken language, marital status, income, and baseline diabetes self-efficacy. In general, older adults were more likely to be white, married, English speakers with lower incomes and higher diabetes self-efficacy.

Phase II results then reported that older participants felt they were “inadequate users” and identified cost as a negative technology requirement related to the persuasive context. Although older participants differed on individual and family factors, and reported ability and cost as negative persuasion context factors, the relationship between these individual and family factors and the persuasive context, and its subsequent relationship to SM processes and technology engagement had not yet been explored. Therefore, using bivariate analysis as needed, the relationship between individual and family factors, computer utilization (a persuasion context variable), SM processes, and technology engagement was examined. Although computer utilization did not differ by income, gender, education, or marital status among older participants, utilization was lower among older black participants, $\chi^2(20) = 34.33, p = .02$. On average, older women spent more total time on the website than men, $t(123) = 2.26, p = .025$. Baseline diabetes self-efficacy was higher among all older participants who used a computer at least 2-2.5 hours per week, $f(5,154) = 2.20, p = .05$, and higher among those older participants who were married compared to those who were single and not in a relationship, $f(4,154) = 4.46, p = .002$. While associations among contextual factors have been identified, baseline diabetes self-efficacy was also positively correlated with total visits to the

website ($r = .21, p = .02$), self-monitoring ($r = .17, p = .03$), and goal attainment ($r = .22, p = .01$).

While on average older participants were healthier than younger participants, it was not identified if biological and behavioral factors influenced computer utilization, SM processes and technology engagement among older participants. Although biological indicators were not associated with SM processes and technology engagement, hemoglobin A1c and total cholesterol levels were higher among older participants who spent at least nine hours per week on a computer [$f(5,149) = 2.78, p = .02$; $f(5,151) = 2.62, p = .03$ respectively]. Although behavioral indicators were not associated with computer utilization, self-monitoring ($r = -.23, p = .01$) and goal attainment ($r = -.262, p = .01$) were negatively associated with fat intake, and positively associated with caloric expenditure [$r = .215, p = .01$; $r = .29, p < .001$ respectively]. Older participants, who consumed fewer calories from fat and increased exercise, self-monitored and attained their goals more often.

Although older adults had lower caloric intake than the younger cohort, average caloric intake was still high and older adults had poorer healthy eating habits. Furthermore, Phase II results highlighted the importance for older adults to attain goals related to making healthy choices, reducing caloric intake, and increasing nutritional knowledge. Phase III qualitative analysis further stresses the relevance of healthy eating among older adults. Of the 281 units not ascribed to an original theoretical code, 98 (35%) related to diet, foods, eating habits and/or nutrition. A selection of participants' statements is presented below:

- “And it all comes down to diet. There’s many, many things in people’s diet today they need to get rid of and stop eating. And, of course, exercise is very important, but I hate exercise.”
- “You have to learn to eat right. I have to have high protein. I mean, I might have a slice of bread in an entire week, if that. Pasta, I stay away from, but I do have it once in a while because I like Asian food. But my main thing is, you’ve got to watch what you eat.”
- “Very simple: You eat more proteins than you do carbohydrates. Get rid of the carbohydrates! Hold those carbohydrates down from anywhere from 70 grams a day to 140, max. Okay, everybody thinks they need 3,500 calories a day to maintain their energy and their life. That’s false; 1,500 a day will do very well for you. And, you know, get rid of the fast-food stuff. Stop eating it. If you drink sodas, get rid of the sodas, because they’ve got 230 grams at least of sugar in every one of those sodas you drink.”
- “And you have to - and one of the things that had been very surprising to me when I’ve gone up there is because I’m thinking, “Okay, a salad is the healthier choice.” And in many cases, having the baby back ribs was actually nutrition-wise better for me to order than it was the salad, because once they put all that stuff in the salad, it totally became unhealthy. Calorie-wise, it was like 500 or 600 calories more than if I’d have ordered the baby back ribs, which are not good for you anyway.”
- “And I would get way too hungry and then I would just, you know, want to go out and eat Mexican food. There’s nothing wrong with that. I mean, you can plan it but just not - But, no. I would get way too hungry.”
- “Now, along with all this other stuff, is it possible to get these doctors who don’t get any nutrition training in medical school at all - they don’t even address that.”

Phase I presented several physical and social environment characteristics that differed among older adults in comparison to the younger study cohort, specifically as age increased, problems solving skills, general health status, and diabetes related distress improved. Although older participants differed on these factors from the younger cohort, Phase II results did not identify a possible explanation for these differences or their relationship with the persuasive context. As such, bivariate analyses were again used to explore the relationship of these psychosocial factors on computer utilization. Increased use of social supports was positively associated with goal attainment ($r = .22, p = .01$); older participants who utilized supportive resources had greater goal attainment.

Phase I results indicate that older adults utilized the computer less frequently than younger participants. This finding coincides with the negative user context perspectives highlighted in Phase II. However, older participants discussed a wide variety of technology features used and the benefits of such features to help with everyday tasks and for entertainment purposes. Similarly, older participants had lower incomes than the younger cohort, which concurs with Phase II participants' concern regarding cost and maintenance and technology.

Overall, contextual factors differed across age, thus confirming the importance of aging perspectives in web-based SM. Contextual factors among older participants also differed, and these differences were related to persuasive context factors, SM processes and technology engagement. Older participants had strong opinions related to the persuasive context regarding their user experiences, features they use, and the requirements mandated of them to use these technologies. Web-based SM interventions must take into consideration the contextual factors of older adults and the effect of the factors on SM processes and technology engagement. The topic of diet and nutrition was also very important to older participations. Web-based SM interventions may need to focus on particular areas of change, such as diet, rather than a broader scope of outcomes. Here Phase I-III finding highlight the relevancy of contextual risk factors, including the persuasive context and specific areas of need.

Self-Management Processes

Phase II resulted in null multivariate effects of age on SM processes. However, a univariate effect suggested that self-monitoring decreased with age. Although the

contextual factor of age was not found to significantly affect SM processes, Phase II identified an influence of the persuasive context on SOC from older participant perspectives. To further explore the relationship between the persuasive context and SM processes among older My Path participants, a one-way analysis of covariance (ANOVA) was performed to examine the effect of baseline computer utilization (a user context variable) on each of the SM processes: self-efficacy, self-monitoring, and goal attainment. Results indicate null differences across baseline computer utilization for self-efficacy $F(5, 118) = 1.39, p = .25$, self-monitoring $F(5, 118) = 2.00, p = .08$, and goal attainment $F(5, 118) = 1.92, p = .09$.

Although the Phase I dataset did not include quantitative measures related to PSD features, discourse from Phase II revealed the importance of primary task, dialogue, credibility, and social support features on SM processes. Specifically, the credibility support of “expertise” and the social support feature “social learning” were found to support knowledge and beliefs, and self-regulation. To further investigate the relationship of PSD features and SM processes among older participants, ANOVA and independent samples t-tests were used to explore mean differences of each of the SM processes: self-efficacy, self-monitoring, and goal attainment, across exposure to social support and expertise features. Table 24 summarizes SM process by PSD feature exposure. Results indicate null differences of mean SM processes across expertise features exposure, however mean self-efficacy significantly differed across social support group attendance, $F(3, 126) = 2.79, p = .04$. Tukey’s HSD post hoc analysis identified that self-efficacy, or an individual’s confidence in their abilities to control their diabetes, was lower among

participants who attended all of the social support groups than those who did not attend any.

Table 24. *Descriptive summary by PSD features*

		Mean	SD
<u>Social Support Feature</u>			
Self-Efficacy*	0 groups	7.46	1.54
	1 group	7.88	1.03
	2 groups	7.22	1.53
	3 groups	6.41	1.86
Self-Monitoring	0 groups	105.08	119.22
	1 group	138.90	102.26
	2 groups	145.63	126.20
	3 groups	139.55	125.84
Goal Attainment	0 groups	75.90	91.20
	1 group	95.63	72.98
	2 groups	94.31	84.69
	3 groups	84.61	78.33
<u>Expertise Feature</u>			
Self-Efficacy	None	7.28	1.61
	Link to Doctor	7.55	1.43
Self-Monitoring	None	115.65	119.49
	Link to Doctor	119.36	125.78
Goal Attainment	None	80.43	88.23
	Link to Doctor	80.31	84.57

*p<.05

Overall, while SM processes did not differ by age, older participants stressed the associations between the persuasive context and SOC, and PSD features with SM processes. However, these associations, although identified in participant experiences, were better quantitatively exemplified with technology engagement. Although specific connections between age, persuasive context, and SM process were not established quantitatively, the relevance of the components is highlighted in the qualitative findings of Phase II.

Technology Engagement

Phase I identified a negative relationship between age and participation; that is, older adults were more likely to decline My Path participation. The most common reasons for non-participation were lack of interest, other health concerns, and internet access. Similarly, according to Phase II results, selection to use a technology is based on interest in technology, technology self-efficacy and perceptions, individual applicability, and cost maintenance. In addition, attrition was due to program burden, particularly in the first six weeks of the program, but program retention improved with age. Phase II found that optimization was based on perceived ease of use, benefits of program, and technology assistance. To further explore possible factors influencing selection and optimization, My Path satisfaction results were descriptively analyzed in detail related to older adults' responses about barriers to using My Path, most and least liked features, and recommendations for improvement.

Table 25 summarizes the five most common satisfaction responses related to barriers, features, and recommendations. The major barriers to use concur with earlier findings; older participants' experiences with computer difficulties, My Path website problems, and insufficient internet/computer skills prohibited technology engagement. Individual applicability was also an important selection indicator from Phase II, while conflicting priorities and other health problems also diminished technology engagement.

Table 25. Five most common satisfaction answers among older participations

Barriers to Use (n=57)		Best Liked (n=96)		Least Liked (n=76)		Recommendations (n=62)	
Technology/ Access	12	Personalization	17	IVR ^a	18	Personalization	11
Conflicting Priorities	9	User Friendly	12	Usability Issue	12	Tracking	7
Health Problems	8	Group Visit	11	Too Burdensome	8	Usability Issues	7
Usability Issues	5	Tracking	9	Goal Setting	5	Group Visits	6
Computer Literacy	3	Information	8	Computer Literacy	3	Goal Setting	4
Other	20	Other	39	Other	30	Other	27

^aInteractive voice response system

Phase II demonstrated the importance of ease of technology use on optimization. Satisfaction results indicate that older adults' least popular My Path aspects were related to burden: the interactive-voice response (IVR) system and usability challenges. Because older adults experienced barriers to use and disliked burdensome features, a correlation analysis was conducted to identify a possible relationship between program satisfaction and technology utilization. Results indicate significant positive relationships between program satisfaction and both total number of website visits ($r = .37, p < .001$) and total time spent on the website ($r = .21, p = .04$).

According to Phase I, although older adults were less likely to participate in My Path, once enrolled; older adults were more likely to complete the program. Again in Phase II, optimization was found to be influenced by ease of technology use, benefits of use and technology assistance. As seen in Table, the most popular My Path features related to ease of use and benefits. Phase III analysis exploring general My Path statements from older participants, revealed positive perceptions about the program, particularly related to benefits. In general, focus group participants reacted positively to the program. Participants' statements regarding the benefits of the My Path program are summarized in Table 26.

Table 26. *General introduction comments about My Path*

Benefit Code	Quotation
Learned	"I thought it was a great program. I learned a lot, and I also sort of used it as a (tool) to make me do something – to make me keep on schedule."
Good review	"I found it helpful and a good review of things I should be doing and I'm really anxious to see the results, especially how exercise fits..."
Lab work follow up	"I liked the follow up on the lab work. I didn't like getting the lab work (laugh) but I liked the follow up sessions and I liked the section in MyPath."
Increased awareness	"I was part of (interventionists name's) group. And, you know, overall, the program was – I thought it was an excellent program. I didn't take advantage of it as well as I should have. And so that's more me and not the program. But it did – it did – when I was using it, I was aware – it made me aware. So, awareness was the best thing for me."
Groups were informative	"I enjoyed the sessions that we went to and learned a lot from the different things. I can't specifically say one thing, specifically, but every session was interesting and fun to be at and meeting new people."
Tracking (pedometer/steps)	"I've been a diabetic for about 25 years. The program helped me kind of realize I needed to step up my act a little bit. I have carried forward some of the things that I was taught and some of the things that – I still document off and on what I've done during the day. I still wear a pedometer, for the most part."
Kept on track	"I think the program was great and my sugar levels were – I was able to maintain a steady level. I could almost set my watch on when my sugar levels were going to drop – two, between two and 2:30 every day."
Reminders	"I've been a diabetic for between 10 and 15 years, and the program really – all of it, at times, just is in the back of your mind. And when you start doing something you shouldn't do, it reminds you."

With a clear understanding of the importance of the persuasive context on technology engagement, it is interesting that Phase I results found null relationships between baseline computer use and retention. However, Phase II identified the importance of previous technology experience as an indicator for a positive user context

and technology engagement. Therefore, ANOVA was used to determine the effect of baseline computer use on technology utilization, specifically number of visits to the My Path website, and the total time spent on the website. As seen in Table 27, there were significant mean effects for both technology utilization variables. Due to violations of homogeneity of variance Games Howell post-hoc analysis was used to identify group differences. Participants who used the computer before My Path between 2-2.5 hours per week visited the site more often and spent more time on the website compared to those who used a computer for 3 to 4.5 hours.

Table 27. *Results of computer use on technology utilization*

		Mean	SD	d.f.	F	p
Number of Site Visits	never – 1 hours	7.66	9.86	5,119	2.80	.02
	2 to 2 half hours	43.10	31.75			
	3 to 4 half hours	10.15	6.81			
	5 to 6 half hours	36.00	45.69			
	7 to 8 half hours	31.23	29.57			
	9 or more hours	32.88	33.17			
Total Time on Site	never -1 hour	117.26	126.33	5,119	3.06	.01
	2 to 2 half hours	314.57	212.39			
	3 to 4 half hours	139.53	101.91			
	5 to 6 half hours	178.60	226.89			
	7 to 8 half hours	175.82	149.09			
	9 or more hours	183.60	142.07			

Although the Phase I dataset did not include quantitative measures related to PSD features, discourse from Phase II revealed the importance of dialogue, credibility, and social support features on technology engagement. Specifically, the dialogue support feature “personalization”, the credibility support features of “expertise”, and the social support feature “social learning” were found to support technology participation and utilization. As seen in Table 25, personalization features were the most popular and

recommended features among older participants. To further investigate the relationship of PSD features and SM processes among older participants, ANOVA and independent samples t-tests were used to explore mean differences of each of website utilization across exposure to social support and expertise features. Table 28 summarizes technology utilization by PSD feature exposure. Results indicate null differences of technology utilization across social support group attendance; however, mean time spent on the website was significantly different across expertise features exposure. In opposition to utilization increasing with expertise feature exposure, older participants with a link to their doctor spent less time on the website.

