ABSTRACT

KENNEDY, STEPHEN DONALD. The TechnoWellness Inventory (TWI): Development of an Instrument to Assess a New Wellness Construct. (Under the direction of Dr. Stanley B. Baker).

The goal of this study was to operationalize a new construct named TechnoWellness by creating an assessment instrument called the TechnoWellness Inventory (TWI). It was hypothesized that TWI scores would predict scores on the Five Factor Wellness Inventory (5F-Wel-A) and that both instruments would share an equivalent factor structure. After being reviewed by a panel of experts and pilot tested, the TWI was administered to a sample of 312 participants. Although an exploratory factor analysis did not identify the expected factors, five different factors were identified and used to create the TWI Leisure Scale, the TWI Technostress Scale, the TWI Physical Scale, the TWI Excess Use Scale, and the TWI Vocational Scale. The TWI and its five scales were found to have high internal consistency reliability. Regression analyses indicated that TWI Total TechnoWellness scores predicted 5F-Wel-A Total Wellness scores, TWI Physical Wellness scores predicted 5F-Wel-A Physical Self scores, and three TWI scales predicted 5F-Wel-A Total Wellness scores. Data therefore offered strong evidence of a relationship between TechnoWellness and holistic wellness. TWI items that seemed problematic were revised or deleted, and a revised version of the instrument was created. The study supported the TWI’s reliability and construct validity, but additional research will be needed to further develop the psychometric properties of the TWI.
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The TechnoWellness Inventory (TWI): Development of an Instrument to Assess a New Wellness Construct

by

Stephen Donald Kennedy

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2014

APPROVED BY:

Stanley B. Baker
Committee Chair

________________________________________________________________________________________

Edwin R. Gerler, Jr.

Helen S. Lupton-Smith

________________________________________________________________________________________

Tamara V. Young
Stephen Kennedy is from Chapel Hill, North Carolina. He earned a bachelor’s degree in psychology with a minor in education from Haverford College in Haverford, Pennsylvania. After returning to North Carolina and receiving his master’s degree in school counseling from the University of North Carolina at Greensboro, Stephen worked as a counselor at Northeast Guilford High School for three years. He received Chi Sigma Iota International’s Outstanding Practitioner Award in 2010 and the UNCG Department of Counseling and Educational Development's Distinguished Practitioner Award in 2011. He has been enrolled in the doctoral program in Counseling and Counselor Education at North Carolina State University since 2011.

After spending three years as the Social Networking Consultant for the Chi Sigma Iota Counseling Academic & Professional Honor Society International (CSI), Stephen became CSI’s Project Director in 2013. In that role, his responsibilities include supervising CSI's webinar program, coordinating volunteer opportunities, and working with chapter leaders as they develop chapter groups and social networking websites. For three years, he also chaired CSI's Professional Member Committee. Stephen is transitioning into a full time position as CSI’s Director of Member Services.

Stephen was President of CSI’s Nu Sigma Chi chapter at North Carolina State University during the 2012-2013 school year. He has served on the board of the North Carolina School Counselor Association as Chair of the Government Relations Committee for four years, and he also volunteers as the association's Virtual Training Coordinator. Stephen
has led presentations on the relationship between technology use and wellness, using technology as a school counselor, career development, and professional advocacy at national and state counseling conferences including the American Counseling Association’s Conference & Expo and the American School Counselor Association’s Annual Conference.

Stephen is a youth advisor and Sunday School teacher at University Presbyterian Church in Chapel Hill, and he also volunteers for Sibshops, a monthly program for children who have siblings with disabilities.
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CHAPTER 1

INTRODUCTION

Widespread use of technology in many parts of the world has prompted researchers to examine its effect on human wellness. Some studies have presented evidence that technology use can enhance wellness by strengthening social connections (Valkenburg & Peter, 2007), encouraging positive emotions (Riva, Baños, Botella, Wiederhold, & Gaggioli, 2012), and improving physical health (Spring et al., 2013). Adverse effects of technology use have been addressed in studies of technology-related anxiety (Brosnan et al., 2012; Thorpe & Brosnan, 2007), technostress (Ayyagari, Grover, & Purvis, 2011; Tu, Wang, & Shu, 2005), technophobia (Rosen, Sears, & Weil, 1993), and addiction to technology (Byun et al., 2009; Young & Abreu, 2011). Nevertheless, in spite of extensive evidence that interactions with technology can affect social, mental, emotional, and physical well-being in both positive and negative ways, researchers within the counseling profession have published surprisingly few articles about the relationship between technology use and wellness.

This chapter summarizes the history of wellness counseling and the emergence of models that identify factors that contribute to holistic wellness. Technology is subsequently identified as a factor that has been extensively researched in other fields but has not been considered in previous wellness models used in the counseling profession. TechnoWellness is introduced as a new construct. A statement of the problem that the study will address is presented, and the purpose of the study is described. Research questions are presented and relevant terms that will be used throughout the dissertation are defined.
Wellness

Myers, Sweeney, and Witmer (2000) described wellness as “a way of life oriented toward optimal health and well-being, in which body, mind, and spirit are integrated by the individual to live life more fully within the human and natural community” (p. 252). Although analysis of the construct continues (Granello, 2011), there is usually consensus that wellness is a positive state, not merely absence of illness, that it exists on a continuum, and that it is a multidimensional and synergistic construct (Roscoe, 2009). Since the late 20th century, wellness has been regarded as the overarching paradigm of counseling (Myers, 1992; Myers & Sweeney, 2008b).

By providing “wellness counseling” to encourage wellness, many professional counselors provide an alternative to the traditional medical model that treats mental and physical illnesses and instead offer an approach that focuses on prevention and early intervention (Myers et al., 2000). Myers and Sweeney (2005a) pointed out, however, that many early wellness models such as Dunn’s High-Level Wellness (1961), Ardell’s Components of Wellness (1977), Hettler’s Hexagon (1980, 1984), and Travis and Ryan’s Illness/Wellness Continuum (1981, 1988) were based on the medical model. In the early years of wellness counseling, professional counselors also lacked instruments that could reliably assess clients’ wellness. Palombi (1992) observed that early wellness inventories such as the Wellness Inventory (WI; Travis, 1981), the Wellness Inventory of the Lifestyle Assessment Questionnaire (LAQ; National Wellness Institute, 1983), and the Lifestyle
Coping Inventory (LCI; Hinds, 1983) did not provide manuals that established the instruments’ reliability and validity.

To help professional counselors encourage wellness among their clients, researchers within the counseling profession developed new assessments and models that focus on wellness. Witmer and Sweeney (1992) proposed that holistic wellness could be operationalized using a theoretical model known as the Wheel of Wellness. The model identified spirituality, self-regulation, work, friendship, and love as five major life tasks and depicted the tasks as spokes on a wheel to show their interconnected nature. To facilitate assessment of clients’ wellness, Myers, Sweeney, and Witmer (1996) developed the Wellness Evaluation of Lifestyle (WEL), an instrument that assessed an individual’s wellness across all dimensions proposed by the Wheel of Wellness model. Hattie, Myers, and Sweeney (2004) used WEL scores from 3,043 people to conduct an exploratory factor analysis and refine the Wheel of Wellness model.

A revised Wheel of Wellness model presented by Myers et al. (2000) still included five major life tasks: spirituality, self-regulation, work and leisure, friendship, and love. While these tasks were similar to the ones proposed in Sweeney and Witmer’s (1991) original model, self-regulation was renamed self-direction and the work task was changed to work and leisure. The factor analysis conducted by Hattie et al. (2004) also identified 12 subtasks that influence wellness both positively and negatively, so these were added to the revised model (Myers et al., 2000). Seven subsequent studies used either factor analysis or structural analysis to evaluate the psychometric properties of the WEL (Myers & Sweeney,
While these studies supported the reliability and validity of the WEL, Myers and Sweeney found that the data did not support the proposed structure of the Wheel of Wellness. Since empirical research on the WEL indicated inaccuracies in the Wheel of Wellness model, Myers and Sweeney (2005c) revised the factor structure and created the IS-Wel. The IS-Wel proposed one higher-order factor, known as the Indivisible Self. The 17 factors originally identified in the Wheel of Wellness model were classified as third-order factors organized within five second-order factors: the Creative Self, the Coping Self, the Social Self, the Essential Self, and the Physical Self (Myers & Sweeney, 2005c). The IS-Wel also proposed that the first-order, second-order, and third-order factors all operate within Local, Institutional, Global, and Chronometrical contexts. Myers and Sweeney provided empirical support for the factor structure of the IS-Wel but acknowledged that the role of the contexts was still theoretical since their research did not address that component of the model. The new data were also used to modify the WEL and produce a new instrument known as the Five Factor Wellness Inventory (5F-Wel; Myers & Sweeney, 2005b). Sweeney and Myers (2005) recommended that professional counselors use both an evidence-based model such as the IS-Wel and an assessment such as the 5F-Wel when they work with clients to develop personal wellness plans that will improve each client’s health and well-being. Extensive summaries of the Wheel of Wellness and the IS-Wel models are presented in Chapter 2.

Technology

Technology’s ubiquitous presence in many parts of the world has led to extensive research on the health and well-being of people who use technology. This subject has
received particular attention in the psychology profession (Brosnan et al., 2012; Erickson & Johnson, 2011; McKenna & Bargh, 1998; McKenna & West, 2007; Mitchell, Becker-Beleave, & Finkelhor, 2005; Morahan-Martin & Schumacher, 2003; Obst & Stafurik, 2010; Rosen et al., 1993; Siddiquee & Kagan, 2006; Walsh, White, & Young, 2008; Wang, Luo, Luo, Gao, & Kong, 2012; Winett, Tate, Anderson, Wojcik, & Winett, 2005). These researchers and others have explored possible effects of technology use on psychological well-being, spiritual life, identity, social support, lifestyle, health, loneliness, anxiety, and problematic behaviors, including addiction. Their findings suggested that it is possible to have both positive and detrimental interactions with technology.

Similar research on how technology use might affect individuals has also been conducted in diverse fields such as business and management (Agarwal & Karahanna, 2000; Ayyagari, Grover, & Purvis, 2011; Douglas et al., 2008; Wang, Ngai, & Wei, 2012), communication (Caplan, 2007; Elias & Lemish, 2009; Liu & LaRose, 2008; Park & Lee, 2012; Valkenburg & Peter, 2007), computer science (Anthony, Clarke, & Anderson, 2000; Bessière, Newhagen, Robinson, & Shneiderman, 2006; Riedl, Kindermann, Auinger, & Javor, 2012; Wastell & Newman, 1996), education (Arigbababu, 2009; Celik & Yesilyurt, 2012; Chen, 2012; Reich, Subrahmanyam, & Espinoza, 2012; Yang & Wu, 2012), psychiatry (King et al., 2013; Shapira et al., 2003), and sociology (Cotton, Ford, Ford, & Hale, 2012; Sautter, Tippett, & Morgan, 2010). The interdisciplinary interest in this topic suggests widespread recognition of possible correlations between technology use and wellness. As new technologies continue to be introduced and used across different settings such as home,
work, and school, researchers have acknowledged the importance of considering its impact. Furthermore, a theme that has emerged across these studies is that interactions with technology are associated with adverse reactions in some cases and with measurable benefits in others.

The worldwide expansion of technology use is reflected in the number of researchers who have examined the health and well-being of technology users from different cultures. In addition to conducting studies in the United States, researchers have examined this topic in Austria (Riedl et al., 2012), Australia (Obst & Stafurik, 2010; Walsh et al., 2008), Brazil (King et al., 2013), Canada (Erickson & Johnson, 2011; Lewis et al., 2012), China (Wang, Luo, et al., 2012; Wang, Ngai, & Wei, 2012), Israel (Boniel-Nissim & Barak, 2011; Elias & Lemish, 2009), the Netherlands (Valkenburg & Peter, 2007), New Zealand (Koopman-Boyden & Reid, 2009), Nigeria (Arigbababu, 2009), Singapore (Lim, 2011), South Africa (Anthony et al., 2000), South Korea (Park & Lee, 2012), Taiwan (Chang, Jong, & Huang, 2012; Chen, 2012; Ku, Chu, & Tseng, 2013; Yang & Wu, 2012), Turkey (Celik & Yesilyurt, 2012; Coklar & Sahin, 2011; Jenaro et al., 2007), and the United Kingdom (Al-Fudail & Mellar, 2008; Brosnan et al., 2012; Madell & Muncer, 2007; Siddiquee & Kagan, 2006; Wastell & Newman, 1996). Global attention to the relationship between humans’ technology use and their health and well-being could indicate that this issue is relevant across cultures.

Computer-based technologies have been the focus of some studies that examine users’ responses to technology. Researchers have published data on the health and well-being of people who use personal computers (Bessière et al., 2006; King et al., 2013; Rosen
et al., 1993) and tablet computers (Lim, 2011). Other studies have included participants who use mobile phones (Madell & Muncer, 2007; Walsh, White, & Young, 2008), smartphones (Park & Lee, 2012; Fox & Duggan, 2012), and personal digital assistants (Spring et al., 2013). Data from these studies have suggested that there is a relationship between dimensions of wellness and interactions with popular computer-based and communication technologies.

As frequent use of some digital information and communication technologies has increased, researchers have focused on participants’ online activities. Many researchers examining the health or well-being of people who interact with technology have addressed use of the Internet (Agarwal & Karahanna, 2000; Bekele, 2010; Brosnan et al., 2012; Caplan, 2007; Chang et al., 2012; Douglas et al., 2008; Elias & Lemish, 2009; Erickson & Johnson, 2011; Liu & LaRose, 2008; Mitchell et al., 2005; Morahan-Martin & Schumacher, 2003; Rainie, 2011; Siddiquee & Kagan, 2006; Wang, Luo, et al., 2012; Winett et al., 2005). Topics explored include possible relationships between Internet use and cognitive absorption, motivation, social anxiety, vulnerability, learning, identity, psychological well-being, satisfaction, problematic behaviors, diversion, identity, lifestyle, and health.

Other researchers have focused on specific types of activities that are conducted over the Internet. Several authors have examined use of social networking websites where users create a profile and link it to the profiles of other users who share a connection (Horrigan, 2006; Ku et al., 2013; Obst & Stafurik, 2010; Reich et al., 2012; Steinfield, Ellison, & Lampe, 2008; Sautter et al., 2010). Research on additional online activities such as email
(Cotton et al., 2012; Faghri et al., 2008; Koopman-Boyden & Reid, 2009; Ku et al., 2013),
blogging (Boniel-Nissim & Barak, 2011), online discussion forums (McKenna & West,
2007), chat rooms (Mileham, 2007; Valkenburg & Peter, 2007), and digital storytelling
(Yang & Wu, 2012) has also been conducted. A substantial amount of data on the
relationship between digital information and communication technologies and individuals’
health and well-being has therefore been collected. In some cases, people using technology
have reported adverse effects such as anxiety, stress, frustration, and excessive use.
However, other users have described benefits such as enjoyment, sense of control,
satisfaction, well-being, and social connectivity.

**TechnoWellness**

While the IS-Wel developed by Myers and Sweeney (2005c) is evidence-based and
describes a large number of factors that affect wellness, it does not consider the role of
technology use. Findings from numerous studies conducted outside of the counseling
profession, which are described in Chapter 2, have nevertheless suggested that some
interactions with technology can affect health and well-being in a positive way while others
can have negative effects on users. The evidence collected in the literature review led to
hypothesizing that it is possible to interact with technology in ways that enhance wellness
and to avoid interactions that detract from wellness. **TechnoWellness** is presented herein as
a new construct in which a person optimizes interactions with technology in ways that
contribute to holistic wellness.
Statement of the Problem

Wellness models encourage professional counselors to identify factors that influence their clients’ wellness and to help clients develop plans to enhance wellness, but prominent models such as the Wheel of Wellness and the IS-Wel do not identify technology use among the factors that influence wellness. Furthermore, a review of counseling literature reveals a limited number of articles on the effects of technology use in spite of the attention that this topic has received in other disciplines. Technological competency for professional counselors has been encouraged (ACA, 2005; Casey, 2000); individuals’ attitudes toward technology have been explored (Campbell & Dobson, 1987; Carlson, Portman, & Bartlett, 2006); and problematic use of technology has been addressed (Jones & Minatrea, 2000; Lehmann & Konstam, 2011). However, in spite of extensive evidence that technology use can have both adverse and beneficial effects, no studies have addressed the relationship between a person’s technology use and holistic wellness.

Introducing a new construct, TechnoWellness, to supplement the existing wellness models would enable professional counselors to consider the relationship between clients’ technology use and wellness. According to research findings in other fields, many people are interacting with technology in both beneficial and harmful ways. By examining the relationship between TechnoWellness and wellness factors identified by the empirically supported IS-Wel, professional counselors and those in similar fields may better understand the ways that technology in various forms can impact wellness. If the present study indicates that interactions with technology have a relationship with certain IS-Wel factors, such as
suggesting that technology use has significant correlations with the Physical Self and the Social Self, professional counselors will be better prepared to counsel clients who are not using technology in an optimal way. Another concern is that professional counselors currently have no instrument that can be used to assess TechnoWellness. This study therefore provides the first step in designing a TechnoWellness Inventory (TWI) that, with further testing in subsequent studies, could be developed into a formal assessment instrument.

**Purpose of the Study**

The purpose of the study is to operationalize the TechnoWellness construct by creating the TWI and administering it to a sample of participants. Scores on the TWI were used in an exploratory factor analysis to indicate whether TechnoWellness includes the Coping, Creative, Essential, Physical, and Social factors identified in the IS-Wel (Myers & Sweeney, 2005c). The results of the exploratory factor analysis enabled TWI scales to be created. The internal consistency reliability of the TWI was then tested using Cronbach’s alphas. Participants also completed the 5F-Wel-A instrument (Myers & Sweeney, 2008a) so that measures of TechnoWellness and holistic wellness could be compared using linear regression. TWI and 5F-Wel-A scales measuring equivalent factors were also compared. Multiple regression was then used to evaluate whether scores on the TWI scales predict holistic wellness as measured by the 5F-Wel-A. Results from the present study provided initial measures of the TWI’s reliability and construct validity, thereby allowing the instrument to be modified. In a future study, a confirmatory factor analysis will be used to
further validate the TWI and develop a formal instrument that professional counselors can use to assess clients’ TechnoWellness.

**Research Questions**

In the present study, one primary research question was examined and six secondary research questions were considered.

**Primary Research Question:** Is there a relationship between individuals’ TechnoWellness and their holistic wellness?

It was hypothesized that a relationship between TechnoWellness and holistic wellness does exist. To facilitate exploration of the Primary Research Question, six secondary research questions were considered. Secondary Research Question 1 was used to explore whether TechnoWellness includes the same factors as the IS-Wel model of holistic wellness, thereby allowing comparisons between equivalent factors in both constructs. In the analysis of Secondary Research Question 2, the internal consistency reliability of the TWI was considered. The third, fourth, and fifth secondary research questions were used to evaluate the relationships between scores on an instrument that measures TechnoWellness (TWI) and an instrument that measures holistic wellness (5F-Wel-A). Finally, revisions to the TWI were considered via Secondary Research Question 6. Cumulatively, exploration of these questions was designed to provide a basis for future studies that can support the TWI’s use as an assessment instrument for TechnoWellness while establishing the hypothesized relationship between TechnoWellness and holistic wellness.
Secondary Research Question 1: Does the TechnoWellness construct include the five factors identified in the Indivisible Self Model of Wellness (IS-Wel): Coping, Creative, Essential, Physical, and Social factors?

Secondary Research Question 2: Is the new instrument used to assess TechnoWellness a reliable measure of the construct?

Secondary Research Question 3: Are participants’ Total TechnoWellness scores on the TWI significantly correlated with their Total Wellness scores as measured by the 5F-Wel-A, thereby suggesting a relationship between TechnoWellness and holistic wellness?

Secondary Research Question 4: In cases where the TWI and 5F-Wel-A include equivalent factors, are there significant correlations between scale scores on the TWI and 5F-Wel?

Secondary Research Question 5: Do any TWI scales predict Total Wellness scores on the 5F-Wel-A, thereby indicating a relationship between a TechnoWellness factor and holistic wellness?

Secondary Research Question 6: To refine the TWI, which of its items should be revised, deleted, or moved to a different scale?

Definition of Terms

Since this study incorporates models that are intended to be used in the counseling profession, a definition of professional counseling is provided. A definition of technology is also proposed since that term is used broadly to describe many different types of tools, and only certain technologies that many people use on a daily basis will be considered in this
study. The study examined the relationship between wellness and TechnoWellness, so both of those constructs are defined.

**Professional Counseling**

Hackney and Cormier (2005) described professional counseling as an approach where counselors treat both intrapersonal concerns, such as self-concept and psychological issues, and interpersonal concerns, including communication and relationship problems, of the clients who work with them. According to Ivey, Ivey, Myers, and Sweeney (2005), professional counselors should consider a variety of theoretical orientations before selecting the approach that is most suitable for a particular client. One possible theoretical orientation is wellness counseling, in which professional counselors use wellness theory and measurement to help clients increase their level of wellness and enjoy a better quality of life (Myers & Sweeney, 2005a).

**Technology**

Technology in this study will refer to computer-based technologies and information and communication technologies (ICTs). Examples of computer-based technologies include personal computers, tablet computers, personal digital assistants, and smartphones, which are mobile phones that include computing capabilities. ICTs include computer-mediated technologies such as the Internet and social networking websites, mobile phones, and other technologies that allow users to communicate virtually in text, audio, or face-to-face formats. Although these tools are not the only types of technology that could potentially influence wellness, they are widely used and have been the focus of most recent research that has
examined the relationship between interactions with technology and aspects of health or well-being.

**TechnoWellness**

TechnoWellness is defined in this study as a mode of interacting with technology that maximizes its potential to enhance health and well-being. Health refers here to physical health, and well-being refers to psychological, social, and spiritual well-being. Like holistic wellness, TechnoWellness exists on a continuum. Interactions with technology that lead to adverse effects such as technology-related anxiety, technostress, technophobia, and addiction to technology can reduce a person’s TechnoWellness. In contrast, interactions with technology that have positive effects such as enhancing social connections, positive emotions, and physical health can increase TechnoWellness.

**Wellness**

In this study wellness will be conceptualized using the definition that Myers et al. (2000) proposed: “A way of life oriented toward optimal health and well-being, in which body, mind, and spirit are integrated by the individual to live life more fully within the human and natural community” (p. 252). Myers et al. (2000) also noted that wellness is the optimal level of both health and well-being that a person can attain. Since wellness encompasses multiple dimensions that are integral to the whole, it is sometimes described as holistic wellness (Myers & Sweeney, 2005c; Roscoe, 2009).
Organization of the Study

This dissertation includes five chapters. The first chapter has provided an overview of wellness as it is defined in the counseling profession, has identified a gap in the counseling literature regarding technology use and TechnoWellness, and has summarized the purpose of the study. This chapter has also presented the primary and secondary research questions that will be considered. In Chapter 2, previous research on adverse and beneficial responses to technology use is described within a literature review, and existing models of holistic wellness are summarized. To illustrate the potential relationships between technology use and second-order factors described in the IS-Wel model (Myers & Sweeney, 2005c), research suggesting that interactions with technology can affect the Creative Self, the Coping Self, the Social Self, the Essential Self, and the Physical Self is also presented. Chapter 3 explains the research methodology used in this study, including the sampling procedures, information about the TWI and 5F-Wel instruments that participants will complete, research hypotheses, and data analyses that will be conducted. Chapter 4 presents analyses of the data that were collected from 312 participants. Chapter 5 discusses the results and presents limitations of the study, recommendations for future research, and implications for practitioners in the counseling profession.
CHAPTER 2
LITERATURE REVIEW

Although few publications within the counseling profession have focused on the connections between technology use and wellness, numerous researchers in other disciplines have identified both adverse and beneficial responses among people who interact with various types of technology. In this chapter, common themes among studies of adverse and beneficial responses are discussed. To identify a wellness model that can be used to explore the possible relationship between technology use and holistic wellness, nine wellness models are described, and the Indivisible Self model (IS-Wel; Myers & Sweeney, 2005c) is established as the model that has the most empirical support and is most relevant to the counseling profession. Finally, evidence that interactions with technology can in some cases have either beneficial or adverse impacts on the five second-order factors within the IS-Wel is shared. Research findings showing potential relationships between technology use and the Social Self, the Creative Self, the Coping Self, the Essential Self, and the Physical Self are presented as the rationale for a TechnoWellness Inventory (TWI) that assesses TechnoWellness in those five domains.

Responses to Interactions with Technology

Adverse Responses

Numerous studies have provided evidence that some interactions with technology can affect health and well-being negatively. A common theme within these studies is that
technology can in some cases cause anxiety, stress, and frustration. Additional studies have focused on the detrimental effects of using technology excessively.