Table 28. *Descriptive summary by PSD features*

		Mean	SD	d.f.	F/t	p-value
<u>Social Support</u>						
Number of Site Visits	0 groups	180.43	167.23	3,121	1.07	.36
	1 group	220.85	161.96			
	2 groups	183.25	109.94			
	3 groups	299.76	168.71			
Total Time on Site	0 groups	28.14	33.35	3,121	2.03	.11
	1 group	27.44	22.44			
	2 groups	34.93	27.58			
	3 groups	44.58	29.84			
<u>Expertise</u>						
Number of Site Visits	None	29.33	30.66	123	-1.06	.29
	Link to Doctor	38.37	39.14			
Total Time on Site ^a	None	205.11	169.74	34.61	2.85	.01
	Link to Doctor	127.15	87.65			

^aEqual variances not assumed

Overall, older adults were less likely to participate in My Path. Based on Phase I and II findings, this is likely due to the negative user and IT context and the influence of

the persuasive context on SOC, specifically selection to use a new technology. Once enrolled, older participants experienced barriers to My Path including access, computer literacy, conflicting priorities, and health problems. Based on these Phase I-III findings, web-based SM should include components that address technology interest, technology self-efficacy and perceptions, individual applicability, and cost and maintenance.

Many older participants left the My Path program due to burden, and the least popular My Path features related to burden as well. However, retention in the program improved with age. Based on Phase II findings, this is likely due to the optimistic opinions and perceived benefit experienced by older participants. These Phase I-III findings indicate that web-based SM components addressing ease of use, benefits, and technology assistance to address burdens and usability issues would improve technology engagement.

Unable to measure PSD features from the Phase I dataset; feature supports were highlighted in Phase II. According to participants, PSD features specifically impact technology engagement. Phase III further analyzed dialogue, credibility, and social support features. Although the dialogue support feature “personalization” was well documented in the satisfaction data as a most popular feature and recommendation, the associations of PSD with technology engagement were not captured quantitatively. However, according to Phase II participants, PSD features are relevant to support technology participation and utilization.

Outcomes

While no additional Phase III analysis was conducted specifically to enhance earlier phase findings, quantitative and qualitative results were complementary. Phase I reported that older My Path participants were healthier than the younger cohort, and Phase II identified health status as an important outcome for older adults. In general, Phase I reported null effects of treatment and age on outcomes, while Phase II reported the importance of maintaining function rather than improvement. Phase II also highlighted the relevancy of including subjective goal attainment and quality of life as indicators for intervention success. Phase I null effects of treatment and age on outcomes may also be due to the Phase II's finding stressing the association of the persuasive context and PSD features on SM processes and technology engagement. My Path may not have included all the relevant components of web-based SM specific to lifespan or persuasive design to significantly impact web-based SM for older adults. Specifically, My Path was not designed for older adults, and PSD features were lacking to support technology utilization and SM processes. My Path features did not tailor or personalize primary tasks, rather it maintained standard guidelines. While My Path provided feedback on progress and reminders to use the program, these feedback systems, including the IVR, were a hindrance rather than a support. Although credible sources were used for all resource information and guidelines, linkages to experts, such as primary care, was inadequate. With the exception of in-person support groups for selected participants, social support features were not available through My Path. Without adequate lifespan and persuasive technology consideration and design, the overall success of My Path was limited.

Phase III Summary

Phase III identified several similarities and differences between Phase I and Phase II results, and expanded previous quantitative and qualitative analysis to explain relevant components of web-based SM for older adults. Based on the merged data, IFSMT, lifespan, and PSD were all found to contribute important components for the design and evaluation of web-based SM for older adults. The persuasive context was found to differ by contextual factors, and influenced SM processes and technology engagement. The persuasive context was also found to influence SOC processes particularly related to technology engagement, and each of the PSD features was related to SM processes, technology engagement or both. The results identified few outcome effects, but support the inclusion of subjective outcomes relevant to older adults.

Chapter Seven: Discussion

This research demonstrated barriers to use and adoption of web-based SM among older adults. However, once older adults participated in the program they utilized the web-site and completed the program. Also, once enrolled, outcomes of the program did not differ by age. Older participants encountered challenges to using the program, but felt positive that My Path supported health. While a lag in technology use and engagement may exist for older adults, personalization and tailored interventions can provide individualized tools to aid older populations in improving their health.

Many Americans suffer from chronic disease; however the incidence of chronic conditions and co-morbidity increases with age. As the aging population is expected to grow over the next 10 to 20 years, increases in the rates and costs of chronic disease are also anticipated. The implications of chronic disease on older adults and their families are often severe increasing individual disability and dysfunction, caregiving burden, and economic costs. The burden of care for chronically ill older adults often falls in the hands of family, while astronomical healthcare spending is dedicated to the treatment and management of chronic disease. As age is a predictor for many chronic conditions, older adults are inherently at greater risk. Bio-psychosocial and environmental factors contribute to the pathology of chronic conditions, yet the progression of a condition is

also dependent upon the lifestyle adaptations, coping mechanisms, medical care, treatment regimens, and social supports.

Although web-based SM is increasing in popularity, a theoretical framework for its design and evaluation has yet to be outlined. As such, web-based SM can find foundations in theories of SM (IFSMT), persuasive technology (PSD), and lifespan development. While IFSMT can inform the process of SM, PSD provides insight into technological factors. When concentrating on older adults, it is essential to also consider aspects of aging. Therefore, the integration of these frameworks informs intervention design to appropriately consider contextual factors, SM processes, technology engagement and outcomes for the implementation of web-based SM for older adults.

With strong theoretical foundations and political patronage, research efforts focusing on web-based SM have expanded in the last decade. Evidence supporting the efficacy of interventions and positive outcomes has been well documented. However, evidence is currently lacking in the area of web-based SM specifically for older adults (Stellefson et al., 2013). Based on SM, persuasive technology, and lifespan perspectives, the purpose of this study was to investigate the implications of the lifespan on web-based SM and to explain relevant components for future intervention design and evaluation.

Phase I participants were on average 58 years of age, while those in the younger cohort were 51 years of age, and those in the older group were 66 years of age. Although the mean age for the older cohort classified these individuals as older adults, 66 is a rather “young” old-age (American Psychological Association, 2011; Poon, 2003). Similar to that of the U.S. aging population, older adult participants had lower incomes; they were more likely to be married or widowed; and were mostly Non-Hispanic/Latino,

white English speakers (The Federal Interagency Forum on Aging-Related Statistics, 2010). They were healthier (physically and mentally) than younger participants; had better medication adherence, and increased diabetes self-efficacy but had poorer healthy eating habits. Younger people with type II diabetes have been found to have poorer health status, associated with higher levels of distress, depression, and hemoglobin A1c, and lower self-efficacy (Hessler, Fisher, Mullan, Glasgow, & Masharani, 2011). As such, older adults with type II diabetes represent a unique subgroup with specific needs and health risks based on their developmental stage and life context.

Older participants also used a computer less frequently than those in the younger group. Age significantly predicted enrollment, older participants were less likely to participate. Age also significantly predicted the reason for non-enrollment. Older adults were more likely to actively opt out of the study and lacked internet access. In the U.S., although rates are increasing, older adults remain the lowest utilizers of the internet, and only 39% of people over the age of 65 have home broadband access compared to 77% of people age 30-49 and 62% of those age 50-64 (Pew Research Center's Internet & American Life Project, 2012a). Internet use and access also decreases among lower income groups (Pew Research Center's Internet & American Life Project, 2012b).

Survival rates indicated that older adults, once enrolled, were more likely to complete the study. However, older participants who discontinued the program did so because they lost interest or the program was too burdensome. Website use, including time on site, number of visits to the site and website features used was not affected by age. Phase III helped to explain these findings by identifying the many positive aspects of My Path that supported participants from their perspective.

Phase II confirmed the importance of technology perspectives. Technology is not neutral, and was found to influence SOC, technology engagement and SM processes. Phase II participants were on average 70 years old, predominantly white, male, married, and well-educated. Although this demographic group is more likely to have access to technology and technical skills (Carpenter & Buday, 2007; Gatto & Tak, 2008), negative perspectives of the persuasive context were identified. While a few participants perceived technology as an opportunity, participants primarily focused on a lack of interest, fear and frustration in using technologies. Participants were unsure how to use technologies, and felt technology advancements negatively impacted society in general.

These findings support recent literature identifying gaps in the adoption and use of computers and internet usage (Lam & Lee, 2006) among older adults. Results also coincide with technology barriers highlighted in the literature related to physical impairments, financial barriers, security concerns, computer anxiety, low computer literacy, reduced self-efficacy, general lack of interest, and reduced benefit ratio (Carpenter & Buday, 2007; Gatto & Tak, 2008; Kim, 2008; Wagner, Hassanein, & Head, 2010). These gaps in technology use and adoption help to explain the reduced participation and lower computer utilization among older participants in the My Path trial.

Although negative attitudes about the persuasion context were identified, participants were optimistic about specific types of technologies they felt were easy to use, helpful with everyday tasks, and fun. Similar findings have been recorded showing frequent internet use by older adults for finance management, shopping, entertaining, education, travel planning and social contact, particularly with adult children (Carpenter

& Buday, 2007). However, regardless of technology type, when encountered with use challenges, participants simply stopped or limited use. In the case of My Path, participants did experience barriers to intervention use and burden throughout the program. However, My Path program retention improved with age. This can be explained by the positive opinions and perceived benefits experienced by older participants. Offering web-based SM through various technology platforms perceived as helpful, easy to use, and user-friendly will be essential for the adoption and engagement of older adults. Passwords, cost and maintenance were identified as barriers, as such; web-based SM must provide password troubleshooting assistance and minimize program expenses. If older participants cannot simply access the intervention or afford the program, they are unlikely to use it.

While contextual factors differed across age, they also differed across older participants and were related to SM processes and technology engagement. Although there were no age differences in technology utilization, the older participants enrolled were primarily white, middle class, and well educated, English speaking with internet access. This raises concerns about applicability of web-based SM for diverse older populations. Similar to findings from AARP (2009), computer utilization of older My Path participants was significantly lower among black older participants. With anticipated increases of minority populations and increased longevity among women, it is unclear if web-based SM is an effective strategy for conditions afflicting older women, such as arthritis and hypertension, and addressing racial and ethnic health disparities in later life.

Older participants with increased diabetes self-efficacy, lower caloric intakes, higher caloric expenditure, self-monitored more frequently and attained their goals more often. Similarly, older participants with better use of supportive resources also attained their goals more often. According to social cognitive perspectives (Bandura, 1997), levels of self-efficacy, or one's belief in their ability to control or improve their illness, will impact behavior change processes. Simply, confident older participants who were already using supportive resources when they began the program were more likely to use the website and report ongoing progress and achievement. Increased attention should be paid to design features that support and hinder self-efficacy.

Older participants were found to self-monitor, or track their progress, of eating, exercise and medication goals, about half as often as the younger group, and although the overall model for SM processes was non-significant, this was a significant univariate effect. In Phase II, older participants stressed the associations between the persuasive context and PSD features with SM processes. However, Phase III was unable to confirm that self-efficacy, self-monitoring, or goal attainment was effected by the persuasive context, as measured by computer utilization. While expertise exposure was not found to impact SM processes in Phase III, self-efficacy was lowest among participants you attended social support groups. Although one would suspect that self-efficacy would improve with social support group attendance, in their examination of self-efficacy, health status and utilization outcomes of SM education groups, Lorig et al. (2001) found that increased self-efficacy reduced healthcare utilization. Similarly, in the case of My Path, older participants with higher self-efficacy did not utilize this support.

Older participants had better medication adherence at all points, but self-monitored less frequently. Older adults may not have felt a need to monitor their progress of medication taking because they already achieved successful adherence. This finding suggests a need for improved tools and features to support self-monitoring in areas of subjective interest to older adults, perhaps focusing on healthy eating and nutrition over medication use and exercise as identified in Phase II. While much of the literature suggests that programs targeting both diet and exercise have moderate improvement on behaviors and health indicators for older adults (McTigue, Hess, & Ziouras, 2006), some studies suggest improved attendance to diet programs (Van Gool et al, 2006) and effective nutrition outcomes (Kimura et al, 2013) in opposition to exercise activities and effects among interventions for older adults. Although the relationship between the persuasive context, PSD features and SM processes was not well captured quantitatively, it was stressed qualitatively. More research is needed to decipher the specific relationships between the persuasive context, SOC, PSD features, and SM processes.

Similarly, the association between PSD features and technology engagement was not well captured quantitatively. Unable to assess the impact of PSD features in Phase I, Phase III examined the importance of dialogue, expertise, and social support features. According to the satisfaction results, personalization was highlighted as an essential PSD feature to support technology engagement. Other research supports the relevancy of personalization for diabetes SM interventions (King et al., 2012). Although associations between social support and website utilization were not identified, utilization was lower among older participants with expertise exposure, as measured by links to their primary care doctor prior to visits. This finding is in direct opposition to recent research stressing

the importance of quality and source expertise as the main indicators for individual trust of online health information (Yi, Yoon, Davis, & Lee, 2013). However, little is known about the reliability and validity of using linkages to primary care as a measure for expertise support. More research is needed to investigate the direct association between expertise features, PSD features in general, and their explicit impact on technology utilization.

There were few effects of lifespan found on outcomes of the intervention. Older participants were healthier at every stage, indicating that these may be different populations with different SM needs. People are at increased risk of diabetes due to obesity, hypertension, and hyperlipidemia, however, older adults are at increased risk simply due to age, among other factors (Gambert & Pinkstaff, 2006; Mooradian, McLaughlin, Boyer, & Winter, 1999), perhaps explaining the improved health status of older participants in comparison to the younger cohort. As the risks for disease progression differs by age, SM needs, goals, and objectives appear to differ as well. One specific example of this difference relates to nutrition. While obesity is most commonly associated with the vast increase in diabetes, older adults are also at risk of under nutrition and extreme weight loss, particularly in long-term care settings (Gambert & Pinkstaff, 2006). As such, nutritional and exercise programs must be specific to individual caloric needs.

The single age by treatment interaction identified in Phase I related to the use of supportive resources. Increased use of supportive resources among the older participant intervention group can be explained by SOC processes. As we age we select and optimize activities that can compensate for losses. As such, older participants, when

provided interventions connecting them with useful resources, will select and optimize these opportunities to maintain health and minimize condition-related losses. The need for individuals with diabetes to connect with health care resources have also been previously identified (King et al., 2012). Web-based SM must be designed to minimize barriers and enhance compensation.

The null effect of treatment and age on outcomes represents the need and value of persuasive context and PSD features incorporation. There simply may not have been enough feature support to encourage SM or engagement. Providing primary task tools, dialogue supports, backing from credible sources and connected with social supports are essential for the success of web-based SM. Additional research supports the inclusion and participation of technology intervention users for successful development (Kleine, 2009, 2010) and SM outcomes for older adults (Heisler, Cole, Weir, Kerr, & Hayward, 2007). Focusing support features on addressing objective and subjective outcomes relevant to older adults will lead to improved overall health outcomes. Other authors have also suggested this alignment of “one-size-fits-all” models to the needs, preferences, and care realities of older adults to improve long-term health outcomes (Hoff, 2010). A complete overhaul of HIT or web-based SM may not be needed, yet the design and implementation strategies must be adapted to overcome age-based burden and barriers and customize programming to better meet the needs of individuals as they age.

According to Dishman (2004), the Director of Intel’s Proactive Health Project and leader of the Center for Aging Services Technology, standards must be put in place to personalize technologies that are adaptive and self-learning to auto-tailor according to individuals’ past encounters with the technology. Only with personalization can

technologies adequately promote healthy behaviors, early disease detection, caregiver support, and improve treatment compliance while reducing provider burden and healthcare costs. These standards must utilize user-center approaches to design and develop (Dey & Guzman, 2006) technologies that address specific needs and barriers.

As such, researchers currently developing health promoting technologies for older populations have identified several design features and adjustments that can improve technology engagement among older adults (Morris, Lundell, & Dishman, 2004).

Although these design strategies are targeted towards individuals with cognitive decline, they provide a helpful start for possible adaptations to web-based SM. Due to cognitive decline with age, following conversations can be difficult, therefore, “pace controls” to replay audio or text information allows older adults to work through programs at their own pace. Forgetting names and/or faces can also be a challenge, consequently memories cues, such as photo-based personal contacts, can provide an alternative mean for remembering individuals with whom they are connected. The fear of imposing on family members may impede individuals from connecting to others. Devices and physical cues can help older adults detect “good times” to connect with family and friends. This design feature, termed presence displays, has been found to improve awareness of others and feeling of connectedness to loved ones among older adults (Dey & Guzman, 2006).

Implications for Social Work Practice

Social workers are currently involved in every section of the health care system. Due to our knowledge of empowerment, human development, and systems perspectives,

social workers have the opportunity to take a leadership role in the participatory design, implementation, and translation of web-based SM specifically for older adults. The findings of this study have important implications for social work education, direct and macro practice, policy, and future research.

Before social workers can be expected to implement technology based interventions, they must be trained in the latest technologies. There is some evidence suggesting reluctance in the adoption and use of technologies in popular areas of social work, including child welfare and mental health (Whitaker, Torrico Meruvia, & Jones, 2010). This may also be the case for health information technologies (HIT). Social workers must be prepared to develop technology competencies to assist older adults in the use of new technologies that may support health and wellbeing.

Direct practice social workers, particularly medical social workers in outpatient primary or specialty care and home health, need to be aware of SM models and available SM interventions, including the 5 A's and the Individual Family Self-Management frameworks. Currently, social workers are not included in the chronic disease management knowledge-base, and therefore the challenges vulnerable populations, including older adults, may be experiencing with HIT are not currently recognized in the literature. As such, it will be essential for direct practitioners to identify these challenges and modify interventions as needed. In light of social work's emphasis on self-determination, direct practitioners can help incorporate important subjective goals and outcomes of older adults as pinpointed by lifespan perspectives.

With recent SM dissemination efforts underway, particularly the National Institute on Aging's (NIA) push for health systems nationwide to implement Stanford

University's Chronic Disease Self-Management Program (CDSMP), organizational social workers must assess the applicability of such programs if added to technology platforms. Social workers must consider the complications that technologies may bring and the segregation of particular populations who may not have the access or abilities to use technology interventions. Here, social workers can bridge the connection of technology and SM perspectives to better meet the needs of individuals who are at risk for both chronic disease and technology limitations.

The sustainability of these interventions depends on our ability to adapt them to practice settings. It will be important to determine how HIT research can be appropriately translated into aging settings including, senior centers, retirement communities, and long term care. The findings of this research suggest that intervention design should weigh heavily on persuasive features and social support. While persuasive features are likely to improve SM outcomes, specifically social support features were identified to impact all areas of SM processes and technology engagement. As social work emphasizes the importance of human relationships, we are particularly well-suited to develop strategies for enhancing social support features for chronic disease management both on and offline.

Since the passing of the Patient Protection and Affordable Care Act (ACA) in 2010, SM interventions will increasingly become an important part of social work practice. With the expansion of accountable care organizations and healthcare integration, social workers will be called to coordinate services across multiple providers and organizations using the primary care medical home model, a model that emphasizing both SM and HIT. However, it is important that social workers advocate for possible

technology adjustments to meet the needs of older populations. For example, health education materials and health exchange access can not only be provided online. Communication efforts must be available in formats perceived positively by older adults. As the ACA focuses on affordability and older participants highlighted cost and maintenance concerns, social workers must also examine and advocate for affordable, low-maintenance HIT interventions.

In addition to this research, there are still some concerns regarding outcomes of HIT interventions. There is evidence suggesting that variability in successful HIT outcomes is due to the traditional top down design approaches (Kleine, 2009, 2010). Including the voices and opinions of older adults will be essential in the design and implementation of effective HIT for older adults. Additional research addressing issues of social justice including access to technologies, applicability of HIT, specifically web-based SM, for older adults of color and lower economic status is still needed.

Future research is needed to better understand and highlight methods for individualizing primary task features and enhancing social support features. While it is clear that these design features are key to successful healthy behavioral change, approaches for adapting current programs to better meet the needs of older adults are not well defined. Including older adults in design process and identifying strategies are needed. As such future researchers should ask how to modify and adjust proven programs to specially target older adults, address barriers, and personalize features.

In developing adaptations, measures for quantifying persuasiveness are needed to better test the relationship of these variables with outcomes. Psychometric techniques and technology analytics can be used to gather information about the persuasion context

and features, however, these methods will need to be explored related to validity and reliability.

While few control trials have been conducted specifically with older adults, many trials include older adults. Secondary analysis of these programs from an aging perspective may shed light on methods for individualizing and improving interventions for older adults. As programs are improved to better address barriers for older adults, additional efficacy trials will be needed to identify improved outcomes due to age-adjusted personalization. In general, research is needed to understand methods for improving design, measuring design features, and demonstrating successful outcomes.

Limitations

Although this research was carefully prepared and research aims have been achieved, there are several limitations and shortcomings. First, the Phase I sample, while representative of the Denver metro area, is comprised of Health Maintenance Organization (HMO) participants with health coverage. Generalizing findings for individuals with type II diabetes lacking full benefits may not be possible. The trial was also limited to individuals with access to the internet, as such these results are likely not applicable for people with limited access. Phase II participants were also predominantly white, well-educated males who used the My Path more often than non-focus group participants, limiting these findings to individuals of similar demographics and situations. However, if concerns related to SM process and technology engagement were identified among this low-risk population, it is possible that lifespan and technology concerns will only be enhanced among more vulnerable populations. With time and funding, additional

focus groups and/or interviews could capture the perspectives of older adults who declined My Path participation and those who did not complete the program. However, Kaiser Permanente has strict rules regulating the contact of human subjects that have refused or discontinued research participation.

While the secondary data analysis used data from the most recent web-based SM efficacy trials, the intervention was not designed for older adults. Randomized controlled trials of older adult specific web-based SM would improve the evidence supporting or nullifying the effectiveness of these interventions for older populations. Due to the nature of secondary analysis, the study was limited to the data and measures collected for the original trial. Specifically, quantitative measures of SOC and PSD features were limited. While Phase III included additional social and expertise support variables, these measures have not been previously used or tested and may not be valid or reliable in measuring persuasive features. However, these variables were supports used by the My Path program and are specific examples of PSD features.

While the study used advanced statistical methods for exploring lifespan effects of web-based SM, outcome analysis did not take time into consideration. Incorporating time into the models would have demonstrated SM differences over the course of 12 months. Although the mixed analysis incorporated multiple methods for integrating the qualitative and quantitative data, the analysis was limited to bivariate models. Structural equation modeling may better demonstrate the path relationship between context, technology engagement, SM processes and outcomes.

Conclusions

For the overall approach of the study a sequential explanatory mixed methods design was used, with a phase quantitative phase I, qualitative phase II, and a mixed phase III occurring in sequential order. For phase I, a secondary analysis of My Path to Healthy Life, a 12 month diabetes specific web-based SM program based on the 5As model, was conducted to investigate lifespan differences in the contextual factors, technology engagement, SM processes, and outcomes. There were 462 participants with type II diabetes enrolled in the trial, ranging from the age 34 to 76 years of age. Data was collected at recruitment, baseline, 4 months, and 12 months, through a combination of surveys, the web-site, and Kaiser Permanente's electronic medical record. Validated measures were used to collect information on all variables. To address all of the specific research questions for phase I, a combination of analysis were conducted depending on model needed.

Phase 2 used the experiences and perceptions of older My Path participants to better understand the mechanisms of age-related differences identified in phase I, with a focus on better understanding the persuasion context of older participants, the SOC and persuasive features that support or hinder technology use, and the outcomes that were important to older adults. All older participants (60 years of age) and English speakers were asked to participate and 40 attended one of the five offered focus groups held at each of the KPCO trial clinics. A theoretically driven content analysis was performed with two coders after establishing inter-rater reliability. After initial coding, elaborative analysis was used to augment theoretical constructs.

Phase III was the mixing of Phase I and II, for overall interpretation. The data was first merged and compared, to identify similarities and differences across the previous phases. It was then expanded, meaning that additional qualitative and quantitative analysis was performed based on the findings from the previous findings.

This study showed that IFSMT, lifespan, and PSD were all found to contribute important components for the design and evaluation of web-based SM for older adults. The persuasive context was found to differ by contextual factors, and influenced SM processes and technology engagement. The persuasive context was also found to influence SOC processes particularly related to technology engagement, and each of the PSD features was related to SM processes, technology engagement or both. The results identified few outcome effects, but support the inclusion of subjective outcomes relevant to older adults.

With a rich history of promoting healthcare services and improving public health conditions, social workers have the unique knowledge and skills to assist in the management of chronic disease among older adults, particularly when combined with HIT. It is time for social work to reemerge in the research and development literature of chronic disease management. Without examining issues important to the social work profession, the impacts of chronic disease prevention and treatment on vulnerable populations will continually be disregarded. As such, due to social work's distinctive understanding of aging issues and digital disparities, social workers must take a leadership role in the evaluation, design, and implementation of web-based SM for older adults.

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Appendix A

I. My Diabetes

These questions ask you about your activities during the past 7 days. If you were sick during the past 7 days, please think back to the last 7 days that you were not sick.

1. How many days in the past week did you test your blood sugar?
☐₀ ☐₁ ☐₂ ☐₃ ☐₄ ☐₅ ☐₆ ☐₇
2. How many days in the past week did you test your blood sugar the number of times recommended by your health care provider?
☐₀ ☐₁ ☐₂ ☐₃ ☐₄ ☐₅ ☐₆ ☐₇
3. How many days in the past week did you check your feet?
☐₀ ☐₁ ☐₂ ☐₃ ☐₄ ☐₅ ☐₆ ☐₇
4. How many days in the past week did you inspect the inside of your shoes?
☐₀ ☐₁ ☐₂ ☐₃ ☐₄ ☐₅ ☐₆ ☐₇
5. Have you smoked a cigarette—even one puff—during the past 7 days?
☐₀ No
☐₁ Yes = 5a. How many cigarettes did you smoke on an average day?

Number of cigarettes: _____

II. Recommendations from My Health Care Team

1. Has your health care team (doctor, nurse, dietitian, or diabetes educator) given you any advice about your diet?
☐₀ No
☐₁ Yes = Which of the following has your health care team (doctor, nurse, dietitian, or diabetes educator) advised you to do?

	<u>No</u>	<u>Yes</u>
a. Follow a low-fat eating plan.	<input type="checkbox"/> ₀	<input type="checkbox"/> ₁
b. Follow a complex carbohydrate diet.	<input type="checkbox"/> ₀	<input type="checkbox"/> ₁
c. Reduce the number of calories I eat to lose weight.	<input type="checkbox"/> ₀	<input type="checkbox"/> ₁
d. Eat lots of food high in dietary fiber.	<input type="checkbox"/> ₀	<input type="checkbox"/> ₁
e. Count the carbohydrates I eat.	<input type="checkbox"/> ₀	<input type="checkbox"/> ₁
f. Eat very few sweets (for example, desserts, non-diet sodas, candy bars).	<input type="checkbox"/> ₀	<input type="checkbox"/> ₁
g. Other (<i>Specify</i> : _____)	<input type="checkbox"/> ₀	<input type="checkbox"/> ₁

2. Has your health care team (doctor, nurse, dietitian, or diabetes educator) given you any advice about exercise?

☐ No

☐ Yes = Which of the following has your health care team (doctor, nurse, dietitian, or diabetes educator) advised you to do?

- | | <u>No</u> | <u>Yes</u> |
|--|--------------------------|--------------------------|
| | <input type="checkbox"/> | <input type="checkbox"/> |
| a. Get low-level exercise (such as walking) on a daily basis. | <input type="checkbox"/> | <input type="checkbox"/> |
| b. Exercise continuously for at least 20 minutes at least 3 times a week. | <input type="checkbox"/> | <input type="checkbox"/> |
| c. Fit exercise into my daily routine (for example, take stairs instead of elevators, park a block away and walk). | <input type="checkbox"/> | <input type="checkbox"/> |
| d. Engage in a specific amount, type, duration, and level of exercise. | <input type="checkbox"/> | <input type="checkbox"/> |
| e. Other (<i>Specify</i> : _____) | <input type="checkbox"/> | <input type="checkbox"/> |

III. My Medications

These questions ask you about medications you take for diabetes, blood pressure and cholesterol. If you have not been prescribed medication for all three conditions, please answer the questions based on the medicines you have been prescribed.

- | | <u>None</u>
<u>Of the</u>
<u>Time</u> | <u>Some</u>
<u>of the</u>
<u>Time</u> | <u>Most</u>
<u>of the</u>
<u>Time</u> | <u>All</u>
<u>of the</u>
<u>Time</u> |
|--|---|---|---|--|
| 1. Over the past <u>4 months</u> , <i>how often did you:</i> | | | | |
| a. Forget to take your diabetes, blood pressure, or cholesterol medicines? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| b. Decide not to take your medicines? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| c. Forget to get prescriptions filled? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| d. Run out of medicines? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| e. Skip your medicines before you went to the doctor? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| f. Miss taking your medicines <u>because</u> you were feeling better? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| g. Miss taking your medicines <u>because</u> you felt sick? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| h. Take someone else's medicines? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

IV. Living with Diabetes

These questions ask about feelings that may be a problem in your life. For each item, please check the box indicating how much you have been distressed or bothered by the feeling. If a particular feeling is not a bother or a problem for you, check "1" (Not a Problem). If it is a serious problem for you, you might check "6" (Serious Problem).

- | | | Not a
Problem | | Moderate
Problem | | Serious
Problem |
|----|--|----------------------------|----------------------------|----------------------------|----------------------------|---|
| | | <input type="checkbox"/> 1 | <input type="checkbox"/> 2 | <input type="checkbox"/> 3 | <input type="checkbox"/> 4 | <input type="checkbox"/> 5 <input type="checkbox"/> 6 |
| 1. | Feeling that I am not testing my blood sugars frequently enough. | <input type="checkbox"/> 1 | <input type="checkbox"/> 2 | <input type="checkbox"/> 3 | <input type="checkbox"/> 4 | <input type="checkbox"/> 5 <input type="checkbox"/> 6 |
| 2. | Feeling that I am often failing with my diabetes regimen. | <input type="checkbox"/> 1 | <input type="checkbox"/> 2 | <input type="checkbox"/> 3 | <input type="checkbox"/> 4 | <input type="checkbox"/> 5 <input type="checkbox"/> 6 |
| 3. | Not feeling confident in my day-to-day ability to manage diabetes. | <input type="checkbox"/> 1 | <input type="checkbox"/> 2 | <input type="checkbox"/> 3 | <input type="checkbox"/> 4 | <input type="checkbox"/> 5 <input type="checkbox"/> 6 |
| 4. | Feeling that I am not sticking closely enough to a good meal plan. | <input type="checkbox"/> 1 | <input type="checkbox"/> 2 | <input type="checkbox"/> 3 | <input type="checkbox"/> 4 | <input type="checkbox"/> 5 <input type="checkbox"/> 6 |
| 5. | Not feeling motivated to keep up my diabetes self-management. | <input type="checkbox"/> 1 | <input type="checkbox"/> 2 | <input type="checkbox"/> 3 | <input type="checkbox"/> 4 | <input type="checkbox"/> 5 <input type="checkbox"/> 6 |

Below are some statements that people sometimes make when they talk about their health. Please indicate how much you agree or disagree with each statement as it applies to you personally. Your answers should be what is true for you and not just what you think the doctor wants you to say. If the statement does not apply to you, check Not Applicable.