**Anxiety.** Several studies found that some participants experienced anxiety in response to using computers or the Internet. In a study of Internet use by college students majoring in psychology, Brosnan et al. (2012) administered a survey of Internet-related anxiety to 216 participants. Twelve participants (5.6%) reported levels of anxiety that were considered pathological. This finding is consistent with research by Rosen et al. (1993), who screened 1,617 college students enrolled in courses that required use of a computer and administered a 5-week Computerphobia Reduction Program to 162 participants who volunteered for treatment after being identified as computerphobic. They found that these participants often exhibited signs of anxiety such as sweaty palms, heart palpitations and headaches when they anticipated using a computer.

Other researchers have found that technology users may experience specific types of anxiety. Thorpe and Brosnan (2007) gave measures of both general and specific anxiety to 185 participants after an initial screening that identified 51 participants as computer anxious, 33 as spider phobics, and 101 as nonanxious. While a comparison between the computer-anxious and spider-phobic participants suggested that the former group did not exhibit all of the symptoms associated with a specific phobia, Thorpe and Brosnan nevertheless found that participants experiencing computer anxiety had some symptoms associated with both social anxiety and performance anxiety, responses associated with fear of an inability to cope with the technology. A different type of technology-related anxiety, one associated with over-use,
was explored by King et al. (2013) in a case study of nomophobia, which is anxiety related to the non-availability of a virtual communication device such as a personal computer or mobile phone. The participant in the study felt that he could relate to other people only in a virtual environment, and he reported symptoms such as blushing, tremors, perspiration, and panic attacks when he was away from his personal computer. Both of these studies suggested that some individuals experience anxiety related to their interactions with technology and that the types of anxiety may vary.

**Stress and frustration.** Multiple researchers have conducted studies where participants experienced stress and frustration when using the Internet, computers, and information and communication technologies (ICTs). Recognizing the potential of social media to create stress in the workplace, Bucher, Fiesler and Suphan (2012) surveyed 2,579 professionals and identified overload, invasion, and uncertainty as challenges posed by social media use. Studies by Al-Fudail and Mellar (2008) and La Paglia, Caci, and La Barbara (2008) indicated that some teachers experience stress when using technology in their classrooms. User frustration with computers also has been noted and the role of instrumental and dispositional factors examined (Bessière et al., 2006). When considered together, studies in which technology users experienced anxiety, stress, or frustration offer strong evidence that interactions with technology can be detrimental in some cases.

**Excessive use.** Overuse of the Internet and other technologies by some individuals has reinforced concerns about possible adverse impacts. Researchers examining over-reliance on technology have proposed a range of terms, including computer addiction,
Internet addiction, Internet abuse, pathological Internet use, and problematic Internet use (Morahan-Martin, 2008; Shapira et al., 2003). Whether the term “addiction” should be used to describe overuse of technology has been extensively debated since it is associated with a mental health disorder that can be diagnosed (Morahan-Martin, 2005, 2008; Pies, 2009; Shaw & Black, 2008; Young, 1998). The American Psychiatric Association (APA, 2013) did not list problems related to technology use among the recognized disorders described in Section II of the Diagnostic and Statistical Manual of Mental Health Disorders (5th ed.; DSM-5). However, the manual did include Internet gaming disorder in Section III among conditions needing further study. Despite the conflicting views about terminology and definition, substantial evidence nevertheless suggests that excessive Internet use can create as well as indicate psychological, emotional, and social difficulties and can have negative outcomes (Caplan, 2007; Morahan-Martin & Schumacher, 2003).

Empirical studies have documented Internet abuse in several countries although prevalence rates have varied, possibly due to factors such as Internet availability, cultural norms, and differences in criteria for excessive Internet use (Morahan-Martin, 2008). In a meta-analysis of 10 qualitative studies conducted between 1996 and 2006, Douglas et al. (2008) reported that participants spending excessive time online displayed irritation and moodiness when offline and frequently denied that their Internet use was problematic. Some participants experienced challenges in interpersonal, occupational, financial, scholastic, or physical areas. Attachment to mobile phones may also be problematic since a qualitative study of 32 Australian adolescents and young adults by Walsh, White, and Young (2008)
identified symptoms of behavioral addiction. Participants in the study reported checking their mobile phones compulsively even at inappropriate times and feeling disconnected from others when they were unable to access their phones. While existing research does not suggest that a majority of people engage in maladaptive technology use, some people are clearly harmed by using technology excessively.

**Beneficial Responses**

In spite of the evidence that some interactions with technology can be harmful, a growing body of research indicates that technology use can also have positive effects. Studies in this area have focused on benefits such as enjoyment, sense of control, life satisfaction, increased well-being, and social connectivity.

**Enjoyment.** People sometimes experience enjoyment while using technology, and researchers have identified this response across different types of technology. A phenomenological study by Lim (2011) found that enjoyment was one of four themes shared by 28 engineering professors who discussed their use of tablet computers in their classrooms. In a survey of 358 college students in Taiwan, Wang, Lin, and Liao (2012) reported that participants with certain personality traits, including extraversion, agreeableness and conscientiousness, were significantly more likely than other students to enjoy their use of blogging websites. Ku et al. (2013) surveyed Taiwanese graduate students about different types of computer-mediated communication technologies, including social networking websites \((n = 122)\), instant messaging \((n = 150)\) and email \((n = 167)\). A factor analysis
revealed that Amusement, which was defined by the variables “entertainment,” “relaxing,” and “having fun,” was a significant gratification for all three types of technology.

Some researchers have focused on the relationship between perceived enjoyment of technology and other variables associated with technology use. Teo and Noyes (2011) surveyed 153 pre-service teachers in Singapore about their computer use and found that perceived enjoyment was the most significant predictor of participants’ perceived ease of use, perceived usefulness, and intention to use computers. In a field study of 228 students at a Chinese university, Wang, Ngai, and Wei (2012) used structural equation modeling to explore whether perceived enjoyment of instant messaging technology was associated with user satisfaction and perceived usefulness. They found that perceived enjoyment was the dominant variable influencing user satisfaction. In another study that used structural equation modeling, Dickinger, Arami, and Meyer (2008) analyzed data from 218 adolescent and adult participants. Perceived enjoyment when using mobile communication devices had a significant influence on participants’ intention to use the devices and their attitudes regarding the technology.

**Sense of control.** In a qualitative study conducted in the United Kingdom, Madell and Muncer (2007) interviewed two focus groups in the 18-20 age range about their reasons for using the Internet and mobile phones for social interactions. Using a grounded theory approach, they found that the most significant theme was that technology usage enabled participants to have a positive sense of control over their interactions with others. Wastell and Newman (1996) measured physiological signs of stress, including systolic blood
pressure, diastolic blood pressure and heart rate when emergency workers in the United Kingdom (N = 45) used paper-based and computer-based records systems. Data suggested that using the computer system significantly reduced participants’ stress by providing them with a greater sense of control.

**Life satisfaction.** To explore relationships among participants’ Internet use, cognitive beliefs, personality traits, and life satisfaction, Liu and LaRose (2008) surveyed 195 students at a university in the United States. They defined life satisfaction as a person’s summative liking or disliking of her or his life, and their study examined participants’ satisfaction with their school lives. After conducting a confirmatory factor analysis and creating a structural model, Liu and LaRose concluded that the students’ Internet use, online social self-efficacy beliefs, and perceived online social support directly influenced their school life satisfaction. They therefore proposed that the cumulative benefits of Internet use can contribute to greater life satisfaction.

**Well-being.** Research focusing on the relationship between well-being and the use of technology, particularly the Internet and information and communication technologies (ICTs), has attracted considerable attention. Although findings have been mixed (Huang, 2010; Wang, Luo, et al., 2012), multiple studies have reported a positive impact on well-being. When Valkenburg and Peter (2007) surveyed Dutch teenagers (N = 1,210) to test whether online communication reduced or stimulated adolescent well-being, they found support for their hypothesis that it encouraged well-being via a positive effect on time with friends and quality of friendships. Using a latent profile approach, Chen (2012) studied
Internet use in a sample of Taiwanese college students ($N = 757$) and found that students who used the Internet for social purposes were more likely to be in the group with good psychological well-being. When Cotton et al. (2012) investigated the relationship between Internet use and depression in an empirical study of a large sample ($N = 7,839$) of retired Americans who were more than 50 years old, they concluded that Internet use reduced a depression outcome by 20-28% and contributed to the mental well-being of older adults. Studies such as these provide encouraging evidence that the use of technology can in some cases enhance well-being, a construct that is not equivalent to wellness but that includes psychological components that influence wellness (Myers et al., 2000).

Proponents of the emerging field of positive technology, which is defined as the use of interactive technologies to support positive functioning, have advocated the use of interactive technologies to support psychosocial development and enhance well-being (Botella et al., 2012; Mitchell, Stanimirovic, Klein, & Vella-Brodrick, 2009). Drawing on the theories and methods of positive psychology (Seligman, Steen, Park, & Peterson, 2005), they proposed that information and communication technologies (ICT) can be used to encourage positive emotions, engagement, self-empowerment, social integration, and connectedness (Riva et al., 2012). Although positive technology advocates have identified increasing wellness as a goal, they typically identify three factors as foci: positive emotions, engagement and actualization, and social connectedness (Botella et al., 2012). These are only several of the factors that contribute to holistic wellness as it is conceptualized in evidence-based wellness models in the counseling profession.
Social connectivity. Researchers have proposed that communication technologies and social networking websites contribute to a perception of social connectivity. Subrahmanyam, Reich, Waechter, and Espinoza (2008) administered paper and online surveys to young adults in California ($N = 131$) to examine their reasons for using social networking websites. Most participants (81%) reported that they used social networking websites (SNS) to communicate with friends they did not see frequently in person, with some also responding that they used the technology to communicate with family (48%) and make plans with friends they saw often (35%). Although most participants were using SNS to correspond with friends when offline communication was lacking, 20% thought that using the SNS had strengthened those friendships.

In a later study of high school students by Reich, Subrahmanyam, and Espinoza (2012), 251 adolescents in California completed paper and online surveys about their use of the Internet, SNS, and instant messaging. The most prominent reason for participants’ use of SNS was to interact with friends whom they did not see often, with 81% of participants selecting this response. Many participants (43%) also thought that communication on social networking websites had strengthened their offline relationships. These studies indicate that at least a sizeable minority of adolescents and young adults believe that using SNS enhances their social connections.

The relationship between technology use and social connectivity among older adults has also been examined in empirical research. A pilot study of how Internet and email use affected quality of life for 15 residents of a retirement community showed a trend toward
decreased loneliness in participants (White et al., 1999). Koopman-Boyden and Reid (2009) examined Internet and email use among a randomly selected sample of 65-84 year-old adults in New Zealand (N = 1,680). Their use of those technologies predicted better self-reported health and increased participation in the community’s leisure and recreation activities, including leadership roles in those activities. However, there was no significant relationship between participants’ technology use and their level of contact with family members or other individuals. These studies therefore suggest that using technology may enhance social connectivity for some older adults but not others.

Studies of different age groups have provided evidence that certain types of technology may enhance social connectivity for some individuals. Although these studies were based on participants’ perceptions of their social interactions and these self-reported data may be biased, the data nevertheless indicate a possible association between technology use and social connectivity. These results therefore suggest a need for further exploration of the relationship between interactions with technology and the social dimension of wellness.

**Summary**

In studies across a range of disciplines, participants who interacted with technology reported positive responses in some cases and negative responses in others. Some technology users have described adverse reactions such as anxiety, stress, frustration, and excessive use. Participants in other studies observed benefits such as enjoyment, sense of control, life satisfaction, increased well-being, and social connectivity when using technology. It should be noted that most studies were not designed to establish a causal
relationship between technology use and these responses, and nearly all studies were based on data that were self-reported and therefore may have included biases (Heppner, Wampold, & Kivlighan, 2008). Nevertheless, a large number of studies reported significant relationships between technology use and variables that could potentially affect a person’s wellness. Considering associations between technology use and wellness, especially within the context of existing wellness models, is therefore important. Before evaluation of whether interactions with technology could enhance or diminish wellness in some areas, the structure of wellness models must be examined.

**Wellness Models**

Multiple wellness models have been proposed, and models of well-being are sometimes placed into the same category as wellness models although the constructs differ. Definitions of both wellness and well-being vary (Amichai-Hamburger, 2009; Myers & Sweeney, 2005a), but the latter construct usually refers to a psychological dimension of wellness. One widely used model of psychological well-being was proposed by Ryff (1989), who identified autonomy, environmental mastery, personal growth, positive relations with others, purpose in life, and self-acceptance as the six factors within that construct. Although Ryff’s model included multiple dimensions that are often associated with wellness, it emphasized psychological factors and did not incorporate dimensions such as physical health and spirituality that are typically included in wellness models. The authors whose models are described in this section treated wellness as a holistic and multidimensional construct although they defined its dimensions differently.
**Dunn’s High-Level Wellness**

In a collection of 29 lectures on wellness, Dunn (1961) presented high-level wellness as an optimal state of functioning. He emphasized the importance of treating wellness as a construct that includes more than physical health. Dunn suggested that high-level wellness involves the “integration of the whole being of the person” (p. 159), including the body, mind, and spirit. The body, mind, and spirit were depicted as three interlocking circles, and an arrow through the circles symbolized an individual’s quest to achieve his or her purpose in life. Dunn also proposed that each person “is functioning within an ever-changing environment and flow of events” (p. 10), meaning that holistic wellness can be influenced by outside factors. He included lectures on community wellness, environmental wellness, family wellness, and social wellness. Dunn’s high-level wellness was an early example of a holistic wellness model, but it was theoretical and was not tested by empirical research.

**Ardell’s Wellness Models**

Ardell (1977) created a wellness model with self-responsibility as the central dimension that influences other dimensions of wellness. He suggested that an individual can become well by taking responsibility for achieving wellness in four dimensions: environmental sensitivity, nutritional awareness, physical fitness, and stress management. Ardell identified environmental sensitivity as the person’s perception of interactions between personal, physical, and social factors. Nutritional awareness referred to a person’s self-monitoring of her or his diet. Ardell described physical fitness as a person’s use of a regular
exercise routine, and he defined stress management as an individual’s ability to cope with stressful experiences.

In a later version of his wellness model, Ardell (1982) still maintained that self-responsibility was the core dimension of wellness but altered the other dimensions. He combined physical fitness and nutritional awareness into the same dimension, and he replaced environmental sensitivity and stress management with two relationship dynamics as well as meaning and purpose. Ardell (2011) reported that he shared a third model on his website during the 1990’s and that this more complex model grouped 14 skill areas into three domains. In the physical domain, he listed adaptions/challenges, appearance, exercise and fitness, lifestyle habits, and nutrition. The meaning and purpose domain included a skill area called meaning and purpose as well as humor, play, and relationships. Finally, the mental domain incorporated effective decisions, emotional intelligence, factual knowledge, mental health, and stress management. None of Ardell’s models were based on empirical research, and he proposed that an individual can create his or her own unique model of wellness (Ardell, 2011).

**Travis and Ryan’s Illness/Wellness Continuum and Wellness Energy System**

Travis and Ryan (1981, 1988, 2004) identified three key concepts of wellness and created models to illustrate each concept. Using the Illness/Wellness continuum (Travis, 1972), they showed that individuals can achieve different degrees of both illness and wellness. On the illness side of the continuum, Travis and Ryan proposed that there are different degrees of illness with premature death at the end of that continuum. The opposite
side of the continuum depicted various degrees of wellness with high-level wellness as the ultimate goal. Travis and Ryan therefore suggested that wellness exists on a continuum and is not a static state.

Another concept that Travis and Ryan (1981, 1988, 2004) emphasized was the importance of managing energy and using it to connect with the universe. In their description of the Wellness Energy System, they proposed that humans intake energy through breathing, eating, and sensing, and that insufficient input can affect wellness negatively. Furthermore, they suggested that wellness depends on healthy output of energy through communicating, feeling, finding meaning, moving, playing and working, self-responsibility and love, sex, thinking, and transcending. Travis and Ryan also proposed the Iceberg Model of Health and Disease, which hypothesized that illness and health are affected by factors that are not clearly visible. They identified levels that exist “below the surface” in a specified order: the lifestyle/behavioral level, the cultural/psychological/motivational level, and the spiritual/being/meaning realm. Travis (1981) published a Wellness Inventory based on the models, and a more comprehensive assessment known as the Wellness Index was also developed (Travis & Ryan, 2004). Travis and Ryan’s models offered a more complex conceptualization of wellness than earlier models, but like those models they were not evidence-based.

**Hettler’s Hexagon**

During a project to improve students’ wellness at a university in the United States, Hettler (1980) defined wellness as an approach to living that is positive and emphasizes the
whole person. He proposed that wellness incorporates emotional, intellectual, occupational, physical, social, and spiritual dimensions. These six dimensions were depicted as a hexagon (Hettler, 1984). Hettler (1980) described the emotional dimension as a person’s awareness and acceptance of her or his feelings while the intellectual dimension represented involvement in creative and stimulating mental activities. The occupational dimension focused on satisfaction and enrichment derived from a person’s work. Hettler (1980) identified the physical dimension as the degree to which a person maintains cardiovascular functioning, chooses nutritious foods, and takes steps to prevent or detect illnesses. He proposed that wellness in the social domain depended on relationships with others and with nature that contribute to a community’s welfare, and he suggested that the spiritual domain measures a person’s efforts to find meaning and purpose in life.

Like Travis and Ryan (1981, 1988, 2004), Hettler (1980) posited that wellness exists on a continuum that ranges from premature death to high-level wellness. He identified the primary causes of premature death in the United States and presented an instrument, the Lifestyle Assessment Questionnaire (LAQ), that was created to promote healthy lifestyles on college campuses. One section of the LAQ was designed to assess wellness across all six dimensions while the other three sections focused on personal growth, risk of death, and medical alerts. When the LAQ was administered to 268 college students, 23% of the students reported that the results motivated them to change one or more lifestyle factors (Hettler, 1980).
The LAQ Wellness Inventory included 11 subscales that encompassed the six wellness dimensions (Hettler, 1980). Hettler (1984) reported that five of the LAQ subscales focused on the physical dimension (Physical Exercise, Physical Nutritional, Physical Self-Care, Physical Vehicle Safety, Physical Drug Abuse). Two subscales assessed the emotional dimension (Emotional Awareness and Acceptance, Emotional Management), and each of the remaining wellness dimensions was measured by one subscale. Hettler did not explain why a disproportionately large number of subscales on the LAQ Wellness Inventory were devoted to the physical domain, and he did not provide evidence of the instrument’s reliability and validity.

**Crose, Nicholas, Gobble, and Frank’s Systems Model of Wellness**

In an article written for professional counselors, Crose, Nicholas, Gobble, and Frank (1992) suggested that wellness can be best conceptualized with a systems model. They defined a system as a whole unit whose unique properties are determined by the interactions between several subparts. Crose et al. (1992) subsequently presented a systems model that depicted emotional, intellectual, physical, social, spiritual, and vocational dimensions. The authors intentionally used the six dimensions that Hettler (1980) identified since that model was widely used at the time, although they proposed that the specific dimensions were less important than the concept of multiple dimensions interacting to influence wellness. Instead of organizing the dimensions into a hexagon, Crose et al. (1992) depicted them as tubes. A wavy line was shown within each tube to show that health within each domain fluctuates throughout life, and lines drawn from each tube to all of the others illustrated that changes in
one dimension can lead to changes in the others. Crose et al. (1992) therefore treated wellness as holistic and suggested that all of the dimensions are interrelated. While this approach differed from earlier models that treated wellness dimensions as independent, it was still based on theory instead of empirical research.

**Chandler, Holden, and Kolander’s Wellness Model**

Chandler, Holden, and Kolander (1992) recommended that professional counselors consider a revised version of Hettler’s Hexagon (1980) that expanded the role of spirituality. Although Hettler identified spirituality as one of six dimensions that influence holistic wellness, Chandler et al. (1992) proposed that spiritual health affects the emotional, intellectual, occupational, physical, and social dimensions that formed the rest of Hettler’s model. Chandler et al. (1992) suggested that all five of those dimensions include both a personal and a spiritual component. They argued that a person must maintain both personal and spiritual health in each dimension to achieve high-level wellness. Chandler et al. (1992) created a revised model that placed the emotional, intellectual, occupational, physical, and social dimensions in a circle with the spiritual component as the inner layer and the personal component as the outer layer. Their model therefore combined elements of both Hettler’s Hexagon and the Wheel of Wellness model, which also identified spirituality as the central component (Myers et al., 2000; Sweeney and Witmer, 1991; Witmer and Sweeney, 1992). Chandler et al. (1992) described a theoretical rationale for the model’s emphasis on spirituality, but they did not conduct research to support the model.
Adams, Bezner, and Steinhardt’s Wellness Model

Adams, Bezner, and Steinhardt (1997) used an exploratory study to validate a new instrument called the Perceived Wellness Survey. Before writing the items for the instrument, Adams et al. (1997) conducted a literature review and selected six wellness dimensions based on both theoretical and empirical support: emotional, intellectual, physical, psychological, social, and spiritual wellness. The dimensions in the model were therefore identical to those presented by Hettler (1980) with the exception of psychological wellness, which was used in place of the occupational dimension. As defined by Adams et al. (1997), psychological wellness is a person’s perception that she or he will experience positive outcomes.

In their study of the Perceived Wellness Survey, Adams et al. (1997) reported high measures of internal consistency reliability and shared evidence of the instrument’s discriminant and face validity. They also conducted a factor analysis and found that all but two items on the Perceived Wellness Survey loaded onto a single factor at .30 or above. Therefore, Adams et al. (1997) concluded that they measured a single factor that was labeled perceived wellness. Although their data suggested a single wellness construct that encompasses six wellness dimensions, they acknowledged that additional research was needed to support the construct validity and psychometric properties of the Perceived Wellness Survey. In a later study, Adams, Bezner, Drabbs, Zambarano, and Steinhardt (2000) gave 112 college students the Perceived Wellness Survey and additional assessments to measure spiritual wellness and psychological wellness. Their data suggested that
psychological wellness mediated the relationship between spiritual wellness and overall wellness, but the study did not consider the entire model or provide additional validation of the Perceived Wellness Survey.

**Myers, Sweeney, and Witmer’s Wheel of Wellness**

Sweeney and Witmer (1991) and Witmer and Sweeney (1992) proposed the Wheel of Wellness model, which was based partly on Adler’s theory of individual psychology (Adler, 1927). They depicted wellness as a wheel containing major life tasks and subtasks. Myers et al. (2000) revised the model after using the Wellness Evaluation of Lifestyle (WEL) to test its structure empirically. In their description of the model’s theoretical background, Myers et al. (2000) observed that Adler’s theory treated people as holistic beings instead of focusing only on the mind, the body, or another single component of the whole person. The authors also described research by Maslow (1970), who suggested that all humans can be encouraged to strive for excellence, growth, and self-actualization. Myers et al. (2000) explained that the theories of Adler and Maslow helped to inspire the strength-based nature of their model.

Both versions of the Wheel of Wellness model suggested that five life tasks contribute to wellness (Myers et al., 2000). Witmer and Sweeney (1992) originally identified the life tasks as spirituality, self-regulation, work, friendship, and love and explained that Alfred Adler proposed these life tasks in his theory of individual psychology (Adler, 1927). Based on their later factor analyses of more than 3000 participants’ scores on the WEL, Myers et al. (2000) relabeled the work task as work and leisure since both of those tasks can offer satisfaction, pleasure, a sense of accomplishment, and the opportunity to become highly
engaged in a particular endeavor. Furthermore, the self-regulation task was renamed self-direction.

In the circumplex Wheel of Wellness model, the five life tasks were placed within the wheel but interacted with the other tasks and subtasks in different ways (Myers et al., 2000). Spirituality, which was defined as awareness of either a being or a force that connects a person to the universe, was conceptualized as the core characteristic of people who are well and the source of all of the other tasks and subtasks. Myers et al. (2000) therefore placed it in the center of the model in the first layer of the wheel. Self-direction was depicted as the second layer of the wheel and defined as the way that a person “regulates, disciplines, and directs the self in daily activities and in pursuit of long-range goals” (Myers et al., 2000, p. 253). The original self-regulation task in Witmer and Sweeney’s model (1992) included seven subtasks, but 12 subtasks were presented in the third layer of the revised model: sense of worth, sense of control, realistic beliefs, emotional awareness and coping, problem solving and creativity, sense of humor, nutrition, exercise, self-care, stress management, gender identity, and cultural identity (Myers et al., 2000). The authors suggested that the 12 subtasks influence the remaining three life tasks that were placed in the fourth layer of the wheel: work and leisure, friendship, and love.