- | | | Disagree
Strongly | Disagree | Agree | Agree
Strongly | Not
Applicable |
|-----|--|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|
| | | <input type="checkbox"/> 1 | <input type="checkbox"/> 2 | <input type="checkbox"/> 3 | <input type="checkbox"/> 4 | <input type="checkbox"/> 5 |
| 6. | When all is said and done, I am the person who is responsible for managing my health. | <input type="checkbox"/> 1 | <input type="checkbox"/> 2 | <input type="checkbox"/> 3 | <input type="checkbox"/> 4 | <input type="checkbox"/> 5 |
| 7. | Taking an active role in my own health care is the most important factor in determining my health and ability to function. | <input type="checkbox"/> 1 | <input type="checkbox"/> 2 | <input type="checkbox"/> 3 | <input type="checkbox"/> 4 | <input type="checkbox"/> 5 |
| 8. | I know what each of my prescribed medications does. | <input type="checkbox"/> 1 | <input type="checkbox"/> 2 | <input type="checkbox"/> 3 | <input type="checkbox"/> 4 | <input type="checkbox"/> 5 |
| 9. | I know the different medical treatment options available for my health conditions. | <input type="checkbox"/> 1 | <input type="checkbox"/> 2 | <input type="checkbox"/> 3 | <input type="checkbox"/> 4 | <input type="checkbox"/> 5 |
| 10. | I know how to prevent problems with my health. | <input type="checkbox"/> 1 | <input type="checkbox"/> 2 | <input type="checkbox"/> 3 | <input type="checkbox"/> 4 | <input type="checkbox"/> 5 |

These questions ask about thoughts and feelings that people sometimes have about taking care of diabetes. For each statement, check the box to indicate how true it is for you.

	<u>Not at All True of Me</u>	<u>A Little True of Me</u>	<u>Moderately True of Me</u>	<u>Very True of Me</u>	<u>Extremely True of Me</u>
11. After I have a bad experience with my diabetes, then I do everything I can to make sure it does not happen again.	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
12. I know what to expect from my diabetes each day.	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
13. When I think about the problems that can happen because of diabetes, it makes me want to do even more to take care of my diabetes.	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
14. After I have a bad experience with my diabetes, I come away knowing exactly what to do and what not to do so the problem doesn't happen again.	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
15. I look for people who have done well with their diabetes and try to learn what they did that helped them.	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
16. Over time, I have gotten better at choosing the best way to solve problems with my diabetes.	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
17. I come up with ways to overcome obstacles that prevent me from exercising regularly.	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
18. I try different approaches to avoid eating unhealthy foods.	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
19. I come up with ways to make sure that I take my diabetes medicines as directed by my doctor.	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5

V. About Me

1. Which one of the following best describes your work status in the past 6 months?

- ☐₁ Worked for pay
- ☐₂ Retired; did not work for pay
- ☐₃ Did not work for pay due to health reasons
- ☐₄ Did not work for pay because of other reasons (for example, student, homemaker)
- ☐₅ Other (*Specify:* _____)

2. What type of work do/did you do in your current or most recent job?

- ☐₀₁ Management, business, and financial (for example, chief executive, financial manager)
- ☐₀₂ Professional (for example, engineer, architect, dentist)
- ☐₀₃ Service worker (for example, waitress, cook, maintenance, house or hotel cleaner)
- ☐₀₄ Sales (for example, cashier, counter clerk, telemarketing)
- ☐₀₅ Administrative support, clerical work (for example, file clerk, answering service, hotel clerk)
- ☐₀₆ Construction (for example, carpentry, electrician, painter, plumber)
- ☐₀₇ Installation, maintenance, and repair (for example, auto mechanic, building maintenance, electronic installation and repair)
- ☐₀₈ Production (for example, assembly line, meat packing, printing)
- ☐₀₉ Transportation and moving (for example, bus or truck driver, railroad, service station or parking lot attendant, garbage or recycling collector)
- ☐₁₀ Other (*Specify:* _____)

3. Think of all the exercises or physical activities that you do outside of work for your health. Altogether, how much pleasure or satisfaction do you get from them?

- ☐₁ Like/enjoy/get satisfaction from activities
- ☐₂ Neutral
- ☐₃ Do not like/enjoy/get satisfaction from activities

I. My Health

For each item below, check the box to indicate which statement best describes your own health today.

1. Mobility

- ☐₁ I have no problems in walking
- ☐₂ I have some problems in walking
- ☐₃ I am confined to bed

2. Self-care

- ☐₁ I have no problems with self-care
- ☐₂ I have some problems washing or dressing myself
- ☐₃ I am unable to wash or dress myself

3. Usual activities (for example, work, study, housework, family or leisure activities)

- ☐₁ I have no problems with performing my usual activities
- ☐₂ I have some problems with performing my usual activities
- ☐₃ I am unable to perform my usual activities

4. Pain/Discomfort

- ☐₁ I have no pain or discomfort
- ☐₂ I have moderate pain or discomfort
- ☐₃ I have extreme pain or discomfort

5. Anxiety/Depression

- ☐₁ I am not anxious or depressed
- ☐₂ I am moderately anxious or depressed
- ☐₃ I am extremely anxious or depressed

6. This thermometer goes from 0 (the worst health you can imagine) to 100 (the best health you can imagine). How good or bad is your own health today? Draw a line from the box below to whichever point on the scale indicates how good or bad you feel your health is today.

**Your own
health state
today**

Best
imaginable
health state

100

90

80

70

60

50

40

30

20

10

0

Worst
imaginable
health state

[Office Use Only: _____]

These questions ask about your mood, and related experiences you may have had.

If your answers indicate issues that might affect your health care or well-being, this information will be shared with your doctor so that the two of you can consider appropriate action.

7.	Over the past <u>2 weeks</u> , how often have you been bothered by any of the following problems?	Not at <u>All</u>	Several <u>Days</u>	More than Half the <u>Days</u>	Nearly Every <u>Day</u>
a.	I had little interest or pleasure in doing things.	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄
b.	I felt down, depressed, or hopeless.	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄
c.	I had trouble falling asleep, staying asleep, or sleeping too much.	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄
d.	I felt tired or had little energy.	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄
e.	I had a poor appetite <u>or</u> I was overeating	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄
f.	I felt bad about myself. I felt I was a failure and have let myself or my family down.	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄
g.	I had trouble concentrating on things, like reading the newspaper or watching TV.	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄
h.	I moved or spoke so slowly that other people noticed. Or the opposite—I was so fidgety or restless that I moved around a lot more than usual.	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄

These questions ask about the type of help you get with your diabetes from your health care team. This might include your doctor, nurse, dietitian, care manager, or diabetes educator who treats your illness.

Your answers will not be shown to anyone not associated with this project.

8. When I received care for my diabetes over the past 4 months or at my last visit with a health care team member, I was:

	<u>Almost Never</u>	<u>Generally Not</u>	<u>Sometimes</u>	<u>Most of the Time</u>	<u>Almost Always</u>
a. Asked for my ideas when we made a treatment plan.	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄	<input type="checkbox"/> ₅
b. Given choices about treatments to think about.	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄	<input type="checkbox"/> ₅
c. Asked to talk about any problems with my medicines or their effects.	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄	<input type="checkbox"/> ₅
d. Helped to set specific goals to improve my eating or exercise.	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄	<input type="checkbox"/> ₅
e. Given a copy of my treatment plan.	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄	<input type="checkbox"/> ₅
f. Asked questions, either directly or on a survey, about my health habits.	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄	<input type="checkbox"/> ₅
g. Sure that my doctor or nurse thought about my values and my traditions when they recommended treatments to me.	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄	<input type="checkbox"/> ₅
h. Helped to make a treatment plan that I could do in my daily life.	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄	<input type="checkbox"/> ₅
i. Helped to plan ahead so I could take care of my illness even in hard times.	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄	<input type="checkbox"/> ₅
j. Contacted after a visit to see how things were going.	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄	<input type="checkbox"/> ₅
k. Encouraged to attend programs in the community that could help me.	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄	<input type="checkbox"/> ₅

These questions ask about different resources people may use to manage their illness. For each item, check the box that best indicates your experience over the past 4 months.

9. Over the past <u>4 months</u> , to what extent:	Not at <u>All</u>	A <u>Little</u>	A Moderate <u>Amount</u>	Quite <u>a Bit</u>	A Great <u>Deal</u>
a. Have family or friends exercised with you?	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
b. Have you shared healthy low-fat recipes with friends or family members?	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
c. Have family or friends bought food or prepared food for you that was especially healthy or recommended?	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
d. Have you walked or exercised outdoors in your neighborhood?	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
e. Have you walked or done other exercise activities with neighbors?	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
f. Have you eaten at a restaurant that offered a variety of tasty, low-fat food choices?	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
g. Have you gone to parks for picnics, walks, or other outings?	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
h. Have you attended free or low-cost meetings (for example, Weight Watchers, church groups, hospital programs) that supported you in managing your illness?	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5
i. Have you attended wellness programs or fitness facilities?	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5

II. My Eating Habits

1. Over the past few months:

- | | | | |
|--|---|--|--|
| a. How many times a week did you eat fast food meals or snacks? | Less
Than 1
<input type="checkbox"/> 1 | 1-3
<input type="checkbox"/> 2 | 4 or More
<input type="checkbox"/> 3 |
| b. How many servings of fruit did you eat each day? | 2 or Less
<input type="checkbox"/> 1 | 3-4
<input type="checkbox"/> 2 | 5 or More
<input type="checkbox"/> 3 |
| c. How many servings of vegetables did you eat each day? | 2 or Less
<input type="checkbox"/> 1 | 3-4
<input type="checkbox"/> 2 | 5 or More
<input type="checkbox"/> 3 |
| d. How many regular sodas or glasses of sweet tea did you drink each day? | Less
Than 1
<input type="checkbox"/> 1 | 1-2
<input type="checkbox"/> 2 | 3 or More
<input type="checkbox"/> 3 |
| e. How many times a week did you eat beans (like pinto or black beans), chicken, or fish? | Less
Than 1
<input type="checkbox"/> 1 | 1-2
Times
<input type="checkbox"/> 2 | 3 or More
Times
<input type="checkbox"/> 3 |
| f. How many times a week did you eat regular snack chips or crackers (not low-fat)? | 1 Time
or Less
<input type="checkbox"/> 1 | 2-3
Times
<input type="checkbox"/> 2 | 4 or More
Times
<input type="checkbox"/> 3 |
| g. How many times a week did you eat desserts and other sweets (not the low-fat kind)? | 1 Time
or Less
<input type="checkbox"/> 1 | 2-3
Times
<input type="checkbox"/> 2 | 4 or More
Times
<input type="checkbox"/> 3 |
| h. How much margarine, butter, or meat fat do you use to season vegetables or put on potatoes, bread, or corn? | Very Little
<input type="checkbox"/> 1 | Some
<input type="checkbox"/> 2 | A Lot
<input type="checkbox"/> 3 |
| i. How many times a week did you eat breakfast when you got up? | Less
Than 1
<input type="checkbox"/> 1 | 1-3
<input type="checkbox"/> 2 | 4 or More
<input type="checkbox"/> 3 |

Think about your eating habits over the past 6 months. For each food item, check one box to show how often you ate it. Remember to include breakfast, lunch, dinner, snacks, and eating out.

2. How often did you eat:	2+ Times per Day	Once per Day	5-6 Times per Week	3-4 Times per Week	1-2 Times per Week	1-3 Times per Month	Less Than Once per Month	Never
a. Cold cereal?	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄	<input type="checkbox"/> ₅	<input type="checkbox"/> ₆	<input type="checkbox"/> ₇	<input type="checkbox"/> ₈
b. Skim milk, on cereal or to drink?	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄	<input type="checkbox"/> ₅	<input type="checkbox"/> ₆	<input type="checkbox"/> ₇	<input type="checkbox"/> ₈
c. Eggs, fried or scrambled in margarine, butter or oil?	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄	<input type="checkbox"/> ₅	<input type="checkbox"/> ₆	<input type="checkbox"/> ₇	<input type="checkbox"/> ₈
d. Sausage or bacon, regular fat?	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄	<input type="checkbox"/> ₅	<input type="checkbox"/> ₆	<input type="checkbox"/> ₇	<input type="checkbox"/> ₈
e. Margarine or butter on bread, rolls, pancakes?	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄	<input type="checkbox"/> ₅	<input type="checkbox"/> ₆	<input type="checkbox"/> ₇	<input type="checkbox"/> ₈
f. Orange juice or grapefruit juice?	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄	<input type="checkbox"/> ₅	<input type="checkbox"/> ₆	<input type="checkbox"/> ₇	<input type="checkbox"/> ₈
g. Fruit (not juices)?	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄	<input type="checkbox"/> ₅	<input type="checkbox"/> ₆	<input type="checkbox"/> ₇	<input type="checkbox"/> ₈
h. Beef or pork hot dogs, regular fat?	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄	<input type="checkbox"/> ₅	<input type="checkbox"/> ₆	<input type="checkbox"/> ₇	<input type="checkbox"/> ₈
i. Cheese or cheese spread, regular fat?	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄	<input type="checkbox"/> ₅	<input type="checkbox"/> ₆	<input type="checkbox"/> ₇	<input type="checkbox"/> ₈
j. French fries, home fries, or hash brown potatoes?	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄	<input type="checkbox"/> ₅	<input type="checkbox"/> ₆	<input type="checkbox"/> ₇	<input type="checkbox"/> ₈
k. Margarine or butter on vegetables, including potatoes?	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄	<input type="checkbox"/> ₅	<input type="checkbox"/> ₆	<input type="checkbox"/> ₇	<input type="checkbox"/> ₈
l. Mayonnaise, regular fat?	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄	<input type="checkbox"/> ₅	<input type="checkbox"/> ₆	<input type="checkbox"/> ₇	<input type="checkbox"/> ₈
m. Salad dressings, regular fat?	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄	<input type="checkbox"/> ₅	<input type="checkbox"/> ₆	<input type="checkbox"/> ₇	<input type="checkbox"/> ₈
n. Rice?	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄	<input type="checkbox"/> ₅	<input type="checkbox"/> ₆	<input type="checkbox"/> ₇	<input type="checkbox"/> ₈
o. Margarine, butter, or oil on rice or pasta?	<input type="checkbox"/> ₁	<input type="checkbox"/> ₂	<input type="checkbox"/> ₃	<input type="checkbox"/> ₄	<input type="checkbox"/> ₅	<input type="checkbox"/> ₆	<input type="checkbox"/> ₇	<input type="checkbox"/> ₈

I. My Activities

Think about the past 4 months.