The fifth and outermost layer of the Wheel of Wellness identified seven life forces: business/industry, community, education, family, government, media, and religion (Myers et al., 2000). Myers et al. (2000) explained that these and potentially other life forces interact with the life tasks. In the figure that was used to illustrate the Wheel of Wellness, “global
events” was written both above and below the wheel to demonstrate that they can affect all of
the life tasks and life forces depicted in the wheel. Myers et al. (2000) presented the Wheel
of Wellness as a theoretical model, and research to test the structure of the model was later
published by Hattie et al. (2004). Although the Wheel of Wellness described a large number
of life tasks and life forces that were believed to affect a person’s wellness, technology use
was not acknowledged in the model.

**Myers and Sweeney’s Indivisible Self Model (IS-Wel)**

The Indivisible Self wellness model (IS-Wel) was created after validation studies of
the WEL did not support some theoretical components of the Wheel of Wellness model
(Myers & Sweeney, 2005c). Using WEL scores from a large sample of participants \(N = 3,043\), Hattie et al. (2004) conducted an exploratory factor analysis on the 17 WEL
subscales that were derived from the 17 life tasks and subtasks in the Wheel of Wellness
model. The authors identified five clear second-order factors that were named the Creative
Self, the Coping Self, the Social Self, the Essential Self, and the Physical Self. Next, the
authors created a structural equation model that was used for a confirmatory factor analysis.
Each item on the WEL was loaded on its anticipated subscale, which were then loaded on the
five second-order factors. The second-order factors were loaded on an overarching factor
that Hattie et al. (2004) named “Wellness.” Because these results were not consistent with
some aspects of the Wheel of Wellness, including the circumplex structure and the central
role of spirituality, Myers and Sweeney proposed the IS-Wel as an alternative model.
Since Hattie et al. (2004) found that all of the second-order factors loaded onto a single higher-order factor, Myers and Sweeney (2005c) conceptualized the one higher-order factor as the Indivisible Self. The word “indivisible” was used to demonstrate that wellness is holistic and includes many dimensions that interact with each other. Hattie et al. (2004) noted that research on psychological well-being by Ryff and Keyes (1995) had also suggested the presence of a single higher order factor, and Myers and Sweeney observed that Adler (1927) had also emphasized holism.

Myers and Sweeney (2005c) proposed that the Indivisible Self is influenced by five second-order factors that were originally identified by Hattie et al. (2004): the Social Self, the Creative Self, the Coping Self, the Essential Self, and the Physical Self. The Social Self encompasses social support based on connections with others individually or in a community and includes friendship and love in relationships with family members, partners, and friends. Myers and Sweeney identified Friendship and Love as the third-order factors that contribute to the Social Self. The authors defined the Creative Self as a set of attributes that allow an individual to be unique among others, and they identified five third-order factors: Thinking, Emotions, Control, Work, and Positive Humor. Myers and Sweeney reported that the Coping Self allows people to respond to life events in an adaptive way and overcome negative experiences. They identified Leisure, Stress Management, Self-Worth, and Realistic Beliefs as the corresponding third-order factors.

In their description of the Essential Self, Myers and Sweeney described third-order factors that affect a person’s perspective about life: Spirituality, Gender Identity, Cultural
Identity, and Self-Care. Finally, they presented the Physical Self as the wellness dimension that includes Exercise and Nutrition as third-order factors and influences physical health. Many of the life tasks and subtasks identified in the Wheel of Wellness model, including spirituality, were therefore incorporated into the IS-Wel as third-order factors (Myers & Sweeney, 2005c). The authors reported that the WEL had been revised into a new instrument called the Five Factor Wellness Inventory (5F-Wel) that would measure the factors identified in the IS-Wel.

Myers and Sweeney (2005c) proposed that the higher-order, second-order, and third-order factors in the IS-Wel all operate within Local, Institutional, Global, and Chronometrical contexts. The contexts incorporated global events and several life forces identified in the Wheel of Wellness model (Myers et al., 2000). Myers and Sweeney observed that local contexts included interactions with family, neighborhoods, and communities where people spend most of their time. Institutional contexts included systems that influence people both directly and indirectly, including business and industry, education, government, the media, and religion. Within global contexts, they included culture, the environment, global events, and politics. Finally, they defined chronometrical context as the recognition that individuals change over time, so choices related to wellness have a cumulative effect that can be positive or negative. Since the contexts were not incorporated into the WEL, Myers and Sweeney acknowledged that they were not tested empirically and should be regarded as a theoretical component of the model.
Summary

Wellness has been conceptualized in different ways although the existing models have some similarities. All of the authors suggested that wellness includes multiple dimensions although various sets of dimensions have been proposed and some models have described different types of interactions between them. There is also consensus that wellness exists on a continuum and that it is possible to achieve an optimal state of wellness, which is sometimes described as high-level wellness. Most of the existing models are theoretical instead of evidence-based. Of the wellness models described in this section, the IS-Wel developed by Myers and Sweeney (2005c) has the most empirical support.

New wellness models have been proposed since Myers and Sweeney (2005c) published the IS-Wel, but these have not been empirically tested. Anspaugh, Hamrick, and Rosato (2006) proposed that emotional, environmental, intellectual, physical, occupational, social, and spiritual dimensions contribute to wellness. All of these dimensions were identified in earlier models (Adams et al., 1997; Dunn, 1961; Hettler, 1980), and Anspaugh et al. (2006) did not conduct additional research to test the structure of their new model. The most recent model created by Ardel (2011) was entirely theoretical and proposed four overlapping dimensions that contribute to wellness: athleticism, exuberance, liberty, and reason. Granello (2011) suggested that wellness comprises eight dimensions: cognition, emotional regulation, physical activity and nutrition, preventative self-care, spirituality and meaning, cultural and environmental context, social relationships, and creativity. Again, empirical tests of the entire model were not conducted. The IS-Wel therefore continues to be
the holistic model with the strongest empirical support. Furthermore, the IS-Wel is based in counseling theory, so it is the ideal model to use when considering TechnoWellness from the perspective of a professional counselor.

**Technology Use and the Indivisible Self**

No prior studies have examined the relationship between technology use and the entire IS-Wel model. Researchers have nevertheless studied associations between interactions with technology and dimensions that Myers and Sweeney (2005c) identified as third-order factors in the IS-Wel. Collectively, these studies offer evidence that technology use can in some cases affect each of the five second-order factors in positive and negative ways. Examples of studies related to the Social Self, the Creative Self, the Coping Self, the Essential Self, and the Physical Self are therefore presented to provide a rationale for developing a TechnoWellness instrument that includes subscales in all five areas.

**Technology Use and the Social Self**

Of the five factors that form the Indivisible Self in the IS-Wel model, perhaps the one most obviously related to TechnoWellness is the Social Self. This second-order wellness factor refers to social support based on connections with others individually or in a community and includes friendship and love in relationships with family members, partners, and friends (Myers & Sweeney, 2005c). Myers and Sweeney identified Friendship and Love as the third-order factors that contribute to the Social Self. Since both of the third-order factors exist on a continuum, Myers and Sweeney observed that they are sometimes not distinguishable since Love can exist between friends and is not defined as a partnership that
needs to include sexual intimacy. The authors also noted that individuals with strong social support are usually involved in families that are either biological or families of choice.

Since popular technologies such as e-mail, mobile phones, social networking websites, and video conferencing programs are used for communication, interpersonal relationships could logically be influenced by use of these tools. Substantial research attests to the importance of considering the relationship between technology use and components of the Social Self.

**Social Self: Beneficial interactions with technology.** The Internet’s ability to help people connect with family and friends has been strongly supported by data from the Pew Internet and American Life Project, which found that by the year 2000 a majority of adults in the United States were using the Internet and email to communicate with both family members and friends (Horrigan, 2006). Researchers focusing on adolescents and young adults have reported that online communication technologies can strengthen offline friendships (Reich et al., 2012; Subrahmanyam et al., 2008). Furthermore, older adults’ use of the Internet to communicate with family and friends has been associated with lower levels of loneliness (White et al., 1999). Sum, Mathews, Hughes, and Campbell (2008) examined specific types of loneliness in a survey of 222 Australian adults who were at least 55 years old. They measured loneliness across social, family, and romantic domains and found that using the Internet to communicate with others was associated with lower levels of social loneliness. Even though participants who spent more time on the Internet for purposes other than communication had higher levels of social loneliness, the participants who spent more
hours on the Internet reported lower levels of romantic loneliness. Relationships between Internet use and both Friendship and Love, the third-order factors within the Social Self, were evident in these studies.

Although several studies of social networking sites (SNS) found that a majority of users did not report observable social benefits (Reich et al., 2012; Subrahmanyam et al., 2008), others have found that a substantial number of users did use SNS to develop friendships. Ellison, Steinfield, and Lampe (2007) surveyed undergraduate students (N = 286) at a university in the United States and found that most participants used Facebook to both stay in touch with friends they met before college and maintain relationships with new friends who attended the same university. The authors also reported a significant association between using Facebook and accumulating bridging social capital, which refers to relationships that allow a person to participate in a community but which are not typically used for emotional support. However, they found a statistically significant but weaker association between Facebook use and bonding social capital, which refers to emotionally close relationships that are found between close friends and family members. Ellison et al. (2007) therefore suggested that SNS are used to strengthen friendships but do not necessarily supplant in-person interactions that lead to close friendships with strong emotional connections.

Researchers examining social networking websites (SNS) have sometimes chosen to focus on specific populations, including individuals who may have difficulty forming offline relationships. Steinfeld et al. (2008) conducted two surveys of college students in the United
States ($N = 288, N = 481$) and found that participants with low self-esteem reported better social relationships after using Facebook. When students with low self-esteem were compared to those with high self-esteem, using Facebook had a greater influence on the social capital of the former group. In a survey of adults with disabilities ($N = 160$), Obst and Stafurik (2010) found that adults with disabilities established social support and a sense of community when they used websites to interact with others who had disabilities. By examining participants who were having difficulty forming connections with others, both of these studies proposed that SNS can have an especially significant impact on social connectivity for individuals in that situation.

Smartphones are another type of technology that may influence the Social Self. In a study of 279 South Korean college students who used smartphones frequently, Park and Lee (2012) conducted a factor analysis to determine participants’ motives for using smartphones. They found that “caring for others” was the most significant factor. Furthermore, a correlation analysis revealed that smartphone use was positively associated with bonding relationships but was negatively associated with bridging relationships. Whereas Ellison et al. (2007) found that SNS were more likely to be used for bridging social capital, Park and Lee’s data suggested that smartphones play a greater role in establishing bonding social capital and may be associated with emotionally close relationships.

Although most researchers examining technology use and social connections have focused on friendship, others have examined the role that technology can play in romantic partnerships. In a study of a large sample in the United States ($N = 3,215$), Sautter et al.
(2010) found that only 5.6% of participants had used Internet dating websites. Nevertheless, relationships can also develop on websites that are not specifically designed for dating. McKenna, Green, and Gleason (2002) conducted three studies that explored the role of Internet newsgroups in relationship formation. In the first study, the authors collected surveys from 568 individuals who participated in newsgroups. Most respondents (54%) had met with someone in person after building a friendship online, and close friendships or romantic relationships had developed more quickly when communication was initiated on the Internet than in person. Strong relationships were more likely to develop among individuals who reported that the Internet was the easiest place to express the “real me.”

To determine whether relationships established online were likely to last, McKenna et al. (2002) administered a follow-up survey two years later ($N = 145$). Most of the relationships (75%) that were reported in the original study were still intact, including 71% of the romantic partnerships. Finally, McKenna et al. (2002) conducted a laboratory study of college students ($N = 62$) to assess why some individuals were more comfortable initiating friendships or romantic relationships on the Internet. Participants who interacted online were more likely to report that they “liked” the other person than when the interaction occurred in person. A correlation analysis suggested online communication allowed participants to focus more on the quality of the conversation and their feelings of knowing the other person.

To identify factors that influence the longevity of romantic relationships that start online, Baker (2002) conducted a qualitative study of four couples in a long-term relationship and four couples who were no longer together. One theme was that interacting in a virtual
location that focuses on a common interest, such as a chatroom for people of the same religion, was associated with successful relationships. Baker also found that the couples who were still together had communicated for a longer time online and had more intimate conversations before they met in person. Although Baker’s sample was small, her research showed that technology can sometimes help people to establish loving relationships.

As these studies indicate, communication through Internet venues such as discussion groups or Internet dating services can lead to face-to-face meetings, close relationships, and partnerships. Considered together, the studies described in this section offer strong evidence that, for some individuals, interactions with technology can enhance the Social Self by facilitating Friendship and Love.

Social Self: Adverse interactions with technology. Despite the possible benefits, technology use can also affect the Social Self adversely. In a survey of mental health professionals (N = 1,504) who reported working with clients who had Internet-related problems, Mitchell et al. (2005) identified types of problems that clients were experiencing. General overuse of the Internet was an issue in 61% of the cases reported, making it the most common concern. Mitchell et al. (2005) noted that overuse was often detrimental to clients’ relationships with family and friends. Problems with pornography were reported in 56% of the cases that the mental health professionals described, and conflict with families or partners was one of six common outcomes identified by their clients. In 21% of the cases, infidelity conducted online was a concern because of its potential impact on a user’s existing relationship. Mitchell et al. (2005) identified additional online activities, including gambling,
interactive gaming, and role-playing, that can become problematic if they interfere with a person’s social relationships. Overall, the authors reported that 10% (n = 149) of the clients described in the study chose to avoid family, friends, and partners or isolated themselves by their online activities.

Mileham (2007) examined the implications of online infidelity by individuals in committed relationships. She interviewed 86 adults who were married and participating in chatrooms designed for married individuals seeking online or in-person liaisons. Participants in troubled marriages shared that using the chatrooms was easier and more gratifying than communicating with their spouses, leading Mileham to conclude that the online chats were motivating most participants to avoid interacting with their partners. Her results therefore suggested that when individuals with partners participate in interactive online sexual relationships, these behaviors can weaken their offline partnerships.

People experiencing social anxiety or loneliness may derive benefits from online connections, but for some of those individuals Internet use can have negative outcomes, including diminished offline social life. Morahan-Martin and Schumacher (2003) conducted a study of 277 college students and found that individuals reporting loneliness used the Internet and email more frequently. Although participants who felt lonely were more likely to report online friendships and describe those relationships as satisfying, they also identified fewer offline friendships and reported that their Internet use interfered with daily functioning. In another study of college students (N = 343), Caplan (2007) found social anxiety predicted a preference for online social interaction. When participants preferred online social
interaction, they were more likely to report their Internet use as problematic. Both of these studies indicated that lonely or socially anxious individuals were more likely to form online friendships but recognized that their offline relationships were suffering as a result. Although debate continues about how technology use affects social interactions, numerous studies show its impact on the Social Self.

**Technology Use and the Creative Self**

Myers and Sweeney (2005c) defined the Creative Self as a set of attributes that allow an individual to be unique among others. Included within the Creative Self factor of the IS-Wel are five third-order factors: Thinking, Emotions, Control, Work, and Positive Humor (Myers & Sweeney, 2005c). The authors proposed that Thinking and Emotions are highly related since a person’s thoughts can affect her or his emotions and vice versa. Control was defined as the perception of a person’s ability to influence the events in his or her life, which can lead to positive expectations that contribute to adaptive Thoughts and Emotions. Myers and Sweeney explained that Work is an essential component of human experience, so having a meaningful job can benefit the Creative Self. Finally, since Positive Humor can reduce stress and even benefit the immune system, Myers and Sweeney observed that it also affects wellness in this domain.

Despite a lack of technology-related studies addressing Positive Humor, a fact worth noting is that the Internet and ICT offer multiple opportunities for laughter, such as amusing websites, apps, and blogs, all of which can be enjoyed with friends. For other third-order factors of the Creative Self, the importance of technology interactions has been established in
empirical studies. Research has shown that technology use can affect problem-solving ability, motivation to learn, emotions, and perceptions of control and work.

**Creative Self: Beneficial interactions with technology.** The effectiveness of technologies designed to enhance problem-solving skills is well documented. Yu, She, and Lee (2010) provided six weeks of Web-based problem-solving instruction to students \( (n = 78) \) in two seventh grade biology classes in Taiwan. In comparison to a control group of students \( (n = 78) \) who received non-Web-based problem-solving training, students in the experimental group demonstrated greater retention of problem-solving skills over an extended period of time. In a study of problem-based learning, Chang et al. (2012) examined Taiwanese college students \( (N = 95) \) in three undergraduate courses. Structural equation modeling indicated that participants’ use of Internet searches had a positive effect on problem-solving skills. In both of these studies, using technology in an educational setting was associated with improved problem-solving and therefore illustrated a benefit to the third-order Thinking factor.

Improvements in thinking have also been documented by researchers who examined critical thinking, motivation, and self-efficacy beliefs. Yang and Wu (2012) reported that, for Taiwanese high school students learning English \( (N = 110) \), using multimedia technology to participate in digital storytelling significantly improved critical thinking, learning self-efficacy, and motivation. In all of the 30 qualitative studies that Bekele (2010) reviewed, Internet-supported learning environments in higher education supported student motivation. Amelink, Scales, and Tront (2012) found a positive relationship between use of tablet
computers and motivation among students ($N = 560$) in an undergraduate engineering program in the United States. Use of spreadsheet software was significantly associated with higher perceived algebra self-efficacy for 82 Turkish students in tenth grade (Topcu, 2011), and access to a laptop and training was correlated with increased academic self-efficacy in a sample of 85 African American students in grades 3-12 (Clark, 2003). Findings from a number of empirical studies therefore suggest that technology use can sometimes benefit the Creative Self by affecting Thinking and Emotions in a positive way.

**Creative Self: Adverse interactions with technology.** Maladaptive interactions with technology on the other hand may undermine the Creative Self by affecting Control and Work. In a meta-analysis of 10 qualitative studies of Internet addiction, Douglas et al. (2008) reported that participants spending excessive time online frequently denied that their use was problematic but nevertheless displayed irritation and moodiness when offline. In addition to disregarding social and physical areas of their lives, participants neglected employment, school, and finances. Research findings have also shown that anxieties about ICT use can put students at a disadvantage in academic work. Brosnan et al. (2012) surveyed 216 undergraduate psychology students and found that 12 exhibited a pathological level of anxiety regarding use of the Internet. In comparison to the other students, those identified as technophobic were significantly less likely to access Internet-based resources used in their courses. Brosnan et al. (2012) therefore concluded that anxiety regarding Internet use can disadvantage students academically. As multiple studies reveal, interactions with technology can influence sub-factors of the Creative Self either beneficially or harmfully.
Technology Use and the Coping Self

This wellness factor of the IS-Wel encompasses Leisure, Stress Management, Self-Worth, and Realistic Beliefs as third-order factors (Myers and Sweeney, 2005c). Myers and Sweeney described Leisure as rewarding activities that allow an individual to become completely absorbed in them, which may also lead to creative and spiritual benefits. They explained that Stress Management helps individuals to cope with life’s challenges, and successful coping subsequently helps them to develop self-efficacy beliefs and benefit from an understanding of Self-Worth. Realistic Beliefs were identified as important because irrational beliefs can lead to disappointment and frustration, which can be detrimental to wellness if they occur frequently. Myers and Sweeney proposed that all factors within the Coping Self allow people to respond to life events in an adaptive way and overcome negative experiences.

Coping Self: Beneficial interactions with technology. The strong association between leisure and technology is clearly illustrated by a Pew research report where respondents identified the Internet as “a diversion and destination” (Rainie, 2011, p. 2). Rainie reported that on a typical day 34% of all adults and 53% of all young adults (ages 18-29) went online “just for fun or to pass the time” (p. 2). In a study of 597 graduate students majoring in business or information management, Ku et al. (2013) used an exploratory factor analysis to identify gratifications sought by participants who used social networking websites (SNS), instant messaging (IM), and e-mail. Along with relationship maintenance, amusement was one of the two major gratifications identified by SNS users. After surveying
juniors enrolled in a college of business ($N = 288$), Agarwal and Karahanna (2000) used structural equation modeling to show that a construct known as cognitive absorption influenced participants’ beliefs about technology’s usefulness. Cognitive absorption was identified as a state of being deeply involved with technology partly due to pleasure and satisfaction. As these studies indicate, some individuals frequently use technology as a leisure activity.

Research findings have suggested that interactions with technology can help individuals manage stress by supporting self-esteem and self-efficacy beliefs. Park and Lee (2012) used a hierarchical multiple regression analysis to analyze survey data from 279 Korean college students who owned smartphones. Participants who reported using smartphones to maintain supportive ties were significantly more likely to have higher self-esteem. In a correlational study of 122 Canadian adults who were over 60 years of age, Erickson and Johnson (2011) found that participants who used the Internet more frequently had higher perceptions of self-efficacy, which refers to positive beliefs about one’s own capabilities. The authors noted that they had measured overall self-efficacy beliefs, not only those specific to technology. Although a causal relationship could not be established, Erickson and Johnson hypothesized that using the Internet can help older adults recognize their ability to live independently while remaining in contact with their family and friends. In both of these studies, researchers found a significant association between interactions with technology and beliefs that reduce stress and help individuals cope with challenges.
Using technology can sometimes help employees cope with work demands. Wastell and Newman (1996) studied emergency workers (N = 45) in the United Kingdom who had the often stressful task of coordinating crisis responses. As participants responded to emergencies from a control room, the researchers recorded cardiovascular activity and visually monitored their anxiety and fatigue. Wastell and Newman observed participants before and after they transitioned from using paper documentation to typing information into a computerized database. The emergency workers had lower blood pressure and anxiety levels after the computer system was implemented, suggesting that the new technology helped participants to cope with the stress of their jobs.

In some cases, technology can offer relief from emotional distress and provide opportunities to join a support group. Boniel-Nissim and Barak (2011) studied blogging by adolescents (N = 161) with social-emotional difficulties. Participants who wrote blogs, especially blogs where others could respond to their posts, had higher self-esteem and a more positive social-emotional condition at the conclusion of the study. Amichai-Hamburger and Barak (2009) proposed that online support groups on a range of topics are an option for those who find them helpful for informational, emotional, and social support. Smartphone and tablet computer apps that are intended for stress management, such as Breathe2Relax and ZenSpace, are available as well.

**Coping Self: Adverse interactions with technology.** Although some researchers have identified ways that technology can help users cope with stress, others have proposed that in some cases technological innovations can cause stress and anxiety. Al-Fudail and
Mellar (2008) observed nine teachers live and on video while collecting galvanic skin responses (GSR). The GSR readings and follow-up interviews indicated that multiple teachers experienced psychological symptoms \((n = 6)\), physical symptoms \((n = 5)\), behavioral symptoms \((n = 4)\), and/or cognitive symptoms \((n = 1)\) of stress when using technology in the classroom. In another study of teachers \((N = 77)\), La Paglia et al. (2008) conducted a multiple regression analysis and found that low self-efficacy beliefs regarding computers predicted higher levels of computer anxiety. In both of these studies, some but not all teachers experienced stress when using technology.

Other studies have suggested that individuals in multiple work settings experience stress when using technology. Ayyagari et al. (2011) surveyed ICT professionals \((N = 661)\) and found evidence of technostress among workers from a variety of industries including healthcare, education, government, finance, retail, and manufacturing. Bucher et al. (2012) conducted a study of communication directors \((N = 234)\) who worked for different types of businesses in Europe. A factor analysis revealed three primary stressors that participants experienced while maintaining social media for their companies: overload, invasion of work into their private lives, and uncertainty in the midst of changing technologies. In both studies, professionals who used technology regularly in their jobs experienced corresponding stress. For the Coping Self, as for other factors of the IS-Wel, research indicates that interactions with technology can be supportive or detrimental.
Technology Use and the Essential Self

Four third-order factors are grouped within this factor: Spirituality, Gender Identity, Cultural Identity, and Self-Care (Myers & Sweeney, 2005c). Myers and Sweeney differentiated between Spirituality and religiosity with the former construct encompassing a person’s hopefulness and senses of meaning and purpose. Since both Cultural Identity and Gender Identity can affect an individual’s perceptions of life experiences, the authors explained that they affect meaning-making processes. Finally, Self-Care was defined as proactive efforts to be well and have a long life. Myers and Sweeney identified all of these third-order factors as processes that influence a person’s perspective about life.

Essential Self: Beneficial interactions with technology. Internet technology allows access to thousands of resources that can help a person develop Spirituality. By conducting an Internet search, a person can locate websites for spiritual and religious organizations, resources on faith and belief, and apps for prayer and meditation. Blogs discuss spiritual beliefs, practices, and experiences. To explore the benefits of participating in online religious groups with discussion forums, McKenna and West (2007) surveyed 207 adults who were active members of Internet groups that focused on discussion and practice of a particular religion but were not affiliated with a physical place of worship. Structural equation modeling showed that participants who were invested in an online religious group reported many of the benefits associated with membership in a traditional religious institution, such as a social support network, engagement in community service, perceptions of a connection to God and others with similar beliefs, trust in others, and feelings of
purpose. McKenna and West therefore concluded that participating in an online religious group can contribute to a person’s sense of self.