1. a. How many **times each week**, on average, did you dance (such as square, folk, line, ballroom)? Do not count aerobic dance.

☐₀₀ Never = *Skip to Question 2*

☐₀₁ 1 time per week or less

☐₀₂ 2 times per week

☐₀₃ 3 times per week

☐₀₄ 4 times per week

☐₀₅ 5 times per week

☐₀₆ 6 times per week

☐₀₇ 7 times per week

☐₀₈ 8 times per week

☐₀₉ 9 times per week

☐₁₀ 10 times per week or more

- b. How much **total time**, on average, did you dance (such as square, folk, line, ballroom)? Do not count aerobic dance.

☐₁ Less than 1 hour per week

☐₂ 1-2½ hours per week

☐₃ 3-4½ hours per week

☐₄ 5-6½ hours per week

☐₅ 7-8½ hours per week

☐₆ 9 hours per week or more

2. a. How many **times each week**, on average, did you play golf, riding a cart? Count **walking time** only.

☐₀₀ Never = *Skip to Question 3*

☐₀₁ 1 time per week or less

☐₀₂ 2 times per week

☐₀₃ 3 times per week

☐₀₄ 4 times per week

☐₀₅ 5 times per week

☐₀₆ 6 times per week

☐₀₇ 7 times per week

☐₀₈ 8 times per week

☐₀₉ 9 times per week

☐₁₀ 10 times per week or more

- b. How much **total time**, on average, did you play golf, riding a cart? Count **walking time** only.

☐₁ Less than 1 hour per week

☐₂ 1-2½ hours per week

☐₃ 3-4½ hours per week

☐₄ 5-6½ hours per week

☐₅ 7-8½ hours per week

☐₆ 9 hours per week or more

3. a. How many times each week, on average, did you play golf, walking or pulling a cart? Count walking time only.

☐₀₀ Never = Skip to Question 4

☐₀₁ 1 time per week or less

☐₀₂ 2 times per week

☐₀₃ 3 times per week

☐₀₄ 4 times per week

☐₀₅ 5 times per week

☐₀₆ 6 times per week

☐₀₇ 7 times per week

☐₀₈ 8 times per week

☐₀₉ 9 times per week

☐₁₀ 10 times per week or more

- b. How much total time, on average, did you play golf, walking or pulling a cart? Count walking time only.

☐₁ Less than 1 hour per week

☐₂ 1-2½ hours per week

☐₃ 3-4½ hours per week

☐₄ 5-6½ hours per week

☐₅ 7-8½ hours per week

☐₆ 9 hours per week or more

4. a. How many times each week, on average, did you play singles tennis? Do not count doubles.

☐₀₀ Never = Skip to Question 5

☐₀₁ 1 time per week or less

☐₀₂ 2 times per week

☐₀₃ 3 times per week

☐₀₄ 4 times per week

☐₀₅ 5 times per week

☐₀₆ 6 times per week

☐₀₇ 7 times per week

☐₀₈ 8 times per week

☐₀₉ 9 times per week

☐₁₀ 10 times per week or more

- b. How much total time, on average, did you play singles tennis? Do not count doubles.

☐₁ Less than 1 hour per week

☐₂ 1-2½ hours per week

☐₃ 3-4½ hours per week

☐₄ 5-6½ hours per week

☐₅ 7-8½ hours per week

☐₆ 9 hours per week or more

5. a. How many times each week, on average, did you play doubles tennis? Do not count singles.

☐₀₀ Never = Skip to Question 6

☐₀₁ 1 time per week or less

☐₀₂ 2 times per week

☐₀₃ 3 times per week

☐₀₄ 4 times per week

☐₀₅ 5 times per week

☐₀₆ 6 times per week

☐₀₇ 7 times per week

☐₀₈ 8 times per week

☐₀₉ 9 times per week

☐₁₀ 10 times per week or more

- b. How much total time, on average, did you play doubles tennis? Do not count singles.

☐₁ Less than 1 hour per week

☐₂ 1-2½ hours per week

☐₃ 3-4½ hours per week

☐₄ 5-6½ hours per week

☐₅ 7-8½ hours per week

☐₆ 9 hours per week or more

6. a. How many **times each week**, on average, did you skate (such as ice, roller, in-line)?
- | | |
|--|--|
| <input type="checkbox"/> ₀₀ Never = <i>Skip to Question 7</i> | |
| <input type="checkbox"/> ₀₁ 1 time per week or less | <input type="checkbox"/> ₀₆ 6 times per week |
| <input type="checkbox"/> ₀₂ 2 times per week | <input type="checkbox"/> ₀₇ 7 times per week |
| <input type="checkbox"/> ₀₃ 3 times per week | <input type="checkbox"/> ₀₈ 8 times per week |
| <input type="checkbox"/> ₀₄ 4 times per week | <input type="checkbox"/> ₀₉ 9 times per week |
| <input type="checkbox"/> ₀₅ 5 times per week | <input type="checkbox"/> ₁₀ 10 times per week or more |
- b. How much **total time**, on average, did you skate (such as ice, roller, in-line)?
- | | |
|---|--|
| <input type="checkbox"/> ₁ Less than 1 hour per week | <input type="checkbox"/> ₄ 5-6½ hours per week |
| <input type="checkbox"/> ₂ 1-2½ hours per week | <input type="checkbox"/> ₅ 7-8½ hours per week |
| <input type="checkbox"/> ₃ 3-4½ hours per week | <input type="checkbox"/> ₆ 9 hours per week or more |
7. a. How many **times each week**, on average, did you do light work around the house (such as sweeping or vacuuming)?
- | | |
|--|--|
| <input type="checkbox"/> ₀₀ Never = <i>Skip to Question 8</i> | |
| <input type="checkbox"/> ₀₁ 1 time per week or less | <input type="checkbox"/> ₀₆ 6 times per week |
| <input type="checkbox"/> ₀₂ 2 times per week | <input type="checkbox"/> ₀₇ 7 times per week |
| <input type="checkbox"/> ₀₃ 3 times per week | <input type="checkbox"/> ₀₈ 8 times per week |
| <input type="checkbox"/> ₀₄ 4 times per week | <input type="checkbox"/> ₀₉ 9 times per week |
| <input type="checkbox"/> ₀₅ 5 times per week | <input type="checkbox"/> ₁₀ 10 times per week or more |
- b. How much **total time**, on average, did you do light work around the house (such as sweeping or vacuuming)?
- | | |
|---|--|
| <input type="checkbox"/> ₁ Less than 1 hour per week | <input type="checkbox"/> ₄ 5-6½ hours per week |
| <input type="checkbox"/> ₂ 1-2½ hours per week | <input type="checkbox"/> ₅ 7-8½ hours per week |
| <input type="checkbox"/> ₃ 3-4½ hours per week | <input type="checkbox"/> ₆ 9 hours per week or more |
8. a. How many **times each week**, on average, did you do heavy work around the house (such as washing windows or cleaning gutters)?
- | | |
|--|--|
| <input type="checkbox"/> ₀₀ Never = <i>Skip to Question 9</i> | |
| <input type="checkbox"/> ₀₁ 1 time per week or less | <input type="checkbox"/> ₀₆ 6 times per week |
| <input type="checkbox"/> ₀₂ 2 times per week | <input type="checkbox"/> ₀₇ 7 times per week |
| <input type="checkbox"/> ₀₃ 3 times per week | <input type="checkbox"/> ₀₈ 8 times per week |
| <input type="checkbox"/> ₀₄ 4 times per week | <input type="checkbox"/> ₀₉ 9 times per week |
| <input type="checkbox"/> ₀₅ 5 times per week | <input type="checkbox"/> ₁₀ 10 times per week or more |
- b. How much **total time**, on average, did you do heavy work around the house (such as washing windows or cleaning gutters)?
- | | |
|---|--|
| <input type="checkbox"/> ₁ Less than 1 hour per week | <input type="checkbox"/> ₄ 5-6½ hours per week |
| <input type="checkbox"/> ₂ 1-2½ hours per week | <input type="checkbox"/> ₅ 7-8½ hours per week |
| <input type="checkbox"/> ₃ 3-4½ hours per week | <input type="checkbox"/> ₆ 9 hours per week or more |

9. a. How many times each week, on average, did you do light gardening (such as watering plants)?

☐₀₀ Never = Skip to Question 10

☐₀₁ 1 time per week or less

☐₀₂ 2 times per week

☐₀₃ 3 times per week

☐₀₄ 4 times per week

☐₀₅ 5 times per week

☐₀₆ 6 times per week

☐₀₇ 7 times per week

☐₀₈ 8 times per week

☐₀₉ 9 times per week

☐₁₀ 10 times per week or more

- b. How much total time, on average, did you do light gardening (such as watering plants)?

☐₁ Less than 1 hour per week

☐₂ 1-2½ hours per week

☐₃ 3-4½ hours per week

☐₄ 5-6½ hours per week

☐₅ 7-8½ hours per week

☐₆ 9 hours per week or more

10. a. How many times each week, on average, did you do heavy gardening (such as spading or raking)?

☐₀₀ Never = Skip to Question 11

☐₀₁ 1 time per week or less

☐₀₂ 2 times per week

☐₀₃ 3 times per week

☐₀₄ 4 times per week

☐₀₅ 5 times per week

☐₀₆ 6 times per week

☐₀₇ 7 times per week

☐₀₈ 8 times per week

☐₀₉ 9 times per week

☐₁₀ 10 times per week or more

- b. How much total time, on average, did you do heavy gardening (such as spading or raking)?

☐₁ Less than 1 hour per week

☐₂ 1-2½ hours per week

☐₃ 3-4½ hours per week

☐₄ 5-6½ hours per week

☐₅ 7-8½ hours per week

☐₆ 9 hours per week or more

11. a. How many times each week, on average, did you jog or run?

☐₀₀ Never = Skip to Question 12

☐₀₁ 1 time per week or less

☐₀₂ 2 times per week

☐₀₃ 3 times per week

☐₀₄ 4 times per week

☐₀₅ 5 times per week

☐₀₆ 6 times per week

☐₀₇ 7 times per week

☐₀₈ 8 times per week

☐₀₉ 9 times per week

☐₁₀ 10 times per week or more

- b. How much total time, on average, did you jog or run?

☐₁ Less than 1 hour per week

☐₂ 1-2½ hours per week

☐₃ 3-4½ hours per week

☐₄ 5-6½ hours per week

☐₅ 7-8½ hours per week

☐₆ 9 hours per week or more

12. a. How many times each week, on average, did you ride a bicycle or stationary cycle using legs only?

☐₀₀ Never = Skip to Question 13

☐₀₁ 1 time per week or less

☐₀₂ 2 times per week

☐₀₃ 3 times per week

☐₀₄ 4 times per week

☐₀₅ 5 times per week

☐₀₆ 6 times per week

☐₀₇ 7 times per week

☐₀₈ 8 times per week

☐₀₉ 9 times per week

☐₁₀ 10 times per week or more

b. How much total time, on average, did you ride a bicycle or stationary cycle using legs only?

☐₁ Less than 1 hour per week

☐₂ 1-2½ hours per week

☐₃ 3-4½ hours per week

☐₄ 5-6½ hours per week

☐₅ 7-8½ hours per week

☐₆ 9 hours per week or more

13. a. How many times each week, on average, did you do aerobic machines involving arms and legs (such as rowing or cross-country ski machines)?

☐₀₀ Never = Skip to Question 14

☐₀₁ 1 time per week or less

☐₀₂ 2 times per week

☐₀₃ 3 times per week

☐₀₄ 4 times per week

☐₀₅ 5 times per week

☐₀₆ 6 times per week

☐₀₇ 7 times per week

☐₀₈ 8 times per week

☐₀₉ 9 times per week

☐₁₀ 10 times per week or more

b. How much total time, on average, did you do aerobic machines involving arms and legs (such as rowing or cross-country ski machines)?

☐₁ Less than 1 hour per week

☐₂ 1-2½ hours per week

☐₃ 3-4½ hours per week

☐₄ 5-6½ hours per week

☐₅ 7-8½ hours per week

☐₆ 9 hours per week or more

14. a. How many times each week, on average, did you do a stair or step machine?

☐₀₀ Never = Skip to Question 15

☐₀₁ 1 time per week or less

☐₀₂ 2 times per week

☐₀₃ 3 times per week

☐₀₄ 4 times per week

☐₀₅ 5 times per week

☐₀₆ 6 times per week

☐₀₇ 7 times per week

☐₀₈ 8 times per week

☐₀₉ 9 times per week

☐₁₀ 10 times per week or more

b. How much total time, on average, did you do a stair or step machine?

☐₁ Less than 1 hour per week

☐₂ 1-2½ hours per week

☐₃ 3-4½ hours per week

☐₄ 5-6½ hours per week

☐₅ 7-8½ hours per week

☐₆ 9 hours per week or more

15. a. How many **times each week**, on average, did you swim gently?

- ☐₀₀ Never = *Skip to Question 16*
- | | |
|--|--|
| <input type="checkbox"/> ₀₁ 1 time per week or less | <input type="checkbox"/> ₀₆ 6 times per week |
| <input type="checkbox"/> ₀₂ 2 times per week | <input type="checkbox"/> ₀₇ 7 times per week |
| <input type="checkbox"/> ₀₃ 3 times per week | <input type="checkbox"/> ₀₈ 8 times per week |
| <input type="checkbox"/> ₀₄ 4 times per week | <input type="checkbox"/> ₀₉ 9 times per week |
| <input type="checkbox"/> ₀₅ 5 times per week | <input type="checkbox"/> ₁₀ 10 times per week or more |

b. How much **total time**, on average, did you swim gently?

- | | |
|---|--|
| <input type="checkbox"/> ₁ Less than 1 hour per week | <input type="checkbox"/> ₄ 5-6½ hours per week |
| <input type="checkbox"/> ₂ 1-2½ hours per week | <input type="checkbox"/> ₅ 7-8½ hours per week |
| <input type="checkbox"/> ₃ 3-4½ hours per week | <input type="checkbox"/> ₆ 9 hours per week or more |

16. a. How many **times each week**, on average, did you swim moderately or fast?

- ☐₀₀ Never = *Skip to Question 17*
- | | |
|--|--|
| <input type="checkbox"/> ₀₁ 1 time per week or less | <input type="checkbox"/> ₀₆ 6 times per week |
| <input type="checkbox"/> ₀₂ 2 times per week | <input type="checkbox"/> ₀₇ 7 times per week |
| <input type="checkbox"/> ₀₃ 3 times per week | <input type="checkbox"/> ₀₈ 8 times per week |
| <input type="checkbox"/> ₀₄ 4 times per week | <input type="checkbox"/> ₀₉ 9 times per week |
| <input type="checkbox"/> ₀₅ 5 times per week | <input type="checkbox"/> ₁₀ 10 times per week or more |

b. How much **total time**, on average, did you swim moderately or fast?