Technology can also help people access resources that help them form Cultural and Gender Identities. Siddiquee and Kagan (2006) conducted a grounded theory study of six refugee women from African nations who had moved to the United Kingdom. Interviews and observations were used to collect data as the women participated in a training program to develop Internet skills. Siddiquee and Kagan concluded that learning to use the Internet helped the women to maintain and develop their personal identities by facilitating connections to both current and former communities. In a qualitative study conducted in Israel, Elias and Lemish (2009) interviewed 70 Russian adolescent immigrants about their experiences using media. Participants reported that the Internet played a key role in their identity formation as they adapted to life in the new society. After reviewing and coding posts in 53 online newsgroups, McKenna and Bargh (1998) concluded that participation of individuals with marginalized sexual and ideological identities led to increased self-acceptance and disclosure to family and friends. They suggested that online anonymity made the participants feel able to express their “true” selves but did note a risk that some ideological groups could support dangerous behaviors. In spite of the need for awareness of possible risk, all three studies provide evidence that technology can play a positive role in the development of Gender Identity and Cultural Identity.

How technology is used can have serious implications when Self-Care is considered. For example, youth who self-injure can access professional mental health websites that
provide recovery-focused information, stories, moderated blogs, and online support services (Lewis, Heath, Michal, & Duggan, 2012). Other websites offer resources on suicide prevention and online support (Lewis et al., 2012). The Internet can therefore be a valuable resource for individuals who are trying to treat harmful and life-threatening conditions.

**Essential Self: Adverse interactions with technology.** Although many resources that discourage maladaptive behaviors are available online, other resources may actually trigger the behaviors. Instead of accessing support resources, individuals who self-injure may find websites that provide instructional videos or may communicate with people who support that behavior (Lewis et al., 2012). Lewis, Heath, Sornberger, and Arbuthnott (2012) analyzed responses to 100 YouTube videos on self-injury and found that few of the comments mentioned recovery. In contrast, many responders reported that they were still self-injuring, so the authors concluded that these responses could encourage self-injury.

Individuals can also find details and images of suicide methods on the Internet (Lewis, Heath, Michal, & Duggan, 2012). Alao, Soderberg, Pohl, and Alao (2006) described several cases of adolescents and adults attempting or committing suicide using methods that they learned online. The authors also described individuals who attempted or completed suicide after discussing suicide in online chat rooms. In these types of cases as in others, interactions with technology have the potential to harm.

**Technology Use and the Physical Self**

Within this factor of the IS-Wel are the third-order factors of Exercise and Nutrition (Myers & Sweeney, 2005c). Myers and Sweeney observed that both factors can play an
important role in lengthening a person’s life although they cautioned that Exercise and Nutrition are often over-emphasized in comparison to other wellness factors that are equally important.

**Physical Self: Beneficial interactions with technology.** Technological innovations can sometimes help people improve their behaviors in both Exercise and Nutrition by enabling them to self-monitor and also receive support from professionals. Spring et al. (2013) compared a group of adults that participated in a weight loss program (n = 35) with a second group (n = 35) who participated in the same program with two additional resources: a personal digital assistant and coaching by phone. Participants in the latter group had a significantly greater chance of losing 5% or more of their original weight. A study of adolescent girls by Winett et al. (1999) collected data from ninth- and tenth-grade students (n = 103) who used an Internet-based health behavior program called Eat4Life during a semester-long health education class. The data analysis compared students who completed the Eat4Life modules with students in a control group (n = 77). Although the two groups did not differ in consumption of high-fat dairy or snacks, the Eat4Life group reported significantly less consumption of fast food and sodas and increased consumption of fruits, vegetables, and fiber. Furthermore, participants in Eat4Life reported completing significantly more aerobic exercise each week. In both of these studies, technology use enhanced the effectiveness of a program that encouraged health.

The versatility of handheld or wearable electronic devices makes them useful for supporting exercise and healthy nutrition. In a study of a worksite walking program, Faghri
et al. (2008) collected pre- and post-test data from participants ($N = 206$) who used pedometers with Internet-based motivational messages during the program. The number of steps that participants walked and other health indicators had improved significantly after the program. Because many people regularly carry a mobile phone, Hurling et al. (2007) tested a mobile phone and Internet based exercise program in the United Kingdom. Seventy-seven adults received text messages and email reminders about exercise while also participating in an online discussion board. In comparison to a control group ($n = 30$), participants in the experimental group had higher self-reported perceived control and intention to exercise and a greater amount of physical activity as reported by an accelerometer. They also lost more body fat. Both of these studies demonstrated that portable electronic devices can be used to motivate people to exercise.

Apps that encourage Exercise and Nutrition have been developed for individuals to download onto their mobile devices. According to data from the Pew Internet and American Life Project, the health apps most often downloaded by smartphone users are for tracking exercise, monitoring diet, and managing weight (Fox & Duggan, 2012). Among other apps that offer incentives for physical activity are those for national and state parks that provide trail maps and GPS-aided navigation systems.

**Physical Self: Adverse interactions with technology.** In some cases an individual’s use of technology may be detrimental to his or her health. As indicated in the first section of Chapter 2 that described adverse responses to interactions with technology, maladaptive use of technology can result in anxiety that triggers physical symptoms or addictive behaviors
that impact a person’s lifestyle negatively. Among the possible physical effects of excessive use are insufficient exercise and a lack of sleep (Douglas et al., 2008; Wang, Luo, et al., 2012). According to the DSM-5, people with an Internet gaming disorder may not eat or sleep for a long time (APA, 2013). For the Physical Self, as for other factors of the IS-Wel, how a person uses technology can affect health and well-being.

Summary

Numerous researchers have identified relationships between technology use and wellness dimensions identified as third-order factors in the IS-Wel model (Myers & Sweeney, 2005c). For each second-order factor in the IS-Wel model, there is evidence that interactions with technology can have beneficial effects in some cases and adverse effects in others. It is therefore hypothesized that technology use can impact wellness positively or negatively in all five areas although additional research is needed to determine whether benefits or adverse responses are more likely to occur within certain factors. Even if there are stronger relationships between technology use and some IS-Wel factors, changes in any of the areas of wellness represented by these factors can affect wellness in the other areas and holistic wellness (Myers & Sweeney, 2008b).

Since both theoretical and evidence-based wellness models currently used in the counseling profession do not address the relationship between an individual’s interactions with technology and holistic wellness, a separate construct seems needed. Understanding the TechnoWellness construct will allow professional counselors to assist clients who could increase beneficial interactions with technology or avoid maladaptive interactions. By
enabling practitioners to help clients use technology in ways conducive to an optimal quality of life, a TechnoWellness model and an accompanying assessment instrument can provide a valuable supplement to the existing wellness models.
CHAPTER 3

METHOD

TechnoWellness has been defined as a mode of interacting with technology that maximizes its potential to enhance health and well-being. The goal of the present study was to construct an assessment instrument that will measure TechnoWellness and operationalize this newly proposed construct. Items on the TechnoWellness Inventory (TWI) were based on previous research that identified correlations between technology use and responses beneficial or detrimental to an individual’s wellness. Some items on the TWI describe interactions with technology that were associated with responses that enhance wellness. Other items focus on interactions with technology that were associated with reactions that decrease wellness. By incorporating both types of items, the TWI was designed to identify ways that a person can not only use technology to enhance wellness but also avoid harmful interactions with technology. This chapter describes the participants in the present study, the assessment instruments that were administered, procedures for collecting data, and data analyses that were performed to both validate the TWI and examine the factor structure of TechnoWellness.

Participants

Participants for the present study were recruited from FindParticipants (www.findparticipants.com) and Qualtrics Panels (www.qualtrics.com/panel_management), associations that offer pools of prospective research participants. At the time of the study, FindParticipants advertised a registry of more than 180,000 potential study participants, and
Qualtrics Panels included more than 700,000 individuals who had agreed to participate in research projects. Both companies advertise to scholars in the social sciences and offer access to their participant pools for a fee.

Qualtrics Panels and FindParticipants were selected because of each participant pool’s diversity. While participants from some communities such as a university campus would be mostly of a similar age, both associations were able to offer participants from different age groups. Furthermore, both associations included prospective participants from a variety of regions within the United States. In contrast, people from a single community would be more likely to have similar experiences with technology. Recruiting participants from FindParticipants and Qualtrics Panels therefore increased the likelihood of having a diverse sample that would strengthen the external validity of the study in accordance with recommended procedures (Heppner et al., 2008).

Working with Qualtrics Panels and FindParticipants also provided the opportunity to recruit more than 300 participants, which Comrey and Lee (1992) identified as a “good” number for a study that uses factor analysis. To ensure that a sample of 300 participants was sufficient to conduct a planned multiple regression, a program called \( G^*\text{Power} \) that Balkin and Sheperis (2011) recommended was used to perform an a priori power analysis. For a multiple regression analysis with five predictor variables, \( G^*\text{Power} \) calculated that a sample of at least 134 participants would be acceptable given an alpha level of .05, minimum power at .80, and an effect size of .10, which Cohen (1992) considered small.
A recruitment message was shared with a total of 3598 people from the participant pools at Qualtrics Panels and FindParticipants. Prospective participants received online access to an Informed Consent form, which is included in Appendix A. If a person consented to participate, she or he was then directed to the online survey that included the demographic survey, the TWI, and the 5F-Wel-A. A total of 398 participants consented to participate in the study. Fifty-four of these participants (13.6%) did not complete all of the questions, which included 38 participants (9.5%) who did not complete any questions on either the TWI or the 5F-Wel-A. Twenty-six participants (6.5%) finished the TWI but did not start the 5F-Wel-A, suggesting that they either did not understand that the survey continued or decided that completing both instruments was too time-consuming. The remaining 344 participants (86.4%) in the study responded to all of the required questions on the demographic survey and both instruments.

Data from 32 participants (9.3%) were excluded because of concerns about their responses. Internet-based survey research studies can benefit from the screening of data sets to remove responses of participants suspected of being careless, inattentive, or lacking sufficient effort. Researchers have argued that using more than one survey method can contribute to reduction of measurement error and have identified several possible methods, including response time monitoring, use of a bogus item as an attention filter, and checking for long strings of identical responses (Huang, Curran, Keeney, Poposki, & DeShon, 2012; Meade & Craig, 2012).
Because the average time to complete the TWI and the demographic survey during pilot testing was 13 minutes, and the 5F-Wel-A was expected to take 10 additional minutes, the estimated mean time to complete the entire study was 23 minutes. Four participants (1.2%) who completed the study in fewer than seven minutes were excluded since their rate of completion was less than a third of the average time, suggesting that they did not read all of the questions. One question on the survey, “Please select 'Disagree' to continue,” served as an attention filter to assess whether participants were reading the questions carefully. Twenty participants’ responses (5.8%) were removed because they answered the attention filter question incorrectly. Eight additional participants (2.3%) were eliminated from the study because they provided identical responses to every question on at least one of the instruments. The final sample included 312 participants who represented 8.7% of the 3598 people who received an invitation and 78.4% of the 398 individuals who submitted an Informed Consent form.

Participant demographics are reported in Table 1. The sample included individuals between 18 and 79 years of age with a mean age of 46.2. More participants reported being female (59.6%) than male (40.4%). When asked about their primary cultural background, most participants (76.6%) responded that they are Caucasian, and the rest identified as African American (10.6%), Hispanic/Latino/Latina (6.1%), Asian or Pacific Islander (4.5%), or Native American (2.2%). Eight percent of the participants reported being biracial. A majority of the participants identified as heterosexual (93%), and the others identified as bisexual (4.2%), gay (1.6%), or lesbian (1.3%).
More than half of the sample (56.1%) reported being married or partnered, and the remainder identified themselves as single (30.8%), separated (1.0%), divorced (9.9%), or widowed (2.2%). Most participants were employed, either full time (46.5%) or part time (15.1%), and the rest reported being retired (12.2%), retired and working part time (4.8%), or not working (21.5%). Although 88.5% of the sample reported that they were not in school, the sample also included high school students (.6%), undergraduate students (5.8%), graduate students (3.8%), and non-degree students (1.3%). When asked about the highest education level that they had completed, 1.0% of the sample responded that they were still in high school, and others reported having a high school diploma (23.1%), Associate’s Degree or degree from a trade or technical school (22.4%), or Bachelor’s Degree (26.3%). The rest of the sample (27.2%) responded that they had earned an advanced degree such as a master’s degree (23.1%), a specialist degree (0.3%), a professional degree (2.9%), or a doctorate degree (1.0%).
Table 1
Participant Demographics (N = 312)

<table>
<thead>
<tr>
<th>Demographic Question</th>
<th>N</th>
<th>% of N</th>
</tr>
</thead>
<tbody>
<tr>
<td>What is your age?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18-19</td>
<td>3</td>
<td>1.0</td>
</tr>
<tr>
<td>20-29</td>
<td>51</td>
<td>16.3</td>
</tr>
<tr>
<td>30-39</td>
<td>52</td>
<td>16.7</td>
</tr>
<tr>
<td>40-49</td>
<td>69</td>
<td>22.1</td>
</tr>
<tr>
<td>50-59</td>
<td>70</td>
<td>22.4</td>
</tr>
<tr>
<td>60-69</td>
<td>57</td>
<td>18.3</td>
</tr>
<tr>
<td>70-79</td>
<td>10</td>
<td>3.2</td>
</tr>
<tr>
<td>What is your biological sex?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>186</td>
<td>59.6</td>
</tr>
<tr>
<td>Male</td>
<td>126</td>
<td>40.4</td>
</tr>
<tr>
<td>What is the primary cultural background with which you most closely identify?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Native American</td>
<td>7</td>
<td>2.2</td>
</tr>
<tr>
<td>Asian or Pacific Islander</td>
<td>14</td>
<td>4.5</td>
</tr>
<tr>
<td>African American</td>
<td>33</td>
<td>10.6</td>
</tr>
<tr>
<td>Caucasian</td>
<td>239</td>
<td>76.6</td>
</tr>
<tr>
<td>Hispanic/Latino/Latina</td>
<td>19</td>
<td>6.1</td>
</tr>
<tr>
<td>Are you biracial?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>25</td>
<td>8.0</td>
</tr>
<tr>
<td>No</td>
<td>287</td>
<td>92.0</td>
</tr>
<tr>
<td>What is your sexual/affectional orientation?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gay</td>
<td>5</td>
<td>1.6</td>
</tr>
<tr>
<td>Lesbian</td>
<td>4</td>
<td>1.3</td>
</tr>
<tr>
<td>Bisexual</td>
<td>13</td>
<td>4.2</td>
</tr>
<tr>
<td>Heterosexual</td>
<td>290</td>
<td>93.0</td>
</tr>
</tbody>
</table>
Table 1 (cont.)

What is your current marital status?

<table>
<thead>
<tr>
<th>Status</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Married/partnered</td>
<td>175</td>
<td>56.1</td>
</tr>
<tr>
<td>Single</td>
<td>96</td>
<td>30.8</td>
</tr>
<tr>
<td>Separated</td>
<td>3</td>
<td>1.0</td>
</tr>
<tr>
<td>Divorced</td>
<td>31</td>
<td>9.9</td>
</tr>
<tr>
<td>Widowed</td>
<td>7</td>
<td>2.2</td>
</tr>
</tbody>
</table>

What is your current employment status?

<table>
<thead>
<tr>
<th>Status</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employed full time</td>
<td>145</td>
<td>46.5</td>
</tr>
<tr>
<td>Employed part time</td>
<td>47</td>
<td>15.1</td>
</tr>
<tr>
<td>Retired, not working</td>
<td>38</td>
<td>12.2</td>
</tr>
<tr>
<td>Retired, working part time</td>
<td>15</td>
<td>4.8</td>
</tr>
<tr>
<td>Not working</td>
<td>67</td>
<td>21.5</td>
</tr>
</tbody>
</table>

Are you currently a student?

<table>
<thead>
<tr>
<th>Status</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes, in high school</td>
<td>2</td>
<td>.6</td>
</tr>
<tr>
<td>Yes, working on an undergraduate degree</td>
<td>18</td>
<td>5.8</td>
</tr>
<tr>
<td>Yes, working on a graduate degree</td>
<td>12</td>
<td>3.8</td>
</tr>
<tr>
<td>Yes, taking courses for fun</td>
<td>4</td>
<td>1.3</td>
</tr>
<tr>
<td>No, not currently a student</td>
<td>276</td>
<td>88.5</td>
</tr>
</tbody>
</table>

What is the highest level of education you have completed?

<table>
<thead>
<tr>
<th>Level</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than high school</td>
<td>3</td>
<td>1.0</td>
</tr>
<tr>
<td>High school graduate</td>
<td>72</td>
<td>23.1</td>
</tr>
<tr>
<td>Trade/technical school/A.A. degree</td>
<td>70</td>
<td>22.4</td>
</tr>
<tr>
<td>Bachelor’s degree</td>
<td>82</td>
<td>26.3</td>
</tr>
<tr>
<td>Advanced degree</td>
<td>85</td>
<td>27.2</td>
</tr>
</tbody>
</table>

If you have an advanced degree, please specify your highest degree.

<table>
<thead>
<tr>
<th>Degree</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Master’s degree</td>
<td>72</td>
<td>23.1</td>
</tr>
<tr>
<td>Specialist degree</td>
<td>1</td>
<td>0.3</td>
</tr>
<tr>
<td>Professional degree (DDS, JD, MD)</td>
<td>9</td>
<td>2.9</td>
</tr>
<tr>
<td>Doctorate degree (Ph.D., Ed.D.)</td>
<td>3</td>
<td>1.0</td>
</tr>
</tbody>
</table>
Instruments

Individuals who consented to participate in the present study completed two instruments. The first instrument was the TechnoWellness Inventory (TWI), a new assessment instrument that was developed by the author of the study to measure TechnoWellness. The second instrument was the Five Factor Wellness Inventory, Adult (5F-Wel-A), an assessment instrument that measures wellness as it is defined in the IS-Wel (Myers & Sweeney, 2008a). Demographic information was collected using questions that are included in the 5F-Wel-A. Myers and Sweeney (2008a) provided evidence of the 5F-Wel-A’s reliability and validity, whereas the present study is the first step in developing and validating the TWI.

TechnoWellness Inventory (TWI)

The TWI is a self-administered instrument that is designed to assess an adult’s TechnoWellness. Providing an empirical basis for items is a recommended practice when developing a new instrument (Heppner et al., 2008; Osipow, 1991), so all items on the TWI describe distinct types of interactions with technology identified in the studies summarized in Chapter 2. Fifty items on the TWI describe beneficial interactions with technology, and 35 items describe adverse interactions with technology. Most items are written in the first person. For example, the item “I use technology to stay in touch with family members” describes a beneficial use of technology, and the item “I often miss meals when I play video games or online games” describes an adverse response to technology use. All items on the TWI are included in Appendix B. A Flesch-Kincaid Grade Level test conducted through
Microsoft Word estimated the TWI’s reading level as 7.9, which suggests that the instrument is close to the eighth-grade reading level.

When researchers are developing a new assessment instrument, recruiting a panel of experts to review items and also pilot testing the items can enhance the instrument’s content validity (Lee & Lim, 2008; Pett, Lackey, & Sullivan, 2003). The researcher therefore recruited a panel of three experts in wellness counseling to review the first version of the TWI. The expert reviewers were asked to provide feedback about whether the items depict the content being tested and can be clearly interpreted (Lee & Lim, 2008). Information about the expert reviewers and a list of the questions that guided their review are found in Appendix C. Two additional items suggested by the panel of experts and supported by the literature were subsequently added to the TWI.

To pilot test the directions and items on the TWI, a class of 20 undergraduate college students was invited to complete the TWI and a follow-up survey about the clarity of the directions and the items on the instrument. Since these individuals completed the entire instrument from the perspective of a participant, they were asked to help identify items that are worded ambiguously or unclearly (Lee & Lim, 2008; Pett et al., 2003). Items on the TWI that seem problematic could therefore be reworded or removed before the instrument was finalized and given to the participants in the present study. The survey used in the pilot test is located in Appendix D.

Twelve individuals (60%) consented to participate in the pilot testing. All of the participants were between 20 and 23 years old, and all of them had previously earned a high
school diploma or an associate’s degree. The sample included nine women and three men. Three participants identified their cultural background as African American, and the rest identified as Caucasian. Eight participants reported that they work part-time, and the other four were not currently employed.

The results of the pilot test indicated that the TWI did not need to be edited before proceeding with the present study. Eleven participants (91.67%) thought that the introductory paragraph adequately explained the purpose of the instrument and that the term “technology” was clearly defined. All twelve participants agreed that the directions for completing the instrument were clear and easy to understand, and ten participants (83.33%) thought that all of the items on the TWI were written clearly and easy to understand. The only survey question where a majority of the participants offered constructive feedback was the question, “Do any items on the TWI seem redundant?” Seven participants (58.33%) thought that some items on the TWI were redundant, and questions focusing on exercise, spiritual beliefs, and communicating with family were cited as examples of similar items. Nevertheless, since some items on a new instrument are typically removed as the instrument is tested (Lee & Lim, 2008), all 85 of the original items were retained for the present study. The average time to finish the TWI in the pilot test was 13.08 minutes.

Participants completing the TWI receive a Total TechnoWellness score that is based on the 85 items. To allow the TWI to measure TechnoWellness in the same way that the 5F-Wel-A measures holistic wellness (Myers & Sweeney, 2008a), each item on the TWI is scored on a four-point Likert scale. For each item on the instrument, participants select
Strongly Agree, Agree, Disagree, or Strongly Disagree. If an item describes a beneficial interaction with technology, such as “I find computers useful in my work,” the participant’s score ranges from 1 for Strongly Disagree to 4 for Strongly Agree. Scoring is reversed for the items that describe adverse interactions with technology, such as “I often miss meals when I play video games or online games”; a score ranges from 1 for Strongly Agree to 4 for Strongly Disagree. To produce a Total TechnoWellness score on a scale that is comparable to the scale used for the Total Wellness score on the 5F-Wel-A (Myers & Sweeney, 2008a), the raw score is divided by the number of items to get the mean, which is multiplied by 25. Scale scores therefore range from 25 to 100 with a higher score representing more adaptive use of technology and a higher level of TechnoWellness.

**Five Factor Wellness Inventory, Adult (5F-Wel-A)**

The Five Factor Wellness Inventory, Adult (5F-Wel-A) is based on the IS-Wel and measures an individual’s wellness (Myers & Sweeney, 2008a). Myers and Sweeney (2008a) reported that the 5F-Wel-A is appropriate for adult participants since it requires a ninth-grade reading level while the versions for adolescents (5F-Wel-T) and children (5F-Wel-E) require sixth- and third-grade reading levels respectively. The 5F-Wel-A includes 73 items based on the second- and third-order factors in the IS-Wel. Seventeen additional items measure contextual variables described in the IS-Wel, and eight items collect demographic information, as described in the next section.

The 5F-Wel-A is a self-administered assessment instrument that can usually be completed within 10 to 20 minutes (Myers & Sweeney, 2008a). Participants read items that
are most often written in the first person, such as “I am usually aware of how I feel about things” and “I eat at least three meals a day including breakfast.” For each item, a participant chooses Strongly Agree, Agree, Disagree, or Strongly Disagree. The 73 factor-based items are used to calculate a Total Wellness score, scores for the second-order Coping Self, Creative Self, Essential Self, Physical Self, and Social Self factors, and scores that measure each of the third-order factors in the IS-Wel: Thinking, Emotions, Control, Work, Positive Humor, Leisure, Stress Management, Self-Worth, Realistic Beliefs, Friendship, Love, Spirituality, Gender Identity, Cultural Identity, Self-Care, Exercise, and Nutrition. For consistency, each score on the 5F-Wel-A is converted to a scaled score that ranges from 25 to 100. A score of 100 therefore represents optimal wellness in a given area (Myers & Sweeney, 2008a).

Myers and Sweeney (2008a) reported that 3,343 adults were in the norm group that was used to develop the 5F-Wel-A. To provide evidence of internal consistency reliability, Myers and Sweeney calculated Cronbach’s alphas for the scales included on the 5F-Wel-A. The alpha values were .89 for the Coping Self, .96 for the Creative Self, .95 for the Essential Self, .90 for the Physical Self, .96 for the Social Self, and .98 for Total Wellness. Among the third-order factors, the lowest coefficient was .58 for Realistic Beliefs, and all other alpha values were .82 or higher. The coefficients for contextual variables were .74 for the Local Context, .73 for the Institutional Context, .66 for the Global Context, and .79 for the Chronometrical Context.
In their description of the 5F-Wel-A’s construct validity, Myers and Sweeney (2008a) discussed research by Hattie et al. (2004) that was used to develop the instrument. Using the Wellness Evaluation of Lifestyle (WEL) created by Myers et al. (1996), Hattie et al. (2004) created a structural equation model that was used for a confirmatory factor analysis. Each item on the instrument was loaded on its anticipated subscale, and the subscales were then loaded on the five second-order factors. The standardized factor loadings were between .35 and .91, and all were statistically significant (Myers & Sweeney, 2008a). The second-order factors were then loaded on an overarching factor that Hattie et al. (2004) named “Wellness.” Myers and Sweeney reported that these standardized factor loadings ranged from .51 to .98 and were significant. A Root Mean Square Error of Approximation (RMSEA) goodness of fit index was .042 (Chi Square = 8261, df = 2533), which showed that the model fit the data acceptably (Myers & Sweeney, 2008a).

**Demographic Survey**

The 5F-Wel-A includes survey questions that were used to collect demographic information about participants. At the beginning of the instrument, participants completed ten survey questions that focused on demographics. These questions provided data about participants’ age, country of residence, marital status, current employment status, status as a student, highest level of education completed, type of advanced degree (if applicable), biological sex, primary cultural background (race/ethnicity), and sexual/affectional orientation. All questions except age and country of residence were multiple choice, and
participants were asked to select the best option. The demographic survey questions are included in Appendix E.

**Procedure**

**Data Collection**

Participants completed all of the instruments online. The TWI and 5F-Wel-A were available on Qualtrics, a website that hosts online surveys. After participants reviewed the Informed Consent form and agreed to participate in the study, they completed the demographic survey first, followed by the TWI and the 5F-Wel-A. If participants decided that they did not want to complete the instruments, they were permitted to leave the Qualtrics website at any time. Data analyses did not include the 54 incomplete surveys or the 32 complete surveys removed because of concerns that were described in the Participants section.

**Data Analyses**

The data analyses in the present study corresponded to the research questions described in Chapter 1. The six secondary research questions were examined with the goal of answering the Primary Research Question: Is there a relationship between individuals’ TechnoWellness and their holistic wellness? Table 2 provides a summary of the six secondary research questions, the corresponding research hypotheses, procedures that were used to analyze the data, and the variables used in each analysis.
<table>
<thead>
<tr>
<th>Research Question</th>
<th>Hypothesis</th>
<th>Analyses</th>
<th>Variables</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Secondary Research Question 1:</strong> Does the TechnoWellness construct include the same five second-order factors identified in the Indivisible Self Model of Wellness (IS-Wel): Coping, Creative, Essential, Physical, and Social factors?</td>
<td>Items in the TWI will load onto Coping, Creative, Essential, Physical, and Social factors.</td>
<td>Exploratory factor analysis</td>
<td>TWI item scores</td>
</tr>
<tr>
<td><strong>Secondary Research Question 2:</strong> Is the new instrument used to assess TechnoWellness a reliable measure of the construct?</td>
<td>The internal consistency of the TWI and its scales will be .70 or higher, demonstrating reliability.</td>
<td>Cronbach’s alpha</td>
<td>TWI item scores</td>
</tr>
<tr>
<td><strong>Secondary Research Question 3:</strong> Are participants’ Total TechnoWellness scores on the TWI significantly correlated with their Total Wellness scores as measured by the 5F-Wel-A, thereby suggesting a relationship between TechnoWellness and holistic wellness?</td>
<td>TWI Total TechnoWellness scores will be a significant predictor of 5F-Wel-A Total Wellness scores ($p &lt; .05$).</td>
<td>Linear regression</td>
<td>TWI Total TechnoWellness score (IV); 5F-Wel-A Total Wellness score (DV)</td>
</tr>
<tr>
<td><strong>Secondary Research Question 4:</strong> In cases where the TWI and 5F-Wel-A include equivalent factors, are there significant correlations between scale scores on the TWI and 5F-Wel-A?</td>
<td>TWI scale scores will be a significant predictor of corresponding 5F-Wel-A scale scores ($p &lt; .05$).</td>
<td>Linear regression</td>
<td>TWI scale scores (IV); 5F-Wel-A scale scores (DV)</td>
</tr>
<tr>
<td><strong>Secondary Research Question 5:</strong> Do any TWI scales predict Total Wellness scores on the 5F-Wel-A, thereby indicating a relationship between a TechnoWellness factor and holistic wellness?</td>
<td>Scores on all TWI scales will be significant predictors ($p &lt; .05$) of Total Wellness scores.</td>
<td>Multiple regression</td>
<td>TWI scale scores (IV); 5F-Wel-A Total Wellness score (DV)</td>
</tr>
</tbody>
</table>
Table 2 (cont.)

<table>
<thead>
<tr>
<th>Research Question</th>
<th>Hypothesis</th>
<th>Analyses</th>
<th>Variables</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Secondary Research Question 6:</strong> To refine the TWI, which of its items should be revised, deleted, or moved to a different scale?</td>
<td>Most items that have cross loadings or moderate factor loadings or that are identified as misplaced will have a strong enough loading on an appropriate factor to retain the items after editing. Most items with weak factor loadings will be marginally associated with the factors and will need to be deleted.</td>
<td>Review of items that have cross loadings, moderate or weak factor loadings, or that seem misplaced.</td>
<td>TWI items</td>
</tr>
</tbody>
</table>

*Note.* TWI = TechnoWellness Inventory
**Exploratory factor analysis of the TWI.** The first of the secondary research questions in the present study was focused on the structure of the TechnoWellness construct. Research discussed in the literature review provided evidence that the TechnoWellness construct may include Coping, Creative, Essential, Physical, and Social factors. This structure was nevertheless theoretical, and a procedure to identify the actual structure of TechnoWellness was needed. An exploratory factor analysis was therefore used to identify factors within the TWI. Based on the literature review and the IS-Wel’s proposed structure of wellness, it was hypothesized that items on the TWI would load onto Coping, Creative, Essential, Physical, and Social factors. If the exploratory factor analysis showed that items in the TWI loaded onto a different combination of factors or only onto a single factor, it would suggest that the construct has a different structure.

Factor analyses are typically used to establish the construct validity of a new instrument, and an exploratory factor analysis is usually conducted first to establish the factor structure of a construct (Lee & Lim, 2008; Pett et al., 2003; Thompson, 2004). After the instrument is revised based on the results of the exploratory factor analysis, it can be administered to a second sample, and a confirmatory factor analysis can validate the factor structure (Lee & Lim, 2008). Since the present investigation is the first study of the TWI, the exploratory factor analysis was used to provide evidence of the factors within the construct and establish scales for the TWI. If any of the proposed five factors was not present, the TWI would not include scales for those factors. If certain items on the TWI did not have a high level of correlation with the existing factors, those items could be removed following
the study. Of the data analyses used in the present study, the exploratory factor analysis was performed first since it would be used to create the TWI scales that are included in the analyses for Secondary Research Questions 4 and 5.

**Internal consistency reliability of the TWI.** Secondary Research Question 2 addressed the reliability of the TWI. An assessment instrument is not valid if it does not provide a reliable measure of the construct (Heppner et al., 2008; Osipow, 1991), so a test of the TWI’s reliability was necessary. When a new instrument is being developed, Cronbach’s alpha is commonly used as an estimate of reliability (Heppner et al., 2008). Lee and Lim (2008) observed that calculating a Cronbach’s alpha can demonstrate the internal consistency of a set of items since a participant’s scores on items measuring the same construct should typically covary. A Cronbach’s alpha was therefore calculated for the entire TWI instrument and for TWI scales that were established following the exploratory factor analysis. In the social sciences, an alpha of .70 or higher is usually required to demonstrate internal consistency (Lee & Lim, 2008). If the Cronbach’s alpha for the TWI or one of its scales would be above .70, this result would provide evidence that the items on the instrument or the scale are relatively homogenous and are measuring the same construct (Heppner et al., 2008). Evidence of the TWI’s reliability in the present study would help to establish the instrument’s psychometric properties as it is developed into a formal assessment instrument in subsequent studies.

**Regression analyses of the TWI and the 5F-Wel-A.** Secondary Research Questions 3, 4, and 5 addressed potential correlations between participants’ scores on the TWI and the
5F-Wel-A. The TWI and the 5F-Wel-A each provides a summative score: the Total TechnoWellness score on the TWI and the Total Wellness score on the 5F-Wel-A. A significant correlation between participants’ Total TechnoWellness and Total Wellness scores would answer Secondary Research Question 3 by indicating a relationship between TechnoWellness and holistic wellness. It was hypothesized that the TWI’s Total TechnoWellness score would be a significant predictor of the Total Wellness score on the 5F-Wel-A and that scores would be positively correlated.

The TWI would include Coping, Creative, Essential, Physical, and Social scales if those factors emerged during the exploratory factor analysis. Items that loaded on one of those five factors would be placed into a TWI scale, and scores on that scale would be compared to scores on the corresponding 5F-Wel-A scale. For example, if TWI items load on a Social factor, those items would be included in a TWI Social Scale that would be compared to the 5F-Wel-A’s Social Self scale. Significant correlations between two corresponding scales on the TWI and 5F-Wel-A would suggest a relationship between the TWI and 5F-Wel-A factors. Based on the literature review that found evidence of this relationship in all five areas, it was hypothesized that the TWI would include Coping, Creative, Essential, Physical, and Social scales and that scores on each scale would correlate significantly with scores from its counterpart on the 5F-Wel-A.

Regression is used to identify whether one or more independent variables predict a dependent variable (Harris, 1998), so the procedure was used to determine whether scores on the TWI predict scores on the 5F-Wel-A. Linear regression can examine whether there is a
relationship between one independent variable and one dependent variable (Harris, 1998), so it was used to determine whether Total TechnoWellness scores on the TWI predict Total Wellness scores on the 5F-Wel-A. A significant relationship \((p < .05)\) between participants’ Total TechnoWellness scores and their Total Wellness scores would support the hypothesized outcome for Secondary Research Question 3. Linear regressions would also be used to identify significant relationships between TWI and 5F-Wel-A scales in the Coping, Creative, Essential, Physical, and Social domains. Significant relationships \((p < .05)\) between any corresponding scales would support the research hypothesis for Secondary Research Question 4.

To determine whether scores on some TWI scales are greater predictors of 5F-Wel-A Total Wellness scores than others, two multiple regression analyses were conducted. Hierarchical multiple regression allows a researcher to input several predictor variables in a specified order and identify each variable’s contribution to the variance in a dependent variable (Heppner et al., 2008). Scores from each of the TWI scales were therefore entered into the regression equation with 5F-Wel-A Total Wellness scores as the dependent variable. The order of entry was determined by the size of the scale with the largest TWI scales entered first. Because hierarchical regression requires adding predictors according to theory, and the theoretical and empirical literature on TechnoWellness factors as predictors of holistic wellness is limited, a stepwise multiple regression was run as well as to provide additional insight about the relationships between the predictor variables and the dependent variable. Stepwise regression is sample-sensitive, so the results are interpreted as
exploratory, but are presented to promote theory building and testing of the relationships in
future investigations. Predictor variables were entered in the order of the amount of variance
in 5F-Wel-A Total Wellness scores that they explained ($R^2$), and variables that would not
cause a statistically significant increase in $R^2$ were not entered (Heppner et al., 2008).

The multiple regression analyses were used to determine whether all of the TWI
scales are significant predictors of holistic wellness as measured by the 5F-Wel-A. If only
some of the TWI scales predicted Total Wellness, this outcome would suggest that some
factors within the TechnoWellness construct are related to holistic wellness while others are
not. In addition, if some TWI scales explained a greater proportion of the variance in Total
Wellness scores, these results would suggest that some TechnoWellness factors have a
stronger relationship with holistic wellness. The hypothesized outcome for Research
Question 5 was that all of the newly created TWI scales would be significant predictors ($p <
.05$) of Total Wellness and would explain similar proportions of the variance in Total
Wellness.

Revisions of the TWI. Following an exploratory factor analysis of a new assessment
instrument, it is critical to revise or delete items that are not strongly correlated with one of
the factors (Lee & Lim, 2008). Secondary Research Question 6 considered which TWI items
should be revised, deleted, or moved to a different TWI scale. Four categories of potentially
problematic items were reviewed: cross-loaded items, items with moderate factor loadings,
items with weak factor loadings, and misplaced items. It was hypothesized that most items
with weak factor loadings would be deleted whereas most items in the other three categories would be revised and retained.

Cross-loaded items are items with a strong loading (≥ .40) on more than one factor (Cabrera-Nguyen, 2010; Pett et al., 2003), and they can be problematic because the item’s highest loading may not be on the factor that it is most related to conceptually (Pett et al., 2003). Items that had a strong loading (≥ .40) on more than one factor were identified as cross-loaded and reviewed (Pett et al., 2003). The goal of this analysis was to determine whether each item had a stronger conceptual relationship with another factor on which it loaded. In these situations, the conceptual relationship would be given precedence and the item would be moved to the appropriate TWI scale.

Factor loadings lower than .40 are not considered strong, but loadings that are close to that criterion may be considered moderate (Thompson, 2004). In some cases, an item with a moderate loading may have a strong enough relationship to a factor that it should be revised instead of deleted (Pett et al., 2003). One common criterion for a moderate factor loading is .35 (Thompson, 2004), so items with a factor loading in the .35-.39 range were therefore subject to the same type of review that the cross-loaded items received. In contrast to items with moderate factor loadings, those with weak factor loadings are unlikely to be associated with any of the identified factors (Pett et al., 2003). In the present study, items with no factor loadings above .35 were considered to be items with weak loadings (Thompson, 2004). Such items were reviewed, but were generally subject to deletion.
Even when an item loads strongly on a particular factor, it is important to review the item and determine whether the item is truly representative of that factor. In some cases, an item may need to be removed from a particular scale so that the scale will represent a consistent content area (Pett et al., 2003). If the misplaced item has a moderate factor loading on another factor and also has a strong conceptual relationship with that factor, Pett et al. (2003) suggested that it is possible to move the item to the second scale. Each item that was placed within a TWI scale following the exploratory factor analysis was therefore reviewed, and the wording and scale placement of items that seemed misplaced were reevaluated. After cross-loaded items, items with moderate factor loadings, items with weak factor loadings, and misplaced items were analyzed individually and edited if necessary, the items that were not deleted were incorporated into the revised TWI.

**Summary**

The present study operationalized the TechnoWellness construct by developing and refining the TWI, an instrument designed to assess TechnoWellness. A sample of 312 participants recruited from Qualtrics Panels and FindParticipants completed online versions of the TWI and the 5F-Wel-A instruments on the Qualtrics website. Data analyses included an exploratory factor analysis to examine the factor structure of TechnoWellness and create scales for the TWI, calculating Cronbach’s alphas to verify the internal consistency reliability of the TWI, and linear and multiple regression analyses to determine whether TWI scores predicted 5F-Wel-A scores. To refine the TWI before the next study of the instrument, items that did not load strongly on a single factor or that did not seem to represent their assigned
scale were reviewed to determine whether they should be revised or deleted. It is expected that the current study will be the first of several studies that will validate the TWI and demonstrate that it can be used to operationalize the TechnoWellness construct. The results of the present study will be used to adjust the TWI items and scales so that future studies can focus on confirming its reliability and validity.
CHAPTER 4

RESULTS

This chapter presents the results of the statistical procedures described in Chapter 3. All procedures used data from a sample of 312 participants. An exploratory factor analysis of participants’ TWI scores was used to address Secondary Research Question 1 and determine the number of interpretable factors as well as which items loaded strongly on those factors. Each factor was defined, and five TWI scales were created to include items that loaded on the corresponding factors. Next, Cronbach’s alpha coefficients for the TWI and its new scales were calculated to answer Secondary Research Question 2 and establish estimates of the internal consistency reliability of the TWI. To respond to Secondary Research Question 3, TWI Total TechnoWellness scores were regressed on 5F-Wel-A Total Wellness scores to determine whether a measure of TechnoWellness predicted holistic wellness. A simple linear regression was used to address Secondary Research Question 4 and identify the relationship between two equivalent TWI and 5F-Wel-A scales. Hierarchical and stepwise multiple regressions were conducted to answer Secondary Research Question 5 and establish whether all of the TWI scales predicted holistic wellness as measured by 5F-Wel-A Total Wellness scores. Finally, Secondary Research Question 6 was addressed by revising or deleting TWI items that did not load strongly on a single factor or that seemed misplaced within their current scale.
Exploratory Factor Analysis of the TWI

Factor Extraction

The goal of an exploratory factor analysis is to obtain a simple factor structure where each item loads only onto the most appropriate factor (Thompson, 2004). The first step in an exploratory factor analysis is to determine the number of factors that will be extracted (Pett et al., 2003). Factors are extracted by order of how much variability in scores they can explain, and the variability of each factor is calculated as an eigenvalue (Green & Salkind, 2011). SPSS, a statistics software program, was used to conduct an initial factor extraction on the TWI data ($N = 312$), and Table 3 shows the first 20 factors identified in the initial extraction.
Table 3
Initial Factor Extraction of TechnoWellness Inventory (TWI) Scores (N = 312)

<table>
<thead>
<tr>
<th>Factor</th>
<th>Eigenvalue</th>
<th>% of Variance</th>
<th>Cumulative % of Variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>21.230</td>
<td>24.976</td>
<td>24.976</td>
</tr>
<tr>
<td>2</td>
<td>8.958</td>
<td>10.539</td>
<td>35.515</td>
</tr>
<tr>
<td>3</td>
<td>2.873</td>
<td>3.380</td>
<td>38.895</td>
</tr>
<tr>
<td>4</td>
<td>2.822</td>
<td>3.320</td>
<td>42.215</td>
</tr>
<tr>
<td>5</td>
<td>2.318</td>
<td>2.727</td>
<td>44.942</td>
</tr>
<tr>
<td>6</td>
<td>1.995</td>
<td>2.347</td>
<td>47.289</td>
</tr>
<tr>
<td>7</td>
<td>1.800</td>
<td>2.117</td>
<td>49.406</td>
</tr>
<tr>
<td>8</td>
<td>1.685</td>
<td>1.983</td>
<td>51.389</td>
</tr>
<tr>
<td>9</td>
<td>1.560</td>
<td>1.835</td>
<td>53.224</td>
</tr>
<tr>
<td>10</td>
<td>1.498</td>
<td>1.763</td>
<td>54.987</td>
</tr>
<tr>
<td>11</td>
<td>1.386</td>
<td>1.631</td>
<td>56.618</td>
</tr>
<tr>
<td>12</td>
<td>1.350</td>
<td>1.589</td>
<td>58.207</td>
</tr>
<tr>
<td>13</td>
<td>1.254</td>
<td>1.475</td>
<td>59.682</td>
</tr>
<tr>
<td>14</td>
<td>1.220</td>
<td>1.435</td>
<td>61.117</td>
</tr>
<tr>
<td>15</td>
<td>1.143</td>
<td>1.345</td>
<td>62.462</td>
</tr>
<tr>
<td>16</td>
<td>1.066</td>
<td>1.255</td>
<td>63.717</td>
</tr>
<tr>
<td>17</td>
<td>1.060</td>
<td>1.247</td>
<td>64.964</td>
</tr>
<tr>
<td>18</td>
<td>1.035</td>
<td>1.218</td>
<td>66.181</td>
</tr>
<tr>
<td>19</td>
<td>.999</td>
<td>1.175</td>
<td>67.356</td>
</tr>
<tr>
<td>20</td>
<td>.964</td>
<td>1.134</td>
<td>68.490</td>
</tr>
</tbody>
</table>
After the initial factor extraction, an appropriate number of factors must be selected to use in a factor rotation (Pett et al., 2003). Multiple criteria have been recommended (Pett et al., 2003; Thompson, 2004), and the most common practice is to eliminate eigenvalues that are less than 1 (Green & Salkind, 2011). However, excluding only these eigenvalues may overestimate the number of factors (Dimitrov, 2012), and this method may not lead to a meaningful data reduction especially when there are more than 40 variables (Pett et al., 2003). If all factors with an eigenvalue greater than 1 were selected for the present analysis, 18 factors would be considered. Pett et al. (2003) suggested that researchers also evaluate the percentage of variance extracted and review a scree plot.

There is no definitive threshold for the maximum variance that should be extracted in a factor analysis (Pett et al., 2003). Although researchers in the natural sciences often continue extracting factors until at least 90% of the variance has been explained, in the social sciences extracted factors often account for 50-60% of the variance. Another strategy is to stop extraction when the last factor accounts for less than 5% of the variance (Pett et al., 2003). In the present study, only the first two factors met the 5% criterion, but those factors explained less than 40% of the variance. As a result, reviewing the amount of variance extracted did not provide a definitive number of factors to consider.

A scree plot of the eigenvalues can also provide insights about the number of factors that should be extracted (Dimitrov, 2012; Pett et al., 2003). After visually approximating where the eigenvalues level off and are at a similar slope, a researcher can use the number of eigenvalues in the steep part of the plot to identify an appropriate number of factors. Green
and Salkind (2011) proposed that this method often yields the most accurate results. As shown in Figure 1, in the present study the slope was steepest between the first and third eigenvalues, and the slope between the fourth and fifth eigenvalues was also visibly steeper. After the fifth or sixth eigenvalue, the slope appeared to level off. To more precisely estimate the number of factors, factor rotations were conducted using five factors, six factors, and seven factors (Green & Salkind, 2011).

Figure 1. Scree plot of the eigenvalues from the exploratory factor analysis of the TWI.
**Factor Rotation**

An exploratory factor analysis tests how strongly the items on an instrument load on each factor, and a loading is considered strong if the absolute value is equal to or above .40 (Pett et al., 2003). The use of orthogonal versus oblique factor rotations has been debated since each approach offers advantages and disadvantages (Pett et al., 2003; Cabrera-Nguyen, 2010), but Thompson (2004) suggested that a varimax rotation, which is the most common form of orthogonal rotation, will yield a simple factor structure in approximately 85% of exploratory factor analyses. Pett et al. (2003) recommended that researchers conduct separate analyses using orthogonal and oblique rotations to compensate for the limitations of each approach. An orthogonal rotation was therefore selected for this initial study, and a varimax rotation was completed using SPSS (Green & Salkind, 2011).

After reviewing each factor loading from the five-, six-, and seven-factor models, the five-factor model was deemed to have the most appropriate structure. Although the hypothesized Coping, Creative, Essential, Physical, and Social factors were not found, each of the five identified factors could be interpreted based on the items that loaded on it. In the six-factor model, no items had strong loadings (≥ .40) on the sixth factor. Similarly, the seven-factor model included no strong loadings (≥ .40) on either the sixth or seventh factor. The five-factor model accounted for 41.56% of the variance in TWI scores, and an observable theme was used to name each of the five factors. Only three of the 85 items (3.5%) loaded strongly on more than one factor; only twelve items (14.11%) did not load strongly on any factor; and only five items (5.88%) were identified as misplaced items that
loaded on a factor but were not consistent with the factor’s theme. It therefore seemed that an interpretable factor structure was achieved using the five-factor model with an orthogonal rotation (Thompson, 2004).

Factors

Factor 1: Using Technology for Leisure

Factor 1 accounted for 16.79% of the variance in TWI scores. Thirty-eight items loaded on Factor 1, representing 44.71% of the 85-item TWI. Items that loaded onto the factor describe a variety of interactions with technology, including most items that were expected to load onto the hypothesized Coping, Essential, and Social factors. A unifying theme was that these items described technology use that typically is not work related, whereas most items describing vocational technology use loaded on Factor 2 or Factor 5. Only one item referencing work (80. I feel more motivated to complete my work when I use some types of technology) loaded on Factor 1, and that item also focused on a positive emotion (motivation).

Adler (1927) identified leisure and work as separate life tasks, and both work and leisure were presented as third-order factors in the IS-Wel model (Myers & Sweeney, 2005c). Although leisure is widely associated with activities that a person does for enjoyment, career theorists often define as leisure all of a person’s activities that exclude work-related tasks and maintenance tasks such as sleeping and eating (Kabanoff, 1980). Items focusing on using technology to interact with friends and family (1, 5, 9, 13, 24, 26, 29, 35, 49, 55, 73, 82, 83), develop one’s identity (4, 13, 21, 25, 37, 42, 48, 67, 69, 71),
experience positive thoughts and emotions (3, 10, 16, 20, 61, 68, 80), and relax or manage stress (36, 46, 54, 66) therefore fit under the theme of leisure. Most TWI items related to leisure activities loaded on Factor 1, but items related to exercise loaded on Factor 3.