- | | |
|---|--|
| <input type="checkbox"/> ₁ Less than 1 hour per week | <input type="checkbox"/> ₄ 5-6½ hours per week |
| <input type="checkbox"/> ₂ 1-2½ hours per week | <input type="checkbox"/> ₅ 7-8½ hours per week |
| <input type="checkbox"/> ₃ 3-4½ hours per week | <input type="checkbox"/> ₆ 9 hours per week or more |

17. a. How many **times each week**, on average, did you do water exercises? Do not count other swimming.

- ☐₀₀ Never = *Skip to Question 18*
- | | |
|--|--|
| <input type="checkbox"/> ₀₁ 1 time per week or less | <input type="checkbox"/> ₀₆ 6 times per week |
| <input type="checkbox"/> ₀₂ 2 times per week | <input type="checkbox"/> ₀₇ 7 times per week |
| <input type="checkbox"/> ₀₃ 3 times per week | <input type="checkbox"/> ₀₈ 8 times per week |
| <input type="checkbox"/> ₀₄ 4 times per week | <input type="checkbox"/> ₀₉ 9 times per week |
| <input type="checkbox"/> ₀₅ 5 times per week | <input type="checkbox"/> ₁₀ 10 times per week or more |

b. How much **total time**, on average, did you do water exercises? Do not count other swimming.

- | | |
|---|--|
| <input type="checkbox"/> ₁ Less than 1 hour per week | <input type="checkbox"/> ₄ 5-6½ hours per week |
| <input type="checkbox"/> ₂ 1-2½ hours per week | <input type="checkbox"/> ₅ 7-8½ hours per week |
| <input type="checkbox"/> ₃ 3-4½ hours per week | <input type="checkbox"/> ₆ 9 hours per week or more |

18. a. How many **times each week**, on average, did you do stretching or flexibility exercises? Do not count yoga or Tai Chi.

☐₀₀ Never = *Skip to Question 19*
☐₀₁ 1 time per week or less ☐₀₆ 6 times per week
☐₀₂ 2 times per week ☐₀₇ 7 times per week
☐₀₃ 3 times per week ☐₀₈ 8 times per week
☐₀₄ 4 times per week ☐₀₉ 9 times per week
☐₀₅ 5 times per week ☐₁₀ 10 times per week or more

- b. How much **total time**, on average, did you do stretching or flexibility exercises? Do not count yoga or Tai Chi.

☐₁ Less than 1 hour per week ☐₄ 5-6½ hours per week
☐₂ 1-2½ hours per week ☐₅ 7-8½ hours per week
☐₃ 3-4½ hours per week ☐₆ 9 hours per week or more

19. a. How many **times each week**, on average, did you do yoga or Tai Chi?

☐₀₀ Never = *Skip to Question 20*
☐₀₁ 1 time per week or less ☐₀₆ 6 times per week
☐₀₂ 2 times per week ☐₀₇ 7 times per week
☐₀₃ 3 times per week ☐₀₈ 8 times per week
☐₀₄ 4 times per week ☐₀₉ 9 times per week
☐₀₅ 5 times per week ☐₁₀ 10 times per week or more

- b. How much **total time**, on average, did you do yoga or Tai Chi?

☐₁ Less than 1 hour per week ☐₄ 5-6½ hours per week
☐₂ 1-2½ hours per week ☐₅ 7-8½ hours per week
☐₃ 3-4½ hours per week ☐₆ 9 hours per week or more

20. a. How many **times each week**, on average, did you do aerobics or aerobic dancing?

☐₀₀ Never = *Skip to Question 21*
☐₀₁ 1 time per week or less ☐₀₆ 6 times per week
☐₀₂ 2 times per week ☐₀₇ 7 times per week
☐₀₃ 3 times per week ☐₀₈ 8 times per week
☐₀₄ 4 times per week ☐₀₉ 9 times per week
☐₀₅ 5 times per week ☐₁₀ 10 times per week or more

- b. How much **total time**, on average, did you do aerobics or aerobic dancing?

☐₁ Less than 1 hour per week ☐₄ 5-6½ hours per week
☐₂ 1-2½ hours per week ☐₅ 7-8½ hours per week
☐₃ 3-4½ hours per week ☐₆ 9 hours per week or more

21. a. How many times each week, on average, did you do light strength training (such as hand-held weights of 5 pounds or less or elastic bands)?

- ☐₀₀ Never *≡ Skip to Question 22*
- | | |
|--|--|
| <input type="checkbox"/> ₀₁ 1 time per week or less | <input type="checkbox"/> ₀₆ 6 times per week |
| <input type="checkbox"/> ₀₂ 2 times per week | <input type="checkbox"/> ₀₇ 7 times per week |
| <input type="checkbox"/> ₀₃ 3 times per week | <input type="checkbox"/> ₀₈ 8 times per week |
| <input type="checkbox"/> ₀₄ 4 times per week | <input type="checkbox"/> ₀₉ 9 times per week |
| <input type="checkbox"/> ₀₅ 5 times per week | <input type="checkbox"/> ₁₀ 10 times per week or more |

- b. How much total time, on average, did you do light strength training (such as hand-held weights of 5 pounds or less or elastic bands)?

- | | |
|---|--|
| <input type="checkbox"/> ₁ Less than 1 hour per week | <input type="checkbox"/> ₄ 5-6½ hours per week |
| <input type="checkbox"/> ₂ 1-2½ hours per week | <input type="checkbox"/> ₅ 7-8½ hours per week |
| <input type="checkbox"/> ₃ 3-4½ hours per week | <input type="checkbox"/> ₆ 9 hours per week or more |

22. a. How many times each week, on average, did you do moderate to heavy strength training (such as hand-held weights of more than 5 pounds, weight machines, or pushups)?

- ☐₀₀ Never *≡ Skip to Question 23*
- | | |
|--|--|
| <input type="checkbox"/> ₀₁ 1 time per week or less | <input type="checkbox"/> ₀₆ 6 times per week |
| <input type="checkbox"/> ₀₂ 2 times per week | <input type="checkbox"/> ₀₇ 7 times per week |
| <input type="checkbox"/> ₀₃ 3 times per week | <input type="checkbox"/> ₀₈ 8 times per week |
| <input type="checkbox"/> ₀₄ 4 times per week | <input type="checkbox"/> ₀₉ 9 times per week |
| <input type="checkbox"/> ₀₅ 5 times per week | <input type="checkbox"/> ₁₀ 10 times per week or more |

- b. How much total time, on average, did you do moderate to heavy strength training (such as hand-held weights of more than 5 pounds, weight machines, or pushups)?

- | | |
|---|--|
| <input type="checkbox"/> ₁ Less than 1 hour per week | <input type="checkbox"/> ₄ 5-6½ hours per week |
| <input type="checkbox"/> ₂ 1-2½ hours per week | <input type="checkbox"/> ₅ 7-8½ hours per week |
| <input type="checkbox"/> ₃ 3-4½ hours per week | <input type="checkbox"/> ₆ 9 hours per week or more |

23. a. How many **times each week**, on average, did you do general conditioning exercises (such as light calisthenics or chair exercises)? Do not count strength training.

☐₀₀ Never *≡ Skip to Question 24*

☐₀₁ 1 time per week or less

☐₀₂ 2 times per week

☐₀₃ 3 times per week

☐₀₄ 4 times per week

☐₀₅ 5 times per week

☐₀₆ 6 times per week

☐₀₇ 7 times per week

☐₀₈ 8 times per week

☐₀₉ 9 times per week

☐₁₀ 10 times per week or more

- b. How much **total time**, on average, did you do general conditioning exercises (such as light calisthenics or chair exercises)? Do not count strength training.

☐₁ Less than 1 hour per week

☐₂ 1-2½ hours per week

☐₃ 3-4½ hours per week

☐₄ 5-6½ hours per week

☐₅ 7-8½ hours per week

☐₆ 9 hours per week or more

24. a. How many **times each week**, on average, did you play basketball, soccer, or racquetball? Do not count time on sidelines.

☐₀₀ Never *≡ Skip to Question 25*

☐₀₁ 1 time per week or less

☐₀₂ 2 times per week

☐₀₃ 3 times per week

☐₀₄ 4 times per week

☐₀₅ 5 times per week

☐₀₆ 6 times per week

☐₀₇ 7 times per week

☐₀₈ 8 times per week

☐₀₉ 9 times per week

☐₁₀ 10 times per week or more

- b. How much **total time**, on average, did you play basketball, soccer, or racquetball? Do not count time on sidelines.

☐₁ Less than 1 hour per week

☐₂ 1-2½ hours per week

☐₃ 3-4½ hours per week

☐₄ 5-6½ hours per week

☐₅ 7-8½ hours per week

☐₆ 9 hours per week or more

25. a. How many times each week, on average, did you walk leisurely for exercise or pleasure?

- | | |
|--|--|
| <input type="checkbox"/> ₀₀ Never = Skip to Question 26 | |
| <input type="checkbox"/> ₀₁ 1 time per week or less | <input type="checkbox"/> ₀₆ 6 times per week |
| <input type="checkbox"/> ₀₂ 2 times per week | <input type="checkbox"/> ₀₇ 7 times per week |
| <input type="checkbox"/> ₀₃ 3 times per week | <input type="checkbox"/> ₀₈ 8 times per week |
| <input type="checkbox"/> ₀₄ 4 times per week | <input type="checkbox"/> ₀₉ 9 times per week |
| <input type="checkbox"/> ₀₅ 5 times per week | <input type="checkbox"/> ₁₀ 10 times per week or more |

b. How much total time, on average, did you walk leisurely for exercise or pleasure?

- | | |
|---|--|
| <input type="checkbox"/> ₁ Less than 1 hour per week | <input type="checkbox"/> ₄ 5-6½ hours per week |
| <input type="checkbox"/> ₂ 1-2½ hours per week | <input type="checkbox"/> ₅ 7-8½ hours per week |
| <input type="checkbox"/> ₃ 3-4½ hours per week | <input type="checkbox"/> ₆ 9 hours per week or more |

26. a. How many times each week, on average, did you walk to do errands (such as to or from a store, or to take children to school)? Count walk time only.

- | | |
|--|--|
| <input type="checkbox"/> ₀₀ Never = Skip to Question 27 | |
| <input type="checkbox"/> ₀₁ 1 time per week or less | <input type="checkbox"/> ₀₆ 6 times per week |
| <input type="checkbox"/> ₀₂ 2 times per week | <input type="checkbox"/> ₀₇ 7 times per week |
| <input type="checkbox"/> ₀₃ 3 times per week | <input type="checkbox"/> ₀₈ 8 times per week |
| <input type="checkbox"/> ₀₄ 4 times per week | <input type="checkbox"/> ₀₉ 9 times per week |
| <input type="checkbox"/> ₀₅ 5 times per week | <input type="checkbox"/> ₁₀ 10 times per week or more |

b. How much total time, on average, did you walk to do errands (such as to or from a store, or to take children to school)? Count walk time only.

- | | |
|---|--|
| <input type="checkbox"/> ₁ Less than 1 hour per week | <input type="checkbox"/> ₄ 5-6½ hours per week |
| <input type="checkbox"/> ₂ 1-2½ hours per week | <input type="checkbox"/> ₅ 7-8½ hours per week |
| <input type="checkbox"/> ₃ 3-4½ hours per week | <input type="checkbox"/> ₆ 9 hours per week or more |

27. a. How many times each week, on average, did you walk fast or briskly for exercise? Do not count walking leisurely or uphill.

- | | |
|--|--|
| <input type="checkbox"/> ₀₀ Never = Skip to Question 28 | |
| <input type="checkbox"/> ₀₁ 1 time per week or less | <input type="checkbox"/> ₀₆ 6 times per week |
| <input type="checkbox"/> ₀₂ 2 times per week | <input type="checkbox"/> ₀₇ 7 times per week |
| <input type="checkbox"/> ₀₃ 3 times per week | <input type="checkbox"/> ₀₈ 8 times per week |
| <input type="checkbox"/> ₀₄ 4 times per week | <input type="checkbox"/> ₀₉ 9 times per week |
| <input type="checkbox"/> ₀₅ 5 times per week | <input type="checkbox"/> ₁₀ 10 times per week or more |

b. How much total time, on average, did you walk fast or briskly for exercise? Do not count walking leisurely or uphill.

- | | |
|---|--|
| <input type="checkbox"/> ₁ Less than 1 hour per week | <input type="checkbox"/> ₄ 5-6½ hours per week |
| <input type="checkbox"/> ₂ 1-2½ hours per week | <input type="checkbox"/> ₅ 7-8½ hours per week |
| <input type="checkbox"/> ₃ 3-4½ hours per week | <input type="checkbox"/> ₆ 9 hours per week or more |

28. a. How many times each week, on average, did you walk or hike uphill? Count uphill part only.

- ☐₀₀ Never = Skip to Section II: Confidence
- | | |
|--|--|
| <input type="checkbox"/> ₀₁ 1 time per week or less | <input type="checkbox"/> ₀₆ 6 times per week |
| <input type="checkbox"/> ₀₂ 2 times per week | <input type="checkbox"/> ₀₇ 7 times per week |
| <input type="checkbox"/> ₀₃ 3 times per week | <input type="checkbox"/> ₀₈ 8 times per week |
| <input type="checkbox"/> ₀₄ 4 times per week | <input type="checkbox"/> ₀₉ 9 times per week |
| <input type="checkbox"/> ₀₅ 5 times per week | <input type="checkbox"/> ₁₀ 10 times per week or more |

b. How much total time, on average, did you walk or hike uphill? Count uphill part only.

- | | |
|---|--|
| <input type="checkbox"/> ₁ Less than 1 hour per week | <input type="checkbox"/> ₄ 5-6½ hours per week |
| <input type="checkbox"/> ₂ 1-2½ hours per week | <input type="checkbox"/> ₅ 7-8½ hours per week |
| <input type="checkbox"/> ₃ 3-4½ hours per week | <input type="checkbox"/> ₆ 9 hours per week or more |

II. Confidence

For each item below, check the box indicating your confidence that you can do the task regularly at the present time.