Table 4 identifies the TWI items that loaded on Factor 1, and it includes the mean (M), standard deviation (SD), and factor loadings for each item. Mean scores ranged from 1 to 4, and they represent the mean number of points that participants earned towards their Total TechnoWellness scores on that item. Items describing maladaptive items were reverse scored, and those items are marked with an asterisk. Two items (25, 67) were identified as items that also loaded strongly on a second factor. Items 25 and 67 were therefore examples of cross loading, a potentially problematic issue that is addressed later in this chapter (Pett et al., 2003).
Table 4
*TWI Items Loading on Factor 1*

<table>
<thead>
<tr>
<th>TWI Item #</th>
<th>TWI Item</th>
<th>M</th>
<th>SD</th>
<th>F1</th>
<th>F2</th>
<th>F3</th>
<th>F4</th>
<th>F5</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>I use technology to stay in touch with family members.</td>
<td>3.32</td>
<td>.785</td>
<td>.505</td>
<td>.079</td>
<td>.049</td>
<td>-.138</td>
<td>-.013</td>
</tr>
<tr>
<td>3.</td>
<td>I use websites with content that is funny without being hurtful.</td>
<td>2.92</td>
<td>.829</td>
<td>.433</td>
<td>.021</td>
<td>.119</td>
<td>-.143</td>
<td>.280</td>
</tr>
<tr>
<td>4.</td>
<td>I find information online that helps me appreciate my culture.</td>
<td>2.77</td>
<td>.800</td>
<td>.516</td>
<td>.043</td>
<td>.154</td>
<td>-.077</td>
<td>.209</td>
</tr>
<tr>
<td>5.</td>
<td>I spend more time communicating with friends online than in person.*</td>
<td>2.46</td>
<td>.931</td>
<td>-.427</td>
<td>.170</td>
<td>-.073</td>
<td>.269</td>
<td>-.058</td>
</tr>
<tr>
<td>9.</td>
<td>I use technology to connect with new friends I have met in person.</td>
<td>2.78</td>
<td>.882</td>
<td>.674</td>
<td>.028</td>
<td>.199</td>
<td>-.084</td>
<td>.164</td>
</tr>
<tr>
<td>10.</td>
<td>Learning to use new technologies makes me feel good about myself.</td>
<td>3.09</td>
<td>.713</td>
<td>.477</td>
<td>.214</td>
<td>.170</td>
<td>-.233</td>
<td>.205</td>
</tr>
<tr>
<td>13.</td>
<td>Participating in online groups helps me to be proud of who I am.</td>
<td>2.40</td>
<td>.883</td>
<td>.657</td>
<td>.171</td>
<td>-.167</td>
<td>.173</td>
<td>.039</td>
</tr>
</tbody>
</table>
Table 4 (cont.)

<table>
<thead>
<tr>
<th>TWI Item #</th>
<th>TWI Item</th>
<th>M</th>
<th>SD</th>
<th>F1</th>
<th>F2</th>
<th>F3</th>
<th>F4</th>
<th>F5</th>
</tr>
</thead>
<tbody>
<tr>
<td>16.</td>
<td>I feel a sense of community when I participate in an online group.</td>
<td>2.63</td>
<td>.842</td>
<td>.685</td>
<td>-.147</td>
<td>.125</td>
<td>-.101</td>
<td>-.008</td>
</tr>
<tr>
<td>19.</td>
<td>I feel uncomfortable when I cannot check my social networking sites.*</td>
<td>3.07</td>
<td>.888</td>
<td>-.507</td>
<td>.247</td>
<td>-.152</td>
<td>.346</td>
<td>-.010</td>
</tr>
<tr>
<td>20.</td>
<td>Spending time online can be intellectually stimulating.</td>
<td>3.11</td>
<td>.596</td>
<td>.399</td>
<td>.178</td>
<td>.028</td>
<td>-.263</td>
<td>.288</td>
</tr>
<tr>
<td>21.</td>
<td>Communicating with others online gives me a stronger sense of cultural identity.</td>
<td>2.34</td>
<td>.870</td>
<td>.711</td>
<td>-.184</td>
<td>.191</td>
<td>-.059</td>
<td>.028</td>
</tr>
<tr>
<td>24.</td>
<td>I use technology to strengthen my relationships with family members.</td>
<td>2.71</td>
<td>.870</td>
<td>.630</td>
<td>-.025</td>
<td>.111</td>
<td>.001</td>
<td>.204</td>
</tr>
<tr>
<td>25.</td>
<td>Using some apps helps me to reflect about my spiritual beliefs.†</td>
<td>1.96</td>
<td>.957</td>
<td>.502</td>
<td>-.169</td>
<td>.452</td>
<td>-.001</td>
<td>-.135</td>
</tr>
<tr>
<td>26.</td>
<td>I find communicating with friends online easier than communicating with friends in person.*</td>
<td>2.67</td>
<td>.884</td>
<td>-.441</td>
<td>.277</td>
<td>-.034</td>
<td>.242</td>
<td>-.036</td>
</tr>
<tr>
<td>TWI Item #</td>
<td>TWI Item</td>
<td>M</td>
<td>SD</td>
<td>F1</td>
<td>F2</td>
<td>F3</td>
<td>F4</td>
<td>F5</td>
</tr>
<tr>
<td>------------</td>
<td>---------------------------------------------------------------------------</td>
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<td>------</td>
<td>------</td>
<td>------</td>
<td>------</td>
<td>------</td>
</tr>
<tr>
<td>28.</td>
<td>I use technology to communicate with others who encourage me to be more physically well.</td>
<td>2.21</td>
<td>.893</td>
<td>.643</td>
<td>-.209</td>
<td>.260</td>
<td>-.090</td>
<td>.060</td>
</tr>
<tr>
<td>29.</td>
<td>I use technology to make new friends online.</td>
<td>2.24</td>
<td>1.015</td>
<td>.676</td>
<td>-.169</td>
<td>.148</td>
<td>-.132</td>
<td>-.077</td>
</tr>
<tr>
<td>32.</td>
<td>I like using technology to share funny experiences with others.</td>
<td>3.50</td>
<td>.626</td>
<td>.602</td>
<td>.167</td>
<td>.082</td>
<td>-.095</td>
<td>.229</td>
</tr>
<tr>
<td>35.</td>
<td>Communicating with friends online instead of in person gives me more control over the relationships.</td>
<td>2.29</td>
<td>.898</td>
<td>.460</td>
<td>-.361</td>
<td>-.052</td>
<td>-.238</td>
<td>.047</td>
</tr>
<tr>
<td>36.</td>
<td>Using some apps can be helpful in managing stressors.</td>
<td>2.51</td>
<td>.878</td>
<td>.476</td>
<td>-.111</td>
<td>.338</td>
<td>-.258</td>
<td>.047</td>
</tr>
<tr>
<td>37.</td>
<td>Social networking sites give me an opportunity to show who I am.</td>
<td>2.56</td>
<td>.950</td>
<td>.703</td>
<td>-.103</td>
<td>.145</td>
<td>-.194</td>
<td>.065</td>
</tr>
<tr>
<td>42.</td>
<td>I use technology to communicate with others about my spiritual beliefs.</td>
<td>2.04</td>
<td>.993</td>
<td>.496</td>
<td>-.274</td>
<td>.177</td>
<td>.003</td>
<td>-.073</td>
</tr>
<tr>
<td>TWI Item #</td>
<td>TWI Item</td>
<td>M</td>
<td>SD</td>
<td>F1</td>
<td>F2</td>
<td>F3</td>
<td>F4</td>
<td>F5</td>
</tr>
<tr>
<td>------------</td>
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<td>-----</td>
</tr>
<tr>
<td>46.</td>
<td>Going online to relax helps me to feel less tense.</td>
<td>2.89</td>
<td>.766</td>
<td>.452</td>
<td>.065</td>
<td>-.017</td>
<td>-.329</td>
<td>-.049</td>
</tr>
<tr>
<td>48.</td>
<td>Sharing information about my cultural identity is easier online than it is in person.*</td>
<td>2.71</td>
<td>.872</td>
<td>-.584</td>
<td>.265</td>
<td>-.017</td>
<td>.189</td>
<td>.008</td>
</tr>
<tr>
<td>49.</td>
<td>I use technology to stay in touch with close friends.</td>
<td>3.05</td>
<td>.856</td>
<td>.622</td>
<td>.110</td>
<td>.076</td>
<td>-.106</td>
<td>.203</td>
</tr>
<tr>
<td>54.</td>
<td>I go online when I am feeling sad or upset.</td>
<td>2.34</td>
<td>.864</td>
<td>.543</td>
<td>-.254</td>
<td>.112</td>
<td>-.330</td>
<td>-.050</td>
</tr>
<tr>
<td>55.</td>
<td>I use technology to strengthen my relationships with friends I have met in person.</td>
<td>2.74</td>
<td>.848</td>
<td>.664</td>
<td>-.002</td>
<td>.135</td>
<td>-.032</td>
<td>.113</td>
</tr>
<tr>
<td>58.</td>
<td>I find information online that helps me avoid risks to my safety.</td>
<td>2.71</td>
<td>.774</td>
<td>.431</td>
<td>-.092</td>
<td>.111</td>
<td>-.112</td>
<td>.098</td>
</tr>
<tr>
<td>61.</td>
<td>Going online makes me feel good about myself.</td>
<td>2.71</td>
<td>.762</td>
<td>.600</td>
<td>-.041</td>
<td>.103</td>
<td>.212</td>
<td>.016</td>
</tr>
<tr>
<td>66.</td>
<td>Participating in online support groups helps me to cope with stressful situations.</td>
<td>2.20</td>
<td>.928</td>
<td>.628</td>
<td>-.359</td>
<td>.196</td>
<td>-.163</td>
<td>-.032</td>
</tr>
<tr>
<td>TWI Item #</td>
<td>TWI Item</td>
<td>M</td>
<td>SD</td>
<td>F1</td>
<td>F2</td>
<td>F3</td>
<td>F4</td>
<td>F5</td>
</tr>
<tr>
<td>-----------</td>
<td>--------------------------------------------------------------------------</td>
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<td>-------</td>
<td>-------</td>
</tr>
<tr>
<td>67.</td>
<td>Sharing information about my gender identity is easier online than it is</td>
<td>3.01</td>
<td>.932</td>
<td>-.474</td>
<td>.440</td>
<td>-.135</td>
<td>.198</td>
<td>.066</td>
</tr>
<tr>
<td></td>
<td>in person.*†</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>68.</td>
<td>Using some types of technology helps me feel more confident about my</td>
<td>2.98</td>
<td>.724</td>
<td>.414</td>
<td>.088</td>
<td>.080</td>
<td>-.150</td>
<td>.271</td>
</tr>
<tr>
<td></td>
<td>abilities.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>69.</td>
<td>I go online for information related to my spiritual beliefs.</td>
<td>2.23</td>
<td>1.017</td>
<td>.459</td>
<td>-.199</td>
<td>.267</td>
<td>.073</td>
<td>-.091</td>
</tr>
<tr>
<td>71.</td>
<td>Communicating with others online gives me a stronger sense of gender</td>
<td>1.98</td>
<td>.912</td>
<td>.620</td>
<td>-.358</td>
<td>.217</td>
<td>-.030</td>
<td>-.093</td>
</tr>
<tr>
<td></td>
<td>identity.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>73.</td>
<td>Communicating with family and friends through social media helps me to</td>
<td>2.29</td>
<td>.928</td>
<td>.712</td>
<td>-.279</td>
<td>.174</td>
<td>-.084</td>
<td>.044</td>
</tr>
<tr>
<td></td>
<td>manage stress.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>77.</td>
<td>I use websites that focus on solving environmental problems.</td>
<td>2.18</td>
<td>.875</td>
<td>.492</td>
<td>-.204</td>
<td>.273</td>
<td>-.003</td>
<td>-.012</td>
</tr>
<tr>
<td>80.</td>
<td>I feel more motivated to complete my work when I use some types of</td>
<td>2.86</td>
<td>.839</td>
<td>.432</td>
<td>-.011</td>
<td>.111</td>
<td>-.058</td>
<td>.393</td>
</tr>
<tr>
<td>TWI Item #</td>
<td>TWI Item</td>
<td>M</td>
<td>SD</td>
<td>F1</td>
<td>F2</td>
<td>F3</td>
<td>F4</td>
<td>F5</td>
</tr>
<tr>
<td>-----------</td>
<td>--------------------------------------------------------------------------</td>
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<td>----</td>
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</tr>
<tr>
<td>82.</td>
<td>I use technology to let family members know I care about them.</td>
<td>2.73</td>
<td>.893</td>
<td>.597</td>
<td>-.078</td>
<td>.026</td>
<td>.084</td>
<td>.191</td>
</tr>
<tr>
<td>83.</td>
<td>I feel less lonely because I have online friendships that substitute for in-person friendships.*</td>
<td>3.00</td>
<td>.920</td>
<td>-.545</td>
<td>.329</td>
<td>-.020</td>
<td>.055</td>
<td>.045</td>
</tr>
</tbody>
</table>

Note. TWI = TechnoWellness Inventory; F = factor.
* The item is reverse scored, and a higher score indicates that participants agreed less with the item.
† The item had a strong loading on Factor 1 and an additional factor.
Factor 2: Technostress

Factor 2 accounted for 11.58% of the variance in scores on the TWI. Twenty-two of the 85 items (25.88%) loaded on Factor 2, and they included 21 of the 35 items (60.0%) that described negative interactions with technology. These 21 items all had strong positive loadings on Factor 2, indicating that responses to those items were positively correlated. Only one item describing a beneficial interaction with technology (76. I use technological devices that help me monitor my blood pressure or heart rate) loaded on Factor 2, and it had a strong negative loading showing that participants’ responses on that item were negatively correlated with the other 21 items.

Factor 2 was titled Technostress because most items described stress-inducing situations or negative emotions that can result from using technology. In addition to items that directly referred to stress (23, 34, 70, 76), items loading on Factor 2 mentioned worry (12), lack of motivation (14), lack of confidence (30), distraction (43, 78), lack of control (65), and guilt (84). Other items described situations such as bullying (27) and family conflict (40) that are likely to provoke stress. Furthermore, the TWI items that referred to negative outcomes other than undesirable emotions and stress mostly loaded on other factors: Factor 1 included items about technology use with negative social consequences, and Factor 4 encompassed most items about overuse of technology. Three items (36, 66, 73) referencing stress loaded on Factor 1, the Using Technology for Leisure factor, but those items described leisure activities that can help a person cope with stress. A few items that loaded on Factor 2 did not appear to fit with the Technostress theme, and the Discussion
section includes the resulting implications. The 22 items that loaded on Factor 2 are shown in Table 5.
Table 5
TWI Items Loading on Factor 2

<table>
<thead>
<tr>
<th>TWI Item #</th>
<th>TWI Item</th>
<th>M</th>
<th>SD</th>
<th>F1</th>
<th>F2</th>
<th>F3</th>
<th>F4</th>
<th>F5</th>
</tr>
</thead>
<tbody>
<tr>
<td>12.</td>
<td>I worry about my ability to use new technologies.*</td>
<td>2.92</td>
<td>0.886</td>
<td>0.015</td>
<td>0.493</td>
<td>0.119</td>
<td>0.015</td>
<td>0.107</td>
</tr>
<tr>
<td>14.</td>
<td>I feel less motivated when I need to use some types of technology for my work.*</td>
<td>3.19</td>
<td>0.753</td>
<td>0.014</td>
<td>0.583</td>
<td>-0.012</td>
<td>0.046</td>
<td>0.230</td>
</tr>
<tr>
<td>23.</td>
<td>Keeping up with email makes my work more stressful.*</td>
<td>2.96</td>
<td>0.910</td>
<td>-0.002</td>
<td>0.523</td>
<td>-0.193</td>
<td>0.121</td>
<td>-0.159</td>
</tr>
<tr>
<td>27.</td>
<td>I have experienced bullying through social media.*</td>
<td>3.46</td>
<td>0.801</td>
<td>-0.276</td>
<td>0.415</td>
<td>-0.215</td>
<td>0.123</td>
<td>0.087</td>
</tr>
<tr>
<td>30.</td>
<td>Using some types of technology makes me feel less confident about my abilities.*</td>
<td>3.06</td>
<td>0.811</td>
<td>-0.072</td>
<td>0.589</td>
<td>-0.035</td>
<td>0.106</td>
<td>0.043</td>
</tr>
<tr>
<td>34.</td>
<td>I experience stress from dealing with the demands of work-related technologies while I am at home.*</td>
<td>3.14</td>
<td>0.869</td>
<td>-0.189</td>
<td>0.621</td>
<td>-0.216</td>
<td>0.031</td>
<td>-0.195</td>
</tr>
<tr>
<td>40.</td>
<td>I have conflicts with family members about the amount of time I spend online.*</td>
<td>3.29</td>
<td>0.840</td>
<td>-0.099</td>
<td>0.442</td>
<td>-0.137</td>
<td>0.343</td>
<td>0.079</td>
</tr>
<tr>
<td>43.</td>
<td>I find keeping up with email a distraction from my work.*</td>
<td>3.03</td>
<td>0.848</td>
<td>-0.027</td>
<td>0.666</td>
<td>-0.184</td>
<td>0.090</td>
<td>-0.138</td>
</tr>
</tbody>
</table>
Table 5 (cont.)

<table>
<thead>
<tr>
<th>TWI Item #</th>
<th>TWI Item</th>
<th>M</th>
<th>SD</th>
<th>F1</th>
<th>F2</th>
<th>F3</th>
<th>F4</th>
<th>F5</th>
</tr>
</thead>
<tbody>
<tr>
<td>45.</td>
<td>I avoid using technologies I have not used before.*</td>
<td>3.00</td>
<td>.765</td>
<td>-.099</td>
<td>.442</td>
<td>-.137</td>
<td>.343</td>
<td>.079</td>
</tr>
<tr>
<td>51.</td>
<td>Having to use technology in my work can make it harder to complete.*</td>
<td>3.19</td>
<td>.850</td>
<td>-.111</td>
<td>.700</td>
<td>-.157</td>
<td>-.020</td>
<td>.126</td>
</tr>
<tr>
<td>52.</td>
<td>I think an online romantic relationship can be more gratifying than an offline romantic relationship.*</td>
<td>3.38</td>
<td>.785</td>
<td>-.363</td>
<td>.422</td>
<td>-.145</td>
<td>.150</td>
<td>.180</td>
</tr>
<tr>
<td>60.</td>
<td>Online work commitments when I am home reduce my time spent with family. *</td>
<td>2.92</td>
<td>.900</td>
<td>-.181</td>
<td>.488</td>
<td>-.102</td>
<td>.212</td>
<td>-.281</td>
</tr>
<tr>
<td>62.</td>
<td>I believe that I am unable to learn to use any new technologies.*</td>
<td>3.35</td>
<td>.843</td>
<td>.089</td>
<td>.508</td>
<td>.002</td>
<td>.070</td>
<td>.236</td>
</tr>
<tr>
<td>64.</td>
<td>I find interacting with family members online easier than communicating with them in person.*</td>
<td>2.73</td>
<td>.928</td>
<td>-.390</td>
<td>.421</td>
<td>-.048</td>
<td>.186</td>
<td>-.041</td>
</tr>
<tr>
<td>65.</td>
<td>When I use technology at work, I feel less in control of my work.*</td>
<td>3.27</td>
<td>.835</td>
<td>-.057</td>
<td>.735</td>
<td>-.074</td>
<td>.011</td>
<td>.198</td>
</tr>
<tr>
<td>65.</td>
<td>When I use technology at work, I feel less in control of my work.*</td>
<td>3.27</td>
<td>.835</td>
<td>-.057</td>
<td>.735</td>
<td>-.074</td>
<td>.011</td>
<td>.198</td>
</tr>
<tr>
<td>TWI Item #</td>
<td>TWI Item</td>
<td>M</td>
<td>SD</td>
<td>F1</td>
<td>F2</td>
<td>F3</td>
<td>F4</td>
<td>F5</td>
</tr>
<tr>
<td>-----------</td>
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</tr>
<tr>
<td>70.</td>
<td>Keeping up with social media makes my work more stressful.*</td>
<td>3.26</td>
<td>.798</td>
<td>-.169</td>
<td>.598</td>
<td>-.130</td>
<td>-.003</td>
<td>-.007</td>
</tr>
<tr>
<td>72.</td>
<td>My online activities prevent me from keeping up with work I need to do.*</td>
<td>3.13</td>
<td>.893</td>
<td>-.161</td>
<td>.603</td>
<td>-.145</td>
<td>.266</td>
<td>-.029</td>
</tr>
<tr>
<td>74.</td>
<td>My online activities prevent me from spending time with friends.*</td>
<td>3.20</td>
<td>.835</td>
<td>-.180</td>
<td>.588</td>
<td>-.147</td>
<td>.350</td>
<td>.035</td>
</tr>
<tr>
<td>75.</td>
<td>I use technological devices that help me monitor my blood pressure or heart rate.</td>
<td>1.79</td>
<td>.934</td>
<td>.232</td>
<td>-.410</td>
<td>.358</td>
<td>-.006</td>
<td>-.068</td>
</tr>
<tr>
<td>76.</td>
<td>I experience stress when I need to use new technologies.*</td>
<td>3.01</td>
<td>.871</td>
<td>-.022</td>
<td>.628</td>
<td>.082</td>
<td>-.013</td>
<td>.100</td>
</tr>
<tr>
<td>78.</td>
<td>I find keeping up social media a distraction from my work.*</td>
<td>3.09</td>
<td>.898</td>
<td>-.179</td>
<td>.609</td>
<td>-.199</td>
<td>.152</td>
<td>-.078</td>
</tr>
<tr>
<td>84.</td>
<td>I feel guilty about the amount of time I spend online.*</td>
<td>4.04</td>
<td>.855</td>
<td>-.158</td>
<td>.551</td>
<td>-.025</td>
<td>.341</td>
<td>-.076</td>
</tr>
</tbody>
</table>

*Note. TWI = TechnoWellness Inventory; F = factor.
* The item is reverse scored, and a higher score indicates that participants agreed less with the item.
Factor 3: Using Technology for Physical Health

Since Physical TechnoWellness was one of the five hypothesized factors for Research Question 1, Factor 3 is the only factor that aligned with the predicted outcome. Five of the 85 TWI items (5.88%) loaded on this factor, and it accounted for 4.95% of the variance in TWI scores. All five items clearly focused on using technology to enhance physical health. The low mean scores on the five items indicated that on average participants disagreed with the statements. Table 6 shows the items that loaded on Factor 3.

Table 6

<table>
<thead>
<tr>
<th>TWI Item #</th>
<th>TWI Item</th>
<th>M</th>
<th>SD</th>
<th>F1</th>
<th>F2</th>
<th>F3</th>
<th>F4</th>
<th>F5</th>
</tr>
</thead>
<tbody>
<tr>
<td>22.</td>
<td>I use apps that help me to exercise.</td>
<td>1.91</td>
<td>.927</td>
<td>.336</td>
<td>-.183</td>
<td>.753</td>
<td>-.162</td>
<td>.065</td>
</tr>
<tr>
<td>33.</td>
<td>I use apps that help me to track my diet.</td>
<td>1.82</td>
<td>.971</td>
<td>.236</td>
<td>-.193</td>
<td>.757</td>
<td>-.123</td>
<td>.059</td>
</tr>
<tr>
<td>44.</td>
<td>I use technology to find information about places I can go to exercise.</td>
<td>2.14</td>
<td>.940</td>
<td>.400</td>
<td>-.166</td>
<td>.540</td>
<td>-.108</td>
<td>.111</td>
</tr>
<tr>
<td>50.</td>
<td>I use apps to help me maintain a healthy weight.</td>
<td>1.84</td>
<td>.923</td>
<td>.290</td>
<td>-.197</td>
<td>.817</td>
<td>-.133</td>
<td>.012</td>
</tr>
<tr>
<td>85.</td>
<td>I go online for information about how to exercise.</td>
<td>2.29</td>
<td>.954</td>
<td>.351</td>
<td>-.102</td>
<td>.439</td>
<td>-.074</td>
<td>.196</td>
</tr>
</tbody>
</table>

Note. TWI = TechnoWellness Inventory; F = factor.
Factor 4: Excess Use of Technology

Factor 4 was named Excess Use of Technology because the items that loaded on it described situations where a person is using technology excessively. The five items represented 5.88% of the 85-item TWI, and the factor explained 4.18% of the variance in scores. Four of the items clearly described overuse of technology that could reduce wellness, but the fifth item (6. I go online for leisure and become so absorbed I lose track of time) conveyed a beneficial interaction with technology. This item was not originally written to describe excessive technology use, and unlike the other items it had a strong negative loading on the factor. The items that loaded on Factor 4 are included in Table 7.
Table 7  
*TWI Items Loading on Factor 4*

<table>
<thead>
<tr>
<th>TWI Item #</th>
<th>TWI Item</th>
<th>M</th>
<th>SD</th>
<th>F1</th>
<th>F2</th>
<th>F3</th>
<th>F4</th>
<th>F5</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.</td>
<td>I sometimes do not get enough sleep because of the time I spend online.*</td>
<td>2.64</td>
<td>.959</td>
<td>-.243</td>
<td>.242</td>
<td>-.113</td>
<td>.629</td>
<td>-.033</td>
</tr>
<tr>
<td>6.</td>
<td>I go online for leisure and become so absorbed I lose track of time.</td>
<td>2.81</td>
<td>.852</td>
<td>.260</td>
<td>-.178</td>
<td>.004</td>
<td>-.561</td>
<td>.073</td>
</tr>
<tr>
<td>18.</td>
<td>I often miss meals when I play video games or online games.*</td>
<td>3.38</td>
<td>.636</td>
<td>-.177</td>
<td>.317</td>
<td>-.188</td>
<td>.510</td>
<td>.059</td>
</tr>
<tr>
<td>38.</td>
<td>I sometimes forget to take time to eat when I am online.*†</td>
<td>3.19</td>
<td>.933</td>
<td>-.173</td>
<td>.402</td>
<td>-.143</td>
<td>.478</td>
<td>.043</td>
</tr>
<tr>
<td>57.</td>
<td>I sometimes do not get enough sleep because I am playing video games or online games.*</td>
<td>3.18</td>
<td>.992</td>
<td>-.176</td>
<td>.362</td>
<td>-.187</td>
<td>.550</td>
<td>.004</td>
</tr>
</tbody>
</table>

*Note. TWI = TechnoWellness Inventory; F = factor.*

* The item is reverse scored, and a higher score indicates that participants agreed less with the item.