1. How confident do you feel that you:

- | | Not At All
Confident | Totally
Confident |
|--|---|----------------------|
| a. Can eat your meals every 4 to 5 hours every day, including breakfast? | <input type="checkbox"/> ₀₁ <input type="checkbox"/> ₀₂ <input type="checkbox"/> ₀₃ <input type="checkbox"/> ₀₄ <input type="checkbox"/> ₀₅ <input type="checkbox"/> ₀₆ <input type="checkbox"/> ₀₇ <input type="checkbox"/> ₀₈ <input type="checkbox"/> ₀₉ <input type="checkbox"/> ₁₀ | |
| b. Can follow your diet when you have to prepare or share food with other people who do not have diabetes? | <input type="checkbox"/> ₀₁ <input type="checkbox"/> ₀₂ <input type="checkbox"/> ₀₃ <input type="checkbox"/> ₀₄ <input type="checkbox"/> ₀₅ <input type="checkbox"/> ₀₆ <input type="checkbox"/> ₀₇ <input type="checkbox"/> ₀₈ <input type="checkbox"/> ₀₉ <input type="checkbox"/> ₁₀ | |
| c. Can choose the appropriate foods to eat when you are hungry (for example, snacks)? | <input type="checkbox"/> ₀₁ <input type="checkbox"/> ₀₂ <input type="checkbox"/> ₀₃ <input type="checkbox"/> ₀₄ <input type="checkbox"/> ₀₅ <input type="checkbox"/> ₀₆ <input type="checkbox"/> ₀₇ <input type="checkbox"/> ₀₈ <input type="checkbox"/> ₀₉ <input type="checkbox"/> ₁₀ | |
| d. Can exercise 15 to 30 minutes, 4 to 5 times a week? | <input type="checkbox"/> ₀₁ <input type="checkbox"/> ₀₂ <input type="checkbox"/> ₀₃ <input type="checkbox"/> ₀₄ <input type="checkbox"/> ₀₅ <input type="checkbox"/> ₀₆ <input type="checkbox"/> ₀₇ <input type="checkbox"/> ₀₈ <input type="checkbox"/> ₀₉ <input type="checkbox"/> ₁₀ | |

1. (Continued)

How confident do you feel that you:

	Not At All Confident										Totally Confident
e. Can do something to prevent your blood sugar level from dropping when you exercise?	<input type="checkbox"/> 01	<input type="checkbox"/> 02	<input type="checkbox"/> 03	<input type="checkbox"/> 04	<input type="checkbox"/> 05	<input type="checkbox"/> 06	<input type="checkbox"/> 07	<input type="checkbox"/> 08	<input type="checkbox"/> 09	<input type="checkbox"/> 10	
f. Know what to do when your blood sugar level goes higher or lower than it should be?	<input type="checkbox"/> 01	<input type="checkbox"/> 02	<input type="checkbox"/> 03	<input type="checkbox"/> 04	<input type="checkbox"/> 05	<input type="checkbox"/> 06	<input type="checkbox"/> 07	<input type="checkbox"/> 08	<input type="checkbox"/> 09	<input type="checkbox"/> 10	
g. Can judge when the changes in your illness mean you should visit the doctor?	<input type="checkbox"/> 01	<input type="checkbox"/> 02	<input type="checkbox"/> 03	<input type="checkbox"/> 04	<input type="checkbox"/> 05	<input type="checkbox"/> 06	<input type="checkbox"/> 07	<input type="checkbox"/> 08	<input type="checkbox"/> 09	<input type="checkbox"/> 10	
h. Can control your diabetes so that it does not interfere with the things you want to do?	<input type="checkbox"/> 01	<input type="checkbox"/> 02	<input type="checkbox"/> 03	<input type="checkbox"/> 04	<input type="checkbox"/> 05	<input type="checkbox"/> 06	<input type="checkbox"/> 07	<input type="checkbox"/> 08	<input type="checkbox"/> 09	<input type="checkbox"/> 10	
i. Can take your diabetes medications at the times that your doctor told you to?	<input type="checkbox"/> 01	<input type="checkbox"/> 02	<input type="checkbox"/> 03	<input type="checkbox"/> 04	<input type="checkbox"/> 05	<input type="checkbox"/> 06	<input type="checkbox"/> 07	<input type="checkbox"/> 08	<input type="checkbox"/> 09	<input type="checkbox"/> 10	
j. Can take your diabetes medications even when you are feeling fine?	<input type="checkbox"/> 01	<input type="checkbox"/> 02	<input type="checkbox"/> 03	<input type="checkbox"/> 04	<input type="checkbox"/> 05	<input type="checkbox"/> 06	<input type="checkbox"/> 07	<input type="checkbox"/> 08	<input type="checkbox"/> 09	<input type="checkbox"/> 10	
k. Can take your diabetes medications even when they have side effects that bother you?	<input type="checkbox"/> 01	<input type="checkbox"/> 02	<input type="checkbox"/> 03	<input type="checkbox"/> 04	<input type="checkbox"/> 05	<input type="checkbox"/> 06	<input type="checkbox"/> 07	<input type="checkbox"/> 08	<input type="checkbox"/> 09	<input type="checkbox"/> 10	
l. Can exercise regularly, even when you are busy?	<input type="checkbox"/> 01	<input type="checkbox"/> 02	<input type="checkbox"/> 03	<input type="checkbox"/> 04	<input type="checkbox"/> 05	<input type="checkbox"/> 06	<input type="checkbox"/> 07	<input type="checkbox"/> 08	<input type="checkbox"/> 09	<input type="checkbox"/> 10	
m. Can limit yourself to recommended servings of high-fat foods <u>at mealtime</u> ?	<input type="checkbox"/> 01	<input type="checkbox"/> 02	<input type="checkbox"/> 03	<input type="checkbox"/> 04	<input type="checkbox"/> 05	<input type="checkbox"/> 06	<input type="checkbox"/> 07	<input type="checkbox"/> 08	<input type="checkbox"/> 09	<input type="checkbox"/> 10	
n. Can limit yourself to recommended servings of high-fat foods <u>when snacking</u> ?	<input type="checkbox"/> 01	<input type="checkbox"/> 02	<input type="checkbox"/> 03	<input type="checkbox"/> 04	<input type="checkbox"/> 05	<input type="checkbox"/> 06	<input type="checkbox"/> 07	<input type="checkbox"/> 08	<input type="checkbox"/> 09	<input type="checkbox"/> 10	

My Path to Healthy Life Satisfaction Survey

For each item, please check the box that best describes your feelings.

How easy was it to use the My Path website?	Very difficult to use <input type="checkbox"/> 1	Difficult to use <input type="checkbox"/> 2	Neutral <input type="checkbox"/> 3	Easy to use <input type="checkbox"/> 4	Very easy to use <input type="checkbox"/> 5	
How helpful was it to set goals and track your DEFs? (Doctor's Advice, Exercise, Food Choices)	Did not help at all <input type="checkbox"/> 1	Neutral <input type="checkbox"/> 2	Helped a little <input type="checkbox"/> 3	Helped quite a bit <input type="checkbox"/> 4	Helped a lot <input type="checkbox"/> 5	
How helpful was it to access your ABCs? (A1c, Blood Pressure, Cholesterol results)	Never used <input type="checkbox"/> 0	Did not help at all <input type="checkbox"/> 1	Neutral <input type="checkbox"/> 2	Helped a little <input type="checkbox"/> 3	Helped quite a bit <input type="checkbox"/> 4	Helped a lot <input type="checkbox"/> 5
How helpful was it to develop your own individualized Action Plans?	Never used <input type="checkbox"/> 0	Did not help at all <input type="checkbox"/> 1	Neutral <input type="checkbox"/> 2	Helped a little <input type="checkbox"/> 3	Helped quite a bit <input type="checkbox"/> 4	Helped a lot <input type="checkbox"/> 5
How helpful were the "Breaking the Chain" exercises?	Never used <input type="checkbox"/> 0	Did not help at all <input type="checkbox"/> 1	Neutral <input type="checkbox"/> 2	Helped a little <input type="checkbox"/> 3	Helped quite a bit <input type="checkbox"/> 4	Helped a lot <input type="checkbox"/> 5
How helpful was "Ask an Expert" on the website?	Never used <input type="checkbox"/> 0	Did not help at all <input type="checkbox"/> 1	Neutral <input type="checkbox"/> 2	Helped a little <input type="checkbox"/> 3	Helped quite a bit <input type="checkbox"/> 4	Helped a lot <input type="checkbox"/> 5
How helpful was "My Resources" on the website? (Recipes, exercise tips, doctor's advice, etc.)	Never used <input type="checkbox"/> 0	Did not help at all <input type="checkbox"/> 1	Neutral <input type="checkbox"/> 2	Helped a little <input type="checkbox"/> 3	Helped quite a bit <input type="checkbox"/> 4	Helped a lot <input type="checkbox"/> 5
How helpful were the automated phone calls from the program?	Did not help at all <input type="checkbox"/> 1	Neutral <input type="checkbox"/> 2	Helped a little <input type="checkbox"/> 3	Helped quite a bit <input type="checkbox"/> 4	Helped a lot <input type="checkbox"/> 5	
How many times did you visit your primary care doctor over the past 12 months?	0 <input type="checkbox"/> 0=(go to question 11)	1 <input type="checkbox"/> 1	2 <input type="checkbox"/> 2	3 <input type="checkbox"/> 3	4 or more <input type="checkbox"/> 4	
Over the past 12 months, in how much detail did you and your primary care doctors discuss the My Path program?	Did not discuss it at all <input type="checkbox"/> 1	Mentioned it, but did not discuss <input type="checkbox"/> 2	Discussed it BRIEFLY <input type="checkbox"/> 3	Discussed it in SOME detail <input type="checkbox"/> 4	Discussed it in GREAT detail <input type="checkbox"/> 5	

Over the past 12 months , to what extent did participating in the My Path to Healthy Life program improve the quality of care you received for your diabetes?	Not at all improved <input type="checkbox"/> 1	Slightly improved <input type="checkbox"/> 2	Moderately improved <input type="checkbox"/> 3	Quite improved <input type="checkbox"/> 4	Completely improved <input type="checkbox"/> 5	
How much did the My Path to Healthy Life program help you to manage your diabetes?	Did not help at all <input type="checkbox"/> 1	Neutral <input type="checkbox"/> 2	Helped a little <input type="checkbox"/> 3	Helped quite a bit <input type="checkbox"/> 4	Helped a lot <input type="checkbox"/> 5	
Over the past 12 months , have you used the Kaiser My Health Record website? (www.kaiserpermanente.org)	NO <input type="checkbox"/> 0	YES <input type="checkbox"/> 1				
Over the past 12 months , have you used any other website to help manage your diabetes?	NO <input type="checkbox"/> 0	YES <input type="checkbox"/> 1	If Yes, Please describe: _____ _____ _____			
Over the past 12 months , have you used any other website related to <u>healthy eating</u> or <u>exercise</u> ?	NO <input type="checkbox"/> 0	YES <input type="checkbox"/> 1	If Yes, Please describe: _____ _____ _____			
How many total hours per week do you use a computer, including surfing the internet?	1-2½ hours <input type="checkbox"/> 1	3-4½ hours <input type="checkbox"/> 2	5-6½ hours <input type="checkbox"/> 3	7-8½ hours <input type="checkbox"/> 4	9 or more hours <input type="checkbox"/> 5	Never, or less than 1 hour <input type="checkbox"/> 6

What, if anything, interfered with or prevented you from using the My Path website as often as you would have otherwise?

How can we improve the My Path to Healthy Life program?
(Please include comments about website, office visits, behavior chains, etc.)

- a. What did you like the **best** about the program?

- b. What did you like the **least** about the program?

- c. What could we change to improve the program?

Appendix B

Recruitment Phone Script

KAISER PERMANENTE OF COLORADO

My Path to Healthy Life Follow-Up Contact Script

Contact Protocol

A total of 5 attempts will be made to contact each participant, varying the time of day and days of the week, to maximize chance of reaching them. Messages should be left on the 1st and 4th attempts. Make sure there are 3 days between messages.

Message Script

Hello, this message is for *(Participant Name)*. This is *Jennifer Dickman* calling from the My Path to Healthy Life program that you participated in through Kaiser Permanente. I am calling to speak with you about participating in a follow up for this program. So we know of a better time to reach you, please call at (Phone) and leave your name, phone number, and a date and time that would be best to reach you.

Contact Script

Hello. Is Mr./Mrs./Ms *(Participant Name)* there?

- ☐ ₁ YES Continue
- ☐ ₂ NO Ask when would be a better time to reach them. Or if you have the Wrong number, apologize for disturbing them and terminate call.
If given a better time: Date:_____ Time:_____

If non-participant asks for additional information about study

"It is our policy not to give out further information but I would be happy to explain it to (participant)."

Hi, Mr./Mrs./Ms *(Participant Name)*. This is Jennifer Dickman, from Kaiser Permanente and I'm calling to follow up with you about the "My Path to Healthy Life" research project you participated in. This call will take about 5 minutes to complete, is now a good time to talk?

- ☐ ₁ YES Continue
- ☐ ₀ NO Ask "Would you like me to call back another time?"
 - ☐ ₁ YES Date:_____ Time:_____
 - ☐ ₀ NO If not interested, thank them and terminate call.

I am calling today to invite you to participate in a focus group related to the research project, My Path to Healthy Life. As you may remember, the My Path to Healthy Life research study involved an internet-based program for managing your diabetes. I am now currently working on my dissertation regarding this project. We would like to learn more about your experiences as a participant in the program for my dissertation and to improve future programming.

Does this sound like something you would like to join?

- ☐ ₁ YES Continue
☐ ₀ NO If not interested, thank them and terminate call.

Great! I would like to take a minute to briefly describe the focus group and how you would be involved. The group is a one-time small group meeting at a Kaiser Permanente clinic and will last about 90 minutes. During the group discussion we will review some of the results from the study. We will ask you about your experience in the program and for your ideas on how the program could be improved. The opinions you provide will be summarized and used to help us make improvements to My Path. To thank you for your time, you will receive a \$10.00 gift card for each meeting you attend.

Do you have any additional questions about the focus groups?

- ☐ ₁ YES Answer questions
☐ ₀ NO Continue

FAQ for more information

Do I have to participate?

No. Participation in a focus group is completely voluntary.

How will my information be used/ will my answers be protected?

The answers provided in the discussion are strictly confidential. Everyone's answers will be combined for analysis and reporting on a group level. You will be free to refuse to answer any questions that are asked.

Who is conducting the focus group?

The discussion groups will be conducted by Kaiser Permanente Colorado's research department.

Now, given this information about the focus group, would you be interested in participating?

- ☐ ₁ YES Continue
☐ ₀ NO If not interested, thank them and terminate call

Do you have a pen or pencil to write down the information you will need to attend a focus group?

We are holding focus groups:

on _____ (day of week), _____ (date) at _____ (time) at _____ clinic
OR
on _____ (day of week), _____ (date) at _____ (time) at _____ clinic
OR
on _____ (day of week), _____ (date) at _____ (time) at _____ clinic.
OR
on _____ (day of week), _____ (date) at _____ (time) at _____ clinic.
OR
on _____ (day of week), _____ (date) at _____ (time) at _____ clinic.

It will be held in _____ (name of room) at the _____
clinic. The _____ clinic is located at _____ (address). This
clinic may be different than your regular clinic.

As the date of the focus group approaches, if you are unable to attend the focus group,
or have other questions, please call me, at 303-614-1219. I will call you the day before to
confirm.

Thank for signing up to participate. Have a nice day/evening.

Appendix C

Focus Group Consent Form

KAISER PERMANENTE OF COLORADO

CONSENT TO PARTICIPATE IN A MEDICAL RESEARCH STUDY (To be read aloud before each focus group)

You have been invited here today to participate in a group discussion related to the research project, My Path to Healthy Life. The My Path to Healthy Life research study is funded by the National Institute of Health (NIH) and involved an internet-based program for managing your diabetes. We are asking you to participate in this follow-up session because you are at least 60 years of age and your experiences as a participant in the My Path to Healthy Life study are essential for the improvement of future programming. The information we are collecting will also contribute to my dissertation entitled, Web-based Chronic Disease Self-Management among Older Adults. You will be one of the approximately 50 people participating in small groups to help guide future My Path programming.

The purpose of today's session is to learn more about your experience in the My Path program and to understand your perceptions related to the results we found related to aging and outcomes. By reviewing some of our findings and getting your opinions about them will help us to design internet-based programs that will be useful to supporting a healthy lifestyle across all age groups.

Today we will spend about 90 minutes and will show you some of the results from the study related to the characteristics of people who participated, how often the program was used, what the outcomes were and how satisfied people were with the program. We will ask for your opinion on what your experience was and ideas on how the program could be improved. For attending, you will receive a \$10.00 gift card.

We are asking you to give us your ideas and opinions only—there are no right or wrong answers to any of the questions or discussion topics. The statements you make will not be connected to you as an individual, so only those of us participating today will know how you answered. We will be audio taping today's meeting to make sure we accurately capture all of the ideas expressed. Our notes and the information you provide will be kept confidential. We will only report summarized results, so your identity will be unknown.

Participating in this focus group is voluntary and you may decide to stop participating at any time. Your ideas and opinions will be valuable to the findings of my dissertation and the improvement of the My Path to Healthy Life program.

If you have any questions, please ask me. If you have any questions later, I will be happy to answer them. You can reach me at 303-614-1219. Additional contact information is listed below.

Study-related questions or non-urgent problems:

Jennifer Dickman, Project Coordinator
Kaiser Permanente Colorado Institute for Health Research
10065 E. Harvard Ave. Denver, CO 80237
303-614-1219, Jennifer.m.dickman@kp.org

Debra Ritzwoller, PhD, Study Principal Investigator
Kaiser Permanente Colorado Institute for Health Research
10065 E. Harvard Ave. Denver, CO 80237
303-614-1317, debra.ritzwoller@kp.org

Medical Questions or Emergencies

Kaiser emergency number: 303-338-4545 (or 911)

Kaiser Permanente of Colorado Institutional Review Board

P.O. Box 378066, Denver, CO. 80237
303-614-1309

Your signature indicates that you have read the information provided above and have decided to participate. Your signature also indicates that you have given permission to be audiotape recorded during the sessions. I have been provided a copy of this form.

Signature of Participant

Date

Name of Participant (printed)

Signature of Person Obtaining Consent

Date

Thank you so much for your participation!

Appendix D

Focus Group Script



Welcome & Introductions

Welcome everyone to the group and thank them for participation. Instruct participants on where the bathrooms are located and the food/beverage available to them.

Purpose & Timeline

Purpose: The purpose of today's focus group is discuss your experiences and opinions about web-based self-management interventions. Specifically, I am interested in learning about what your experience was like when you participated in the My Path program and to learn more about your opinions regarding self-management, technology, and changes related to getting older.

Timeline: We'll spend the first few minutes reviewing the informed consent and I can answer any questions you may have. After, we will begin our discussion. Throughout our conversation I will present some results from the My Path program. I will also ask you to discuss your thoughts and opinions about the results presented. At the end of the group, I will ask for any final thoughts and hand out the gift cards as a thank you for coming today.

Informed Consent

See Consent

Start audio recording

Explain to the Group

- Need to stimulate ideas about what you experience and have experienced
- Need to hear from everyone in study groups. If you feel more comfortable writing your idea down, please do. I will collect feedback at the end.
- There are no correct answers - only your opinion
- I am going to concentrate on what you say, but I also will be taking notes
- Only one person talking at a time; I might miss something important
- It's not what I think that's important, but rather the purpose of the group is that what you feel is important

- Don't feel bad if you don't know much about some of the things that we talk about.
- If your view is different than the rest of the group, make sure you tell me about that, since there are different ways of looking at the same thing.
- Agree only if you think it is appropriate to do so.

Are there Any Questions?

Introduction

Let's go around the room and introduce ourselves. As we go around the room, can you also tell the group in general what you thought about the My Path program?

(Use In General Table; Slide 2)

MY PATH		
In General	YES	NO

Now that we know a bit more about each other and how we felt about the program, how many of you - raise your hands - would change the program if you could?

(Tally in Yes/No Table; double click Slide 2)

Why?

Why not?

With this in mind we will spend the rest of our time exploring how we can improve web-based self-management specifically for older adults.

Context

Let's start at the beginning.

Display participant characteristics summary; Slide 3

AT THE START

- In general
 - 463 people participated in the study
 - People were on average 58.4 years of age
- Older adults were more likely to refuse study because they were not interested or they did not have internet
- Older Participants
 - Had lower Incomes
 - More likely to be married or widowed
 - Healthier (physically & mentally) than younger participants
 - Had better eating and medication taking habits
 - Used a computer less frequently

How many of you have tried a new technology (computer, mobile/smart phone, application, tablet, mp3 player, TV/Blue Ray etc.) within the last year or so? Let's talk about this experience. (Use Like/Challenges Table; Slide 4)

NEW TECHNOLOGY	
Likes	Challenges



What did you like about the new technology?

What challenges did you experience?

Are there times that you choose not to use a new technology? Can you describe these times?

ADDITIONAL:

- According to this, older adults that we contacted were more often not interested in participating and lacked access to the internet. How do you feel about this?
- Even those who could/wanted to participate used their computers less often. Why do think older participants spent less time on the computer?

Participation-Engagement

Now that we have talked about your experience a bit, let's discuss what helps you engage in technology and self-management; Slide 5.

Show enrollment, web-site utilization, retention self-management process results; Slide 6

PARTICIPATING IN TECHNOLOGY & SELF-MANAGING DIABETES

- Older participants used the website just as much as younger participants, and were more likely to complete the program
 - However those who did not complete the study said:
 - They were no longer interested
 - Program was too burdensome
- Older participants demonstrated higher confidence levels in their ability to self-manage their diabetes
- Older participants were more successful in medication taking but less successful in meeting exercise goal

Technology Processes (Complete Technology Grid; Slide 7)

WHAT HELPS YOU?

	Log In	Use Website	Set Goals on Site	Enter Progress	Check Labs	Use New Tools
My Path						
Add						

With these results in mind, I would now like to ask you a few questions about using websites to help manage your health. In general, do you think technology can help you manage your diabetes?

For My Path, was there anything (features or tools) that helped you log in? Track you goals? Check in on your A1c, blood pressure, and cholesterol readings? Use new tools?

Is there something that would help you log-in more often? Use the web-site more often? Help you set goals and track them often? Encourage you to try new tools?

Self-Management Processes (Complete SM Grid; Slide 8)

Let's also talk about managing your health. In general, as we get older what helps you to manage your diabetes?

WHAT HELPS YOU?					
	Feel Confident	Set & Meet GOALS	Make Healthy Decisions	Plan & Take Action	Use Social Resources
My Path					
Add					

When you were in My Path, was there anything that helped you feel more confident in managing your health? What helps you feel more confident?

Regarding goals, were you able to make goals and accomplish goals that were important to you? What choice/options of goals would you want available to you?

Were you able to use the program to support activities (like healthy decision making, planning, taking action, or using social resources) that were important to you? What helps you maintain healthy decision making, planning, taking action, or using social resources?

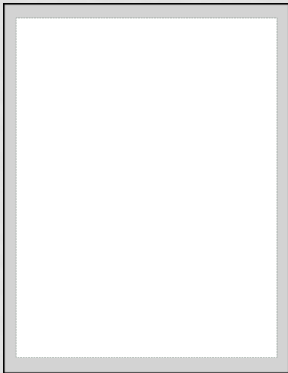
ADDITIONAL:

- Do you feel that you were aware of all the options available to you?
- Did the program restrict you in anyway?

Outcomes

Let's talk about overall results of the study; Slide 9. On the piece of paper, write down the top 3-5 things you hoped to get out of the My Path program. What results are important to you?

Now that you have these written down, let's talk as a group to come up with a list of results that are important to you. (Complete List in White Box; Slide 10)



At the End

- Biological Health
- Social & Mental Health
- Behaviors
 - Diet & Exercise
 - Medication taking
- Older Participants
 - Supportive resources
 - Medication taking

So, when thinking about overall results, things like changes in BMI, A1c, blood pressure, or even things like exercise and diet, do you think older participants had positive results?

Why do you think this?

Show outcome results; double click Slide 10

ADDITIONAL:

- Do you feel that these results are personally relevant to you? Do you care about these?
- How should we measure the success of My Path and programs like it?
- Do you think it's important to look at maintenance of these outcomes?

Closing

As for any closing thoughts and thank participants for their time.

Distribute the gift cards.

Appendix E

Phase	Element	Component	Descriptor	Code	Example
Context (Ryan & Sawin, 2009)	Persuasion Context (Oinas-Kukkonen & Harjumaa, 2009)	User Context	User's pre-existing attitudes about technology	Context_UserPositive	Participant likes technology because...
				Context_UserNegative	Participant does not like technology because...
		Technology Context	Features of the technological application.	Context_TechFeaturesPositive	Participant likes a specific application on their phone
				Context_TechFeaturesNegative	Participant dislikes aspects of their new computer
			Requirements of the technological application.	Context_TechReqPositive	Participant likes that their computer runs faster because it uses high speed internet rather than dial up
				Context_TechReqNegative	Participant dislikes that their computer requires a password to log on
Process Web-Based Self-Management (Ryan & Sawin, 2009; Glasgow, 2011)	SOC (Baltes, 1999)	Selection	Narrowing the use of technology	PSOC_Selection	Participant only uses the computer to play card games
		Optimization	Spending more time using technology to achieve desired levels of functioning	PSOC_Optimization	Participant gets really good at playing solitaire on the computer
		Compensation	Making up for loss to maintain desired levels of functioning	PSOC_Compensation	Participant plays against the computer at bridge, because his/her partner moved away
	PSD-Primary Task (Oinas-Kukkonen & Harjumaa, 2009)	Reduction	Reducing complex behavior into simple tasks to help user perform the behavior	PPrimaryTask_Reduction	Smoking cessation website provides an interactive test that measures how much money a user will save by quitting
		Tunneling	Guiding users through a process or experience	PPrimaryTask_Tunneling	Smoking cessation site offers information about treatment

					opportunities after the user has taken an interactive test about how addicted he/she is to tobacco
		Tailoring	Targeting information at potential needs, interests, personality, usage context, other factors relevant to a user group.	PPrimaryTask _Tailoring	Personal trainer website provides different information content for different user groups—beginners and experts
		Personalization	Offering personalized content or services	PPrimaryTask _Personalization	Statements most relevant to user presented first on website instead of generic or random order
		Self-Monitoring	Keeping track of one's own performance or status	PPrimaryTask _Self-Monitoring	Heart rate monitor presents users heart rate during exercise
		Simulation	Providing simulations to enable users to observe immediately the link between cause and effect regarding user's behavior	PPrimaryTask _Simulation	Before and after pictures of people who have lost weight
		Rehearsal	Providing means to rehearse a behavior to enable user to change their attitudes or behavior	PPrimaryTask _Rehearsal	A restaurant simulator to help people practice healthy ordering skills
	PSD-Dialogue Support (Oinas-Kukkonen & Harjumaa, 2009)	Praise	Using praise via words, images, symbols or sounds to provide feedback on users behaviors	PDialogue _Praise	Sending text messages to user when reaching individual goals
		Rewards	Offering virtual rewards to give credit	PDialogue _Rewards	Modifying site background, sounds and images according

			for performing behaviors		to user's performance
		Reminders	Using reminders to remind user of their behaviors	PDialogue _Reminders	Sending test messages to users daily to take medication
		Suggestions	Offering fitting suggestions for user to carry out behavior	PDialogue _Suggestions	Program for healthy eating that suggest eating fruits instead of candy for snacks
		Similarity	System reminds user of themselves	PDialogue _Similarity	Using language or music to motivate users; use of slang words or pop-music for teenagers
		Liking	Visually attractive system that is appealing to users	PDialogue _Liking	Using colors, fonts, pictures and images that are attractive to users
		Social Role	Integrating a social role	PDialogue _SocialRole	Program has a virtual specialist to support communication between users
	PSD- Credibility Support (Oinas- Kukkonen & Harjumaa, 2009)	Trustworthiness	Providing information that is truthful and unbiased	PCredibility _Trustworthiness	Providing information about medications, rather than biased marketing to sell medication
		Expertise	Providing information demonstrating knowledge, experience, and competence	PCredibility _Expertise	Using up to date information from experts (Doctors, specialists)
		Credibility	Providing a reliable look	PCredibility _Credibility	Excluding advertisements
		Real-World Feel	Highlighting information about the organization and actual people	PCredibility _RealWorldFeel	Options to contact specific people in the company
		Authority	Refers to people in a role of authority	PCredibility _Authority	Citing CDC (government) quotes or statistics
		Third Party Endorsement	Including endorsements from well-known and	PCredibility _ThirdPartyEndorsement	Logoed pop up assuring secure connects

			respected sources		
		Verifiability	Providing a means to verify the accuracy of the site contents	PCredibility_Verifiability	Links to other website supporting content
	PSD-Social Support (Oinas-Kukkonen & Harjumaa, 2009)	Social Learning	Providing means to observe others who are performing target behaviors and to see the outcomes of their behaviors	PSocial_SocialLearning	Sharing examples of fitness routines that worked for individual to encourage physical activity of others
		Social Comparison	Providing means for comparing performance with others	PSocial_SocialComparison	Share and compare recipe ideas via instant messenger
		Normative Influence	Leveraging peer pressure	PSocial_NormativeInfluence	Smoking cessation application shows pictures of newborn babies with health issues due to mother's smoking
		Social Facilitation	Providing a means for people to feel that others are performing the behavior along with them	PSocial_SocialFacilitation	Feature showing how many people tracked their goals at the same time as them
		Cooperation	Providing means for people to cooperate with others	PSocial_Cooperation	Program that collects individual weight data, sends to a central server to analyzed at group level for participants to work as a team
		Competition	Providing means for people to compete with others	PSocial_Competition	Online competition to lose the most weight, loose and win a prize
		Recognition	Providing public recognition for users who perform target behavior	PSocial_Recognition	Names of awarded people are published on site; personal success stories published on site

Proximal Outcomes (Ryan & Sawin, 2009)	SOC (Baltes, 1999)	Maximization of objective and subjective SM behaviors	Maximization of intervention intended universal SM behaviors	Outcome_MaxObjectiveGains	Participant wants to meet doctors SM expectations
			Maximization of SM behaviors specific to individual, personal conditions	Outcome_MaxSubjectiveGains	Participant wants to improve exercise based their current abilities (knee issues; hip replacement)
		Minimization of objective and subjective SM behavior losses	Minimization of disease related losses	Outcome_Min_Loss	Participant wants to reduce the negative effects of diabetes
		Attainment of subjective SM goals	Attainment of individual, personal SM goals	Outcome_AttainGoal	Instead of meeting exercise standards, participants wants to walk more often
Distal Outcomes (Ryan & Sawin, 2009)	Outcomes (Ryan & Sawin, 2009)	Health Status	Indicator of the disease trajectory as a desired outcome	Outcome_Health Status	Participant wants to improve indicator of health: BMI, Blood pressure, lipids, A1c
		Quality of Life	perceived quality of life and wellbeing as a desired outcome	Outcome_QoL	Participant wants to improve indicator in addition to health measures:
	SOC (Baltes, 1999)	Maintain of Function	Desire to maintain current levels of function as an outcome	Outcome_Maintain Function	Participant doesn't want to improve health, but continue to control diabetes as they are currently
No Code					