† The item had a strong loading on Factor 4 and an additional factor.

**Factor 5: Using Technology for Vocational Purposes**

The three items that loaded on Factor 5 included 3.53% of the 85 TWI items and accounted for 4.07% of the variance in TWI scores. All of the items focused on the usefulness of technology in a person’s workplace, so using technology for vocational
purposes was the common theme. High means indicated that most participants agreed with all three items. Table 8 describes the items that loaded on Factor 5.

Table 8  
**TWI Items Loading on Factor 5**

<table>
<thead>
<tr>
<th>TWI Item #</th>
<th>TWI Item</th>
<th>M</th>
<th>SD</th>
<th>F1</th>
<th>F2</th>
<th>F3</th>
<th>F4</th>
<th>F5</th>
</tr>
</thead>
<tbody>
<tr>
<td>41.</td>
<td>Using computers and other technology helps me to feel more in control of my work.</td>
<td>2.87</td>
<td>.836</td>
<td>.360</td>
<td>-.008</td>
<td>.123</td>
<td>-.086</td>
<td>.569</td>
</tr>
<tr>
<td>56.</td>
<td>I find computers useful in my work.</td>
<td>3.38</td>
<td>.820</td>
<td>.137</td>
<td>.014</td>
<td>.082</td>
<td>.023</td>
<td>.714</td>
</tr>
<tr>
<td>63.</td>
<td>Using technology to communicate with others is helpful in my work.</td>
<td>3.08</td>
<td>.877</td>
<td>.236</td>
<td>-.004</td>
<td>.105</td>
<td>-.003</td>
<td>.722</td>
</tr>
</tbody>
</table>

*Note. TWI = TechnoWellness Inventory; F = factor.*

**Items with Weak or Moderate Factor Loadings**

Twelve of the 85 items on the TWI (14.12%) did not have a strong loading ($\geq .40$), as defined by Pett et al. (2003), on any of the five identified factors. Table 9 lists the items with weak ($< .35$) or moderate (.35-.39) factor loadings (Thompson, 2004), and implications for restructuring the TWI are addressed later in this chapter.
### Table 9
*Items with Weak or Moderate Factor Loadings*

<table>
<thead>
<tr>
<th>TWI Item #</th>
<th>TWI Item</th>
<th>M</th>
<th>SD</th>
<th>F1</th>
<th>F2</th>
<th>F3</th>
<th>F4</th>
<th>F5</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>I go online for information about healthy nutrition.</td>
<td>2.88</td>
<td>.810</td>
<td>.319</td>
<td>.000</td>
<td>.365</td>
<td>-.051</td>
<td>.172</td>
</tr>
<tr>
<td>8</td>
<td>I try to avoid using computers or other technology in my work.*</td>
<td>3.39</td>
<td>.790</td>
<td>-.067</td>
<td>.311</td>
<td>-.112</td>
<td>.015</td>
<td>.353</td>
</tr>
<tr>
<td>11</td>
<td>Using computers helps me solve problems.</td>
<td>3.33</td>
<td>.613</td>
<td>.357</td>
<td>.223</td>
<td>.059</td>
<td>-.044</td>
<td>.321</td>
</tr>
<tr>
<td>15</td>
<td>I consider how reliable a website is before using medical information it provides.</td>
<td>3.33</td>
<td>.688</td>
<td>.167</td>
<td>.151</td>
<td>.042</td>
<td>.064</td>
<td>.287</td>
</tr>
<tr>
<td>17</td>
<td>I am careful to keep my personal information secure online.</td>
<td>3.38</td>
<td>.636</td>
<td>-.044</td>
<td>.191</td>
<td>-.011</td>
<td>.105</td>
<td>.230</td>
</tr>
<tr>
<td>31</td>
<td>I believe that having good computer skills could help me in several ways.</td>
<td>3.50</td>
<td>.626</td>
<td>.255</td>
<td>.325</td>
<td>-.027</td>
<td>-.184</td>
<td>.342</td>
</tr>
<tr>
<td>39</td>
<td>I believe that learning to use new technologies gives me a sense of accomplishment.</td>
<td>3.13</td>
<td>.644</td>
<td>.311</td>
<td>.231</td>
<td>.126</td>
<td>-.203</td>
<td>.219</td>
</tr>
</tbody>
</table>
Table 9 (cont.)

<table>
<thead>
<tr>
<th>TWI Item #</th>
<th>TWI Item</th>
<th>M</th>
<th>SD</th>
<th>F1</th>
<th>F2</th>
<th>F3</th>
<th>F4</th>
<th>F5</th>
</tr>
</thead>
<tbody>
<tr>
<td>47.</td>
<td>Using computers and other technology helps me to learn things that I need to know.</td>
<td>3.40</td>
<td>.719</td>
<td>.289</td>
<td>.313</td>
<td>-.051</td>
<td>-.212</td>
<td>.177</td>
</tr>
<tr>
<td>53.</td>
<td>I almost always trust websites that provide suggestions to improve my health.*</td>
<td>2.77</td>
<td>.829</td>
<td>-.354</td>
<td>.362</td>
<td>-.174</td>
<td>.114</td>
<td>.002</td>
</tr>
<tr>
<td>59.</td>
<td>I go online for amusement and fun.</td>
<td>3.35</td>
<td>.696</td>
<td>.331</td>
<td>.141</td>
<td>-.009</td>
<td>-.328</td>
<td>.134</td>
</tr>
<tr>
<td>79.</td>
<td>I believe that I can avoid computers and have the same employment options.*</td>
<td>3.20</td>
<td>.879</td>
<td>-.047</td>
<td>.391</td>
<td>-.048</td>
<td>-.082</td>
<td>.357</td>
</tr>
<tr>
<td>81.</td>
<td>I do not have time to exercise because of the time I spend online.*</td>
<td>2.58</td>
<td>1.096</td>
<td>-.103</td>
<td>-.092</td>
<td>-.051</td>
<td>-.020</td>
<td>.145</td>
</tr>
</tbody>
</table>

Note. TWI = TechnoWellness Inventory; F = factor.
* The item is reverse scored, and a higher score indicates that participants agreed less with the item.
Creating TWI Scales

The results of the exploratory factor analysis were used to create five TWI scales to use in the subsequent analyses: a Leisure Scale, a Technostress Scale, a Physical Scale, an Excess Use Scale, and a Vocational Scale. Each scale included all of the items that loaded on the corresponding factor. Items with weak or moderate loadings on the five factors were still used to calculate participants’ Total TechnoWellness scores because they were part of the instrument being used to examine the TechnoWellness construct in the present study. However, they were not included in a TWI scale because they did not reliably represent any of the constructs measured by the five scales.

Internal Consistency Reliability of the TWI

To estimate the internal consistency reliability of the TWI, SPSS was used to calculate a Cronbach’s alpha for the entire TWI and for each of its scales. Results of this analysis are shown in Table 10. Internal consistency reliability was high for the TWI and all of the scales except the Excess Use Scale. As noted earlier, one item that loaded on the Excess Use factor did not seem to be consistent with the theme of overusing technology (6. I go online for leisure and become so absorbed I lose track of time). When that item was removed from the scale, the Cronbach’s alpha increased to .811. Therefore, Item 6 was eliminated from the TWI Excess Use scale, and a revised version of the scale was used in the regression analyses.
Table 10

*Internal Consistency Reliability of the TWI and the TWI Scales*

<table>
<thead>
<tr>
<th>Instrument</th>
<th>Number of items</th>
<th>Cronbach’s alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>TechnoWellness Inventory (TWI)</td>
<td>85</td>
<td>.856</td>
</tr>
<tr>
<td>TWI Leisure Scale</td>
<td>38</td>
<td>.884</td>
</tr>
<tr>
<td>TWI Technostress Scale</td>
<td>22</td>
<td>.896</td>
</tr>
<tr>
<td>TWI Physical Scale</td>
<td>5</td>
<td>.881</td>
</tr>
<tr>
<td>TWI Excess Use Scale</td>
<td>5</td>
<td>.520</td>
</tr>
<tr>
<td>TWI Excess Use Scale (Revised)</td>
<td>4</td>
<td>.811</td>
</tr>
<tr>
<td>TWI Vocational Scale</td>
<td>3</td>
<td>.820</td>
</tr>
</tbody>
</table>

*Note.* TWI = TechnoWellness Inventory

**Regression Analyses of the TWI and the 5F-Wel-A**

**Linear Regression of TWI Total TechnoWellness Scores on 5F-Wel-A Total Wellness Scores**

To test the relationship between participants’ summative scores on the TWI and 5F-Wel-A, a simple linear regression was used to predict 5F-Wel-A Total Wellness scores based on TWI Total TechnoWellness scores. Regression assumes that variables have a normal distribution; the relationship between the independent and dependent variables is linear; and the distribution has homoscedasticity, which means that a dependent variable varies equally across all values of a predictor variable (Harris, 1998; Osborne & Waters, 2002). Tests of the assumption of normality, the assumption of linearity, and the assumption of homoscedasticity are therefore shown in Appendix F. The results of the tests suggested that
all of the assumptions were satisfied, and the use of simple linear regression was therefore appropriate.

An analysis of potential outliers, which are typically defined as points that are more than three standard deviations from the mean (Osborne & Overbay, 2004), was also conducted in SPSS. Two participants’ 5F-Wel-A Total Wellness scores were more than three standard deviations from the mean, and three participants’ TWI Total TechnoWellness scores were more than three standard deviations from the mean. Although outliers can be due to errors, it is also possible for participants’ scores to be outliers for legitimate reasons (Osborne & Overbay, 2004). Osborne and Overbay proposed that legitimate outliers are more likely in large samples and that researchers can expect for approximately 1% of a normally distributed sample to be three standard deviations from the mean. In this case, fewer than 1% of the sample were identified as outliers on either measure, and consequently no participants’ scores were eliminated. It was also assumed that the population could include people with abnormally low or high wellness or TechnoWellness scores, and eliminating these data could cause the sample to be less representative of the population.

The simple linear regression suggested that participants with higher TWI Total TechnoWellness scores had higher 5F-Wel-A Total Wellness scores, $b = 0.553$, $t(310) = 11.688, p < .001$. The unstandardized beta ($b$) value of .553 indicated that for every one unit increase in TWI Total TechnoWellness scores, 5F-Wel-A Total Wellness scores increased by .553. TWI Total TechnoWellness scores accounted for 30.6% of the variance in Total Wellness scores, $r^2 = 0.306$. Figure 2 shows a scatterplot depicting the strong positive
relationship between TWI Total TechnoWellness scores and 5F-Wel-A Total Wellness scores.

*Figure 2.* Scatter Plot of the Regression of TWI Total TechnoWellness scores on 5F-Wel-A Total Wellness scores.

**Linear Regression of TWI Physical Scale Scores on 5F-Wel-A Physical Self Scores**

Although the TWI and the 5F-Wel-A each includes five scales, the only scale
measuring a similar construct on both instruments is the scale focusing on physical health. A simple linear regression was used to examine the relationship between TWI Physical Scale scores and 5F-Wel-A Physical Self scores.

Appendix G describes procedures used to test the assumption of normality, the assumption of linearity, and the assumption of homoscedasticity for the regression of TWI Physical Scale scores on 5F-Wel-A Physical Self scores. Although the results suggested that normality and linearity could be assumed, a scatterplot of the standardized residuals as a function of standardized predicted values showed that the residuals appeared in the shape of a fan. The scatterplot is shown in Figure 3. When residuals form the shape of a fan instead of being randomly scattered around the horizontal fit line, heteroscedasticity is likely and homoscedasticity cannot be assumed (Osborne & Waters, 2002). The fan shape was formed because the variance among residuals was greater when the predicted TWI Physical Scale values were lower. When participants’ predicted TWI Physical Scale values were higher, fewer residuals above two or below negative two were observed. The implications of this conclusion are described in the Discussion section.
Figure 3. Scatterplot of the standardized residuals as a function of standardized predicted values for the regression of TWI Physical Scale scores on 5F-Wel-A Physical Self scores.

When the simple linear regression was performed, TWI Physical Scale scores predicted higher 5F-Wel-A Physical Self scores, $b = .306$, $t(310) = 5.661$, $p < .001$. For every one unit increase in TWI Physical Scale scores, 5F-Wel-A Physical Self scores increased by .306. TWI Physical Scale scores accounted for 9.4% of the variance in 5F-Wel-A Physical Self scores. Regression analyses were not conducted on the remaining TWI and
5F-Wel-A scales because the respective scales did not measure equivalent constructs within TechnoWellness and holistic wellness.

**Multiple Regression of TWI TechnoWellness Scales on 5F-Wel-A Total Wellness Scores**

To determine whether all five TWI scales were significant predictors of holistic wellness as measured by the 5F-Wel-A Total Wellness score, a multiple regression analysis, which is a method recommended by Heppner et al. (2008), was conducted. It was hypothesized that all five TWI scales would significantly improve the regression model, and two types of multiple regression analyses were conducted. First, a hierarchical multiple regression was used so that the variance explained by each TWI scale could be examined after the scale was added to the regression model (Heppner et al., 2008). Because this was the first study of the TWI and predictor variables in the hierarchical multiple regression were added according to theory, a stepwise multiple regression was also conducted. In stepwise regression, predictor variables that explain a greater percentage of the variance in the model ($R^2$) are entered first, and variables that do not contribute a statistically significant increase in $R^2$ are not entered (Heppner et al., 2008). Using stepwise regression therefore ensured a model where the predictor variables with the highest correlation to the dependent variable were entered first, and the procedure offered an exploratory analysis of the relationships between the predictor variables and the dependent variable.

In both multiple regression analyses, participants’ 5F-Wel-A Total Wellness scores served as the dependent variable. The five TWI scales were used as predictor variables: the TWI Leisure Scale, TWI Technostress Scale, TWI Physical Scale, TWI Excess Use Scale,
and TWI Vocational Scale. An analysis of outliers showed that four or fewer participants had scores that were more than three standard deviations from each scale’s mean, and none of these outliers were removed because they could represent the few extreme scores that occur naturally within a normally distributed population (Osborne & Overbay, 2004).

To test the assumptions of normality, linearity, and homoscedasticity, plots of the residuals were created, and analyses are presented in Appendix H. The assumption of normality appeared to be met in all cases, but examination of residual scatterplots suggested that the simple linear regressions of TWI Physical Scale scores, TWI Excess Use Scale scores, and TWI Vocational Scale scores on 5F-Wel-A Total Wellness scores did not satisfy the assumption of homoscedasticity. Linearity was also a concern when TWI Vocational Scale scores were regressed on 5F-Wel-A Total Wellness scores. Implications are included in the Discussion section.

When multiple regression is used, it is important to consider multicollinearity. If predictor variables are highly correlated, it can inflate the amount of variance ($R^2$) that the model explains (Kennedy, 1998). One common strategy to test for multicollinearity is to calculate variance inflation factors (VIF). SPSS was used to calculate a VIF for each predictor variable during both multiple regression analyses. All of the VIF values were less than 2, so none were close to the threshold of 10 that is generally accepted as indicative of multicollinearity (Kennedy, 1998).

For the hierarchical multiple regression, TWI scales were entered into the regression model by order of size with the largest scales entered first. In Step 1, participants’ scores on
the TWI Leisure Scale accounted for 13.0% of the variance in 5F-Wel-A Total Wellness scores, $R^2 = 0.130$, $F(1, 310) = 46.158$, $p < .001$. Scores from the TWI Technostress Scale, which were entered in Step 2, explained an additional 15.8% of the variance and significantly improved the regression model, $R^2_{\text{change}} = 0.158$, $F(1, 309) = 68.655$, $p < .001$. In Step 3, adding participants’ TWI Physical Scale scores accounted for only an additional 0.1% of the variance and did not significantly improve the model, $R^2_{\text{change}} = 0.001$, $F(1, 308) = 0.481$, $p > .05$. Scores from the TWI Excess Use Scale were added in Step 4, and they explained an additional 4.6% of the variance in 5F-Wel-A Total Wellness scores. The regression model was significantly improved in Step 4, $R^2_{\text{change}} = 0.046$, $F(1, 307) = 0.481$, $p < .001$. Finally, in Step 5 participants’ TWI Vocational Scale scores accounted for an additional 0.4% of the variance and did not significantly improve the model, $R^2_{\text{change}} = 0.004$, $F(1, 306) = 1.822$, $p > .05$.

The results of the hierarchical multiple regression are presented in Table 11, and the final model explained 32.8% of the variance in 5F-Wel-A Total Wellness scores. In the final model, TWI Leisure Scale scores significantly predicted 5F-Wel-A Total Wellness scores, $b = .472$, $t(1, 306) = 7.579$, $p < .001$. For every one unit increase in TWI Leisure Scale scores, 5F-Wel-A Total Wellness scores increased by .472. TWI Technostress Scale scores significantly predicted 5F-Wel-A Total Wellness scores, $b = .228$, $t(1, 306) = 7.579$, $p < .001$. For every one unit increase in TWI Technostress Scale scores, 5F-Wel-A Total Wellness scores increased by .228. The third significant predictor of 5F-Wel-A Total Wellness scores was TWI Excess Use Scale scores, $b = .140$, $t(1, 306) = 4.600$, $p < .001$. For every one unit
increase in TWI Excess Use Scale scores, 5F-Wel-A Total Wellness scores increased by .140.

Table 11 also includes the results of the stepwise multiple regression. Scores from the TWI Leisure Scale were entered first, and they explained 13.0% of the variance in 5F-Wel-A Total Wellness scores, $R^2 = 0.130, F(1, 310) = 46.158, p < .001$. In the second step, scores from the TWI Technostress Scale accounted for an additional 15.8% of the variance and significantly improved the regression model, $R^2_{\text{change}} = 0.158, F(1, 309) = 68.655, p < .001$. Scores from the TWI Excess Use Scale were then entered as the final predictor that was statistically significant, and they explained an additional 4.3% of the variance, $R^2_{\text{change}} = 0.043, F(1, 308) = 19.876, p < .001$. The final model explained 33.1% of the variance in 5F-Wel-A Total Wellness scores.

In the final stepwise model, TWI Leisure Scale scores were a significant predictor of 5F-Wel-A Total Wellness scores, $b = .540, t(1, 308) = 10.679, p < .001$. For every one unit increase in TWI Leisure Scale scores, 5F-Wel-A Total Wellness scores increased by .540. TWI Technostress Scale scores significantly predicted 5F-Wel-A Total Wellness scores, $b = .223, t(1, 308) = 4.954, p < .001$. For every one unit in TWI Technostress Scale scores, 5F-Wel-A Total Wellness scores increased by .223. Finally, TWI Excess Use Scale scores were also a significant predictor of 5F-Wel-A Total Wellness scores, $b = .134, t(1, 308) = 4.458, p < .001$. For every one unit increase in TWI Excess Use Scale scores, 5F-Wel-A Total Wellness scores increased by .134.
Both the hierarchical multiple regression model and the stepwise hierarchical regression model explained more than 32% of the variance in 5F-Wel-A Total Wellness scores and identified the same three TWI scales as significant predictors of 5F-Wel-A Total Wellness scores. It should be noted that TWI Technostress Scale scores explained the largest percent of the variance in both models (15.8%), but it had a smaller $b$ coefficient than the TWI Leisure Scale and was entered as the second predictor variable in the stepwise model. Although the VIF values indicated that multicollinearity was not a concern, this discrepancy suggests that the $R^2_{\text{change}}$ for the TWI Technostress Scale may have been inflated due to correlations with other predictor variables (Kennedy, 1998).
### Table 11
Hierarchical and Stepwise Regressions Predicting 5F-Wel-A Total Wellness Scores from TWI Scales

<table>
<thead>
<tr>
<th></th>
<th>Hierarchical Multiple Regression</th>
<th>Stepwise Multiple Regression</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>b Step 1</td>
<td>b Step 2</td>
</tr>
<tr>
<td>Constant</td>
<td>52.750**</td>
<td>20.029**</td>
</tr>
<tr>
<td></td>
<td>(3.499)</td>
<td>(5.064)</td>
</tr>
<tr>
<td></td>
<td>[45.9-59.6]</td>
<td>[10.1-30.0]</td>
</tr>
<tr>
<td>Leisure</td>
<td>.359**</td>
<td>.474**</td>
</tr>
<tr>
<td></td>
<td>(.053)</td>
<td>(.050)</td>
</tr>
<tr>
<td></td>
<td>[.26-.46]</td>
<td>[.38-.57]</td>
</tr>
<tr>
<td>Technostress</td>
<td>--</td>
<td>.328**</td>
</tr>
<tr>
<td></td>
<td>--</td>
<td>(.040)</td>
</tr>
<tr>
<td>Physical</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Excess Use</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vocational</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>R²</th>
<th>.130</th>
<th>.288</th>
<th>.282</th>
<th>.335</th>
<th>.328</th>
<th>.130</th>
<th>.288</th>
<th>.331</th>
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</thead>
<tbody>
<tr>
<td>ΔR²</td>
<td></td>
<td>.158</td>
<td>.001</td>
<td>.046</td>
<td>.004</td>
<td>--</td>
<td>.158</td>
<td>.043</td>
<td></td>
</tr>
<tr>
<td>F</td>
<td></td>
<td>46.158**</td>
<td>68.655**</td>
<td>.481</td>
<td>21.224**</td>
<td>1.822</td>
<td>46.158**</td>
<td>68.655**</td>
<td>19.876**</td>
</tr>
<tr>
<td>(df)</td>
<td></td>
<td>(310)</td>
<td>(309)</td>
<td>(308)</td>
<td>(307)</td>
<td>(306)</td>
<td>(310)</td>
<td>(309)</td>
<td>(308)</td>
</tr>
</tbody>
</table>

*Note. TWI = TechnoWellness Inventory; standard errors in parentheses; confidence intervals in brackets; b indicates unstandardized regression coefficient; df indicates degrees of freedom.

*p < .05; **p < .001.*
Revisions of the TWI

To address Secondary Research Question 6, TWI items in four categories were considered for revision or deletion. First, cross-loaded items that had a strong loading (≥ .40) on more than one factor were evaluated (Pett et al., 2003). Next, items that only had moderate factor loadings (.35-.39) or weak factor loadings (< .35) were reviewed (Thompson, 2004). Finally, misplaced items that loaded strongly on a particular factor but did not seem to be consistent with that factor’s theme were considered (Pett et al., 2003).

Items with Cross Loadings

Three TWI items had a strong loading (≥ .40) on more than one factor and were therefore considered cross-loaded. Pett et al. (2003) recommended that researchers review each cross-loaded item and consider which factor is most appropriate from a conceptual perspective. In some of these cases, an item will have a stronger conceptual relationship with a factor other than the one that it loaded on most strongly (Pett et al., 2003).

The first cross-loaded item on the TWI was Item 25, which presented using apps to reflect on spiritual beliefs. The item was placed in the TWI Leisure Scale because its strongest loading was on the factor named Using Technology for Leisure, and this placement seemed appropriate since a person could choose to use technology for spiritual reflection during her or his leisure time. The item also loaded strongly on the Using Technology for Physical Health factor, which was the factor that inspired the TWI Physical Scale. Because three of the five items in the TWI Physical Scale referred to using apps, Item 25’s mention of this type of technology could explain why it also loaded on that factor. Although apps
focusing on spirituality such as SoulPulse and PrayerWorks are available, they are not the only type of technology that facilitates spiritual reflection. For example, some people choose to participate in an online religious or spiritual community (McKenna & West, 2007). Item 25 was therefore revised to say “Using technology sometimes helps me to reflect about my spiritual beliefs.”

The strongest loading for Item 38, “I sometimes forget to take time to eat when I am online,” was on the Excess Use of Technology factor. Since other items that loaded on Factor 4 discussed overuse of technology, Item 38 seemed to be appropriately placed in the TWI Excess Use Scale. Nevertheless, the item also had a strong loading on the Technostress factor, which was used to develop the TWI Technostress Scale. Item 38 may have also loaded on that factor because it included the word “forget,” which has a negative connotation unrelated to the item’s primary focus. Since it was possible to describe the same situation without using the word “forget,” Item 38 was reworded to say “I sometimes miss meals when I am online.” The phrase “miss meals” was used so that the item would still convey that a person is not eating when he or she would otherwise be doing so.

Item 67, “Sharing information about my gender identity is easier online than it is in person,” had a strong negative loading on Using Technology for Leisure and a strong positive loading on Technostress. The absolute value of the loading on Using Technology for Leisure was higher, so the item was placed in the TWI Leisure Scale. Given that Item 67 describes a leisure use of technology and the other item about gender identity (71) had a strong loading of .620 on Using Technology for Leisure, Item 67 seems to be appropriately
placed as a reverse-scored item in the corresponding scale. Furthermore, although the item
describes a potentially maladaptive interaction with technology, it is not likely to produce the
levels of stress associated with items on the TWI Technostress Scale. Item 67 was therefore
retained on the TWI Leisure Scale, and the item was not edited because it used the same
wording as other items that presented interactions being easier online than in person (26, 48,
64). All three TWI items with cross loadings on two factors are presented in Table 12.

**Items with Moderate Factor Loadings**

Items with no strong factor loadings (≥ .40) but at least one factor loading in the .35-
.39 range were reevaluated due to the presence of a moderate factor loading (Thompson,
2004). One such TWI item was Item 7, “I go online for information about healthy nutrition,”
which had a loading of .365 on the Using Technology for Physical Health factor. Due to
Item 7’s focus on nutrition, it clearly had the strongest conceptual relationship with the Using
Technology for Physical Health factor. Because the moderate factor loading could have been
due to lack of clarity, the words “to find” were added to make Item 7 more precise: “I go
online to find information about healthy nutrition.” The item was then placed on the TWI
Physical Scale.

Item 8, “I try to avoid using computers or other technology in my work,” had a
moderate loading of .353 on the Using Technology for Vocational Purposes factor. Because
the item referred to a person’s technology use in her or his job, Item 8 seemed to load on the
appropriate factor although the loading could have been stronger. The words “try to” may
have deemphasized the behavior of avoiding interactions with technology, so those words
were removed. The revised Item 8, “I avoid using computers or other technology in my work,” was then placed on the TWI Vocational Scale.

Another item with one moderate factor loading was Item 11, “Using computers helps me solve problems,” which loaded on the Using Technology for Vocational Purposes factor (.357). Its loading on the Using Technology for Leisure factor (.321) was low but nevertheless higher than .30. This outcome is not surprising due to the item’s ambiguity about where the problems are occurring. Although computers sometimes help people to solve problems during both leisure and work activities, they are often used to address specific problems encountered in the workplace (Lim, 2011; Mamaghani, 2006; Mirvis, Sales, & Hackett, 1991; Wastell & Newman, 1996). Furthermore, the TWI’s Vocational Scale needed to be strengthened since the first version of the scale included the minimum acceptable number of items (Costello & Osborne, 2005). Item 11 was therefore placed on the TWI Vocational Scale after being reworded to refer to work settings: “Using computers helps me solve problems at work.”

Item 53 stated, “I almost always trust websites that provide suggestions to improve my health.” The item had moderate loadings on both the Using Technology for Leisure factor (-.354) and the Technostress factor (.362). However, Item 53 was most clearly related to physical health, and its loading on the Using Technology for Physical Health factor was only -.174. Because Item 53 had a weak loading on the factor that seemed conceptually appropriate, it was deleted (Pett et al., 2003).
The final item with moderate factor loadings was Item 79, “I believe that I can avoid computers and have the same employment options.” With a higher loading on the Technostress factor (.391) than the Using Technology for Vocational Purposes factor (.357), the data for Item 79 were similar to the results for other work-related items that described a potentially stressful situation. However, the item was originally intended to focus on a person’s beliefs about avoiding computers instead of the stress that could provoke this reaction. Ironically, the use of the words “I believe” may have caused participants to think more about their reasons for avoiding computers and less about whether or not they possess that belief. To make the wording more direct, Item 79 was revised to say “I can avoid computers and have the same employment options.” It was then placed on the TWI Vocational Reasons for conceptual reasons as well as the need to build that scale. Because Item 79’s loading on the Technostress factor was so close to a strong loading (≥ .40, Pett et al., 2003), its placement on the TWI Vocational Scale is admittedly questionable. It will be important to continue monitoring this item during the next study of the TWI, and it may need to be deleted or moved to the TWI Technostress scale if similar results are found. All of the items that were reviewed due to moderate factor loadings are presented in Table 13.

**Items with Weak Factor Loadings**

Weak factor loadings are often defined as those that are less than .35 (Thompson, 2004). Seven items met this criterion, and it could be assumed that they did not reasonably represent any of the five factors identified in the exploratory factor analysis (Pett et al., 2003). As expected, the seven items were not conceptually associated with a single factor.
identified in the exploratory factor analysis with the possible exception of one that described using technology as a leisure activity (59. I go online for amusement and fun). Because including these items on a TWI scale could jeopardize the scale’s internal consistency reliability and construct validity (DeVellis, 2012), they were deleted from the TWI. The items with weak factor loadings are presented in Table 14.

**Misplaced Items**

When developing an instrument, it is important to review all items and determine whether any items do not represent a factor’s content area in spite of a strong loading on that one factor (Pett et al., 2003). An item that was already removed from a TWI scale was Item 6, “I go online for leisure and become so absorbed I lose track of time.” The item loaded on the Excess Use of Technology factor; but after Cronbach’s alphas were calculated, it was removed from the TWI Excess Use Scale because it lowered the scale’s internal consistency reliability to an unacceptable level. Removing the item increased the reliability estimate to .811, and the TWI Excess Use Scale was still a significant predictor of holistic wellness in the regression analysis. Because Item 6 did not load strongly on any other factors, it was deleted from the TWI. Each TWI scale was reviewed to determine whether any additional items should be moved to a different scale or eliminated before the next study to evaluate the TWI. Problematic items were identified within the two largest scales, the TWI Leisure Scale and the TWI Technostress Scale.

**Misplaced items in the TWI Leisure Scale.** Within the TWI Leisure Scale, the only item that referred to work was Item 80, “I feel more motivated to complete my work when I
use some types of technology.” Although the item loaded on the Using Technology for Leisure factor, its factor loading was .432, and typically the items that represent a factor best have loadings above .60 (Pett et al., 2003). Item 80 also had a .393 loading, which was only slightly below the .40 threshold, on the Using Technology for Vocational Purposes factor. Because of Item 80’s clear connection to a person’s work, the item was moved to the TWI Vocational Scale. Because items describing positive feelings usually loaded on the Using Technology for Leisure factor, the word “feel” was removed in case this contributed to its placement in that factor. The revised Item 80 read “I am more motivated to complete my work when I use some types of technology.”

**Misplaced items in the TWI Technostress Scale.** Items that loaded on the Technostress factor described a variety of events that occur during both work and leisure time, but the presence of a stressful reaction or situation justified their placement in the Technostress scale. For example, items such as 23, “Keeping up with email makes my work more stressful,” and 65, “When I use technology at work, I feel less in control of my work,” described technology use in a vocational setting but focused on the person’s negative reactions. Item 40, “I have conflicts with family members about the amount of time I spend online,” was related to overuse of technology and presented an event that could occur during leisure time, but it also depicted a situation that would probably provoke stress. Although the common theme of stress and negative emotions explained why most items loaded on the Technostress factor, three items did not seem to be consistent with the factor.
Item 52, “I think an online romantic relationship can be more gratifying than an offline romantic relationship,” described an interaction with technology that is potentially maladaptive but not clearly related to Technostress. The item had a loading of -.363 on the Using Technology for Leisure factor, so it had a moderate negative loading on that factor. Because of the clear relationship between a person’s romantic relationships and leisure activities, the item was moved to the TWI Leisure Scale. The words “I think” were removed from the item to reduce possible ambiguity, and the updated item was “An online romantic relationship can be more gratifying than an offline romantic relationship.”

Another item that seemed to be more appropriate for the TWI Leisure Scale was Item 64, “I find interacting with family members online easier than communicating with them in person.” The item was reverse-scored and referred to a person’s interactions with her or his family, which would mostly occur during leisure hours. Item 64 had a .390 loading on the Using Technology for Leisure factor, which was only slightly below the .40 cutoff for a strong factor loading. As a result, the item was moved to the TWI Leisure Scale. To improve the clarity of Item 64, it was reworded to say “Interacting with family members online is easier than communicating with them in person.”

The final misplaced item that loaded on the Technostress factor was Item 75, “I use technological devices that help me monitor my blood pressure or heart rate.” This item clearly addressed physical health, and it had a moderate loading of .358 on the Using Technology for Physical Health factor that included the other items in the TWI Physical Scale. Since the phrase “technological devices” may have confused participants and the
word “devices” already implies use of technology, the item was revised to say, “I use devices that help me monitor my blood pressure or heart rate.” Item 75 was then moved to the TWI Physical Scale. Table 14 describes outcomes for all of the items that were identified as misplaced items within the TWI scales.
Table 12  
*Items Reevaluated Due to Cross Loadings*

<table>
<thead>
<tr>
<th>TWI Item #</th>
<th>TWI Item</th>
<th>F1</th>
<th>F2</th>
<th>F3</th>
<th>F4</th>
<th>F5</th>
<th>Revised TWI Item &amp; Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>25.</td>
<td>Using some apps helps me to reflect about my spiritual beliefs.</td>
<td>.502</td>
<td>-.169</td>
<td>.452</td>
<td>-.001</td>
<td>-.135</td>
<td>Using technology sometimes helps me to reflect about my spiritual beliefs. (Leisure Scale)</td>
</tr>
<tr>
<td>38.</td>
<td>I sometimes forget to take time to eat when I am online.*</td>
<td>-.173</td>
<td>.402</td>
<td>-.143</td>
<td>.478</td>
<td>.043</td>
<td>I sometimes miss meals when I am online.* (Excess Use Scale)</td>
</tr>
<tr>
<td>67.</td>
<td>Sharing information about my gender identity is easier online than it is in person.*</td>
<td>-.474</td>
<td>.440</td>
<td>-.135</td>
<td>.198</td>
<td>.066</td>
<td>N/A: Not revised. (Leisure Scale)</td>
</tr>
</tbody>
</table>

*Note. TWI = TechnoWellness Inventory; F = factor.*

* The item is reverse scored, and a higher score indicates that participants agreed less with the item.
### Table 13

**Items Reevaluated Due to Moderate Factor Loadings**

<table>
<thead>
<tr>
<th>TWI Item #</th>
<th>TWI Item</th>
<th>Revised TWI Item &amp; Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.</td>
<td>I go online for information about healthy nutrition.</td>
<td>I go online to find information about healthy nutrition. (Physical Scale)</td>
</tr>
<tr>
<td>8.</td>
<td>I try to avoid using computers or other technology in my work.*</td>
<td>I avoid using computers or other technology in my work.* (Vocational Scale)</td>
</tr>
<tr>
<td>11.</td>
<td>Using computers helps me solve problems.</td>
<td>Using computers helps me solve problems at work. (Vocational Scale)</td>
</tr>
<tr>
<td>53.</td>
<td>I almost always trust websites that provide suggestions to improve my health.*</td>
<td>N/A: Deleted Item</td>
</tr>
<tr>
<td>79.</td>
<td>I believe that I can avoid computers and have the same employment options.*</td>
<td>I can avoid computers and have the same employment options.* (Vocational Scale)</td>
</tr>
</tbody>
</table>

* The item is reverse scored, and a higher score indicates that participants agreed less with the item.

**Note.** TWI = TechnoWellness Inventory; $F = \text{factor.}$
Table 14

*Items Deleted Due to Weak Factor Loadings*

<table>
<thead>
<tr>
<th>TWI Item #</th>
<th>TWI Item</th>
<th>F1</th>
<th>F2</th>
<th>F3</th>
<th>F4</th>
<th>F5</th>
</tr>
</thead>
<tbody>
<tr>
<td>15.</td>
<td>I consider how reliable a website is before using medical information it provides.</td>
<td>.167</td>
<td>.151</td>
<td>.042</td>
<td>.064</td>
<td>.287</td>
</tr>
<tr>
<td>17.</td>
<td>I am careful to keep my personal information secure online.</td>
<td>-.044</td>
<td>.191</td>
<td>-.011</td>
<td>.105</td>
<td>.230</td>
</tr>
<tr>
<td>31.</td>
<td>I believe that having good computer skills could help me in several ways.</td>
<td>.255</td>
<td>.325</td>
<td>-.027</td>
<td>-.184</td>
<td>.342</td>
</tr>
<tr>
<td>39.</td>
<td>I believe that learning to use new technologies gives me a sense of accomplishment.</td>
<td>.311</td>
<td>.231</td>
<td>.126</td>
<td>-.203</td>
<td>.219</td>
</tr>
<tr>
<td>47.</td>
<td>Using computers and other technology helps me to learn things that I need to know.</td>
<td>.289</td>
<td>.313</td>
<td>-.051</td>
<td>-.212</td>
<td>.177</td>
</tr>
<tr>
<td>59.</td>
<td>I go online for amusement and fun.</td>
<td>.331</td>
<td>.141</td>
<td>-.009</td>
<td>-.328</td>
<td>.134</td>
</tr>
<tr>
<td>81.</td>
<td>I do not have time to exercise because of the time I spend online.*</td>
<td>-.103</td>
<td>-.092</td>
<td>-.051</td>
<td>-.020</td>
<td>.145</td>
</tr>
</tbody>
</table>

*Note. TWI = TechnoWellness Inventory; F = factor.*

* The item is reverse scored, and a higher score indicates that participants agreed less with the item.
<table>
<thead>
<tr>
<th>TWI Item #</th>
<th>TWI Item</th>
<th>Revised TWI Item &amp; Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.</td>
<td>I go online for leisure and become so absorbed I lose track of time.</td>
<td>N/A: Deleted Item</td>
</tr>
<tr>
<td>52.</td>
<td>I think an online romantic relationship can be more gratifying than an offline romantic relationship.</td>
<td>An online romantic relationship can be more gratifying than an offline romantic relationship. <em>(Leisure Scale)</em></td>
</tr>
<tr>
<td>64.</td>
<td>I find interacting with family members online easier than communicating with them in person.</td>
<td>Interacting with family members online is easier than communicating with them in person. <em>(Leisure Scale)</em></td>
</tr>
<tr>
<td>75.</td>
<td>I use technological devices that help me monitor my blood pressure or heart rate.</td>
<td>I use devices that help me monitor my blood pressure or heart rate. <em>(Physical Scale)</em></td>
</tr>
</tbody>
</table>
Table 15 (cont.)

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>TWI</th>
<th>Voc</th>
<th>Voc</th>
<th>Voc</th>
<th>Voc</th>
</tr>
</thead>
<tbody>
<tr>
<td>80.</td>
<td>I feel more motivated to complete my work when I use some types of technology.</td>
<td>.432</td>
<td>-.011</td>
<td>.111</td>
<td>-.058</td>
<td>.393</td>
</tr>
<tr>
<td></td>
<td>I am more motivated to complete my work when I use some types of technology.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note. TWI = TechnoWellness Inventory; F = factor.*

* The item is reverse scored, and a higher score indicates that participants agreed less with the item.*
Summary of Revisions of the TWI

Based on the results of the exploratory factor analysis, 20 of the 85 items (23.5%) on the TWI were reevaluated using criteria recommended by Pett et al. (2003). Three items (25, 38, 67) that cross-loaded (≥ .40) on more than one factor were allowed to remain on the scale that matched the highest loading, but two of the items were reworded. Four items (7, 8, 11, 79) with moderate loadings (.35-.39) on a conceptually appropriate factor were reworded and added to the corresponding scale, and Item 53 was deleted because its moderate loadings were not on an appropriate factor. Seven items (15, 17, 31, 39, 47, 59, 81) were deleted because all of their factor loadings were weak (< .35). Items that seemed misplaced were also reviewed. Item 6 was deleted because it weakened the reliability of the scale it loaded on and did not load strongly on any other scales. Four additional items (52, 64, 75, 80) that seemed misplaced did load above .35 on a more fitting scale, so after being edited for clarity they were edited and moved to a different scale.

A total of 10 TWI items (11.8%) were edited, and 9 items (10.6%) were deleted. The revised TWI included 76 items, and the items with their original numbers are organized by scale in Appendix I. The updated TWI Leisure Scale had 39 items; the TWI Technostress Scale had 19 items; the TWI Physical Scale had seven items; the TWI Vocational Scale had seven items; and the TWI Excess Use Scale had four items. Because the TWI will not be divided into scales when the instrument is administered, the items were renumbered and the new instrument is presented in Appendix J.
Summary

In order to address the six secondary research questions within the present study, the TWI and 5F-Wel-A instruments were administered to 312 participants. An exploratory factor analysis of TWI scores was used to examine Secondary Research Question 1. The hypothesized structure of Coping, Creative, Essential, Physical, and Social factors was not supported by the data, but Leisure, Technostress, Physical, Excess Use, and Vocational factors were evident. TWI items with strong loadings on each factor were placed in five corresponding TWI scales.

The reliability of the TWI was explored in Secondary Research Question 2. Cronbach alphas were calculated for the entire TWI and each of its five scales, and all alpha values were above 0.80. To address Secondary Research Question 3, a simple linear regression was used to examine the relationship between TWI Total TechnoWellness scores and 5F-Wel-A Total Wellness scores. TWI Total TechnoWellness scores significantly predicted 5F-Wel-A Total Wellness scores ($p < .001$) and explained 30.6% of the variance in the dependent variable.

Although the original intention of Secondary Research Question 4 was to identify relationships between five corresponding TWI and 5F-Wel-A scales, a scale focusing on physical health was the only scale that the two instruments had in common. A simple linear regression was therefore conducted to determine whether TWI Physical Scale scores predicted 5F-Wel-A Physical Self scores. TWI Physical Scale scores explained 9.4% of the variance in 5F-Wel-A Physical Self scores ($p < .001$). To examine Secondary Research
Question 5, all five TWI scales were used as the predictor variables in a hierarchical multiple regression with 5F-Wel-A Total Wellness scores as the dependent variable. Entering scores from the TWI Leisure Scale, Technostress Scale, and Excess Use Scale significantly improved the regression model \( (p < .001) \), but entering scores from the TWI Physical Scale and Vocational Scale did not improve the model. When a stepwise multiple regression model was used as a comparative measure, the same three TWI scales were identified as significant predictors of 5F-Wel-A Total Wellness scores. In both regression models, it was found that the same three TWI scales accounted for more than 32\% of the variance in 5F-Wel-A Total Wellness scores.

Finally, Secondary Research Question 6 was addressed by reexamining TWI items that did not load strongly \((\geq .40)\) on a single factor. Cross-loaded items that had a strong loading \((\geq .40)\) on multiple factors (Pett et al., 2003), items that had moderate \((.35-.39)\) or weak \(< .35\) factor loadings (Thompson, 2004), and items that seemed misplaced were considered for deletion or revision. Based on this analysis, nine TWI items (10.6\%) were deleted, and 10 items (11.8\%) were revised. An updated 76-item TWI was established, and it will be used in the next study of the instrument.
CHAPTER 5
DISCUSSION

The goal of the present study was to answer the Primary Research Question “Is there a relationship between individuals’ TechnoWellness and their holistic wellness?” To examine the Primary Research Question, six secondary research questions were explored. First, the implications of the participant demographics are discussed. Next, analyses of whether the results summarized in Chapter 4 supported the hypotheses for each of the secondary research questions are presented. Limitations of the present study are then shared, and the resulting implications for future research are discussed. Finally, implications for professional counselors are presented.

Discussion of the Results

Participant Demographics

The desired sample size for the present study was obtained ($N = 312$), and demographic data showed that it was representative of the United States population in some ways. Adults between the ages of 20 and 70 were well represented with more than 15% of the sample in each age group within that range (20-29, 30-39, 40-49, 50-59, 60-69), although fewer than 5% of the participants were younger than 20 or older than 70. The percentage of participants who identified as Caucasian (76.6%) was slightly smaller than the percentage (77.9%) in the United States as of 2012 (United States Census Bureau, 2014). The sample included a smaller percentage of African American participants (10.6%) than the national statistic (13.1%); and the percentages of Asian and Pacific Islander (4.5%),
Hispanic/Latino/Latina (6.1%), and Native American (2.2%) participants were all within one percent of the national estimates reported by the United States Census Bureau (2014). The percentage of participants who identified as lesbian, gay, or bisexual (7.05%) was larger than a national estimate of 3.5% for people who identify as LGBT (Gates & Newport, 2013).

The sample’s large size and diversity with regard to age, race/ethnicity, and sexual orientation provided evidence of its external validity and increased the generalizability of the results (Heppner et al., 2008). However, the sample included more women (59.6%) than men (40.4%), and only a 1.8% difference between women (50.9%) and men (49.1%) was reported in the 2010 United States Census (Howden & Meyer, 2011). Only two participants in the study were from outside the United States, so the sample was not representative of people in other nations. Additional considerations regarding demographics are discussed in the Limitations section.

Secondary Research Question 1

It was hypothesized that TechnoWellness would include factors that corresponded to the five factors within the Indivisible Self Model of Wellness (IS-Wel). Because the IS-Wel includes Coping, Creative, Essential, Physical, and Social factors, it was anticipated that an exploratory factor analysis of participants’ TWI scores would reveal equivalent factors related to technology use. Data from the present study did not support this hypothesis. Instead, the factor analysis revealed five factors that were named Using Technology for Leisure, Technostress, Using Technology for Physical Health, Excess Use of Technology, and Using Technology for Vocational Purposes.
Although the five factors that emerged were not anticipated, the results are understandable. First, having separate factors for technology use within a person’s leisure time and vocational time could reflect that many people use technology differently for work tasks than they do for other purposes. Many of the research studies cited in Chapter 2 focused exclusively on participants’ technology use outside of work (Boniel-Nissim & Barak; 2011; Ellison et al., 2007; Madell & Muncer, 2007; McKenna & Bargh, 1998; McKenna et al., 2002; McKenna & West; 2007; Obst & Stafurik, 2010; Reich et al., 2012; Sautter et al., 2010; Steinfield et al., 2008; Subrahmanyan et al., 2008; Valkenburg & Peter, 2007) or on interactions with technology at participants’ jobs (Al-Fudail & Mellar, 2008; Ayyagari et al., 2011; Bucher et al., 2012; La Paglia et al., 2008; Lim, 2011; Wastell & Newman, 1996). Since these studies dealt with technology use either during or outside of work, differences between participants’ use of technology for leisure and work were not explored.

Although differences between technology use during leisure hours and work hours were not apparent in the studies cited in Chapter 2, they have been reported elsewhere. Some people have acknowledged using technologies such as video-sharing, instant messaging, social networking, blogging, and online games during work hours, but more individuals have reported using them only at home (Madden & Jones, 2008). Since 2000, the percentage of American adults who use the Internet at work has risen only from 41% to 44%, but the number who go online at home has increased from 76% to 90% (Fox & Rainie, 2014). The presence of both a Using Technology for Leisure factor and a Using Technology for
Vocational Purposes factor could be an outcome of having different kinds of interactions with technology in each setting.

Since only three TWI items loaded on the Using Technology for Vocational Purposes factor, it was considerably smaller than the Using Technology for Leisure factor. Costello and Osborne (2005) proposed that three items is the minimum number for a stable scale, and they recommended having at least five items per scale. In addition to the three items that loaded on the Using Technology for Vocational Purposes factor, 12 other TWI items focused on a person’s work. However, 10 of those items dealt with stressful situations at work, and they understandably loaded on the Technostress factor. It therefore seemed necessary to strengthen the TWI Vocational Scale by modifying items that were related to work but did not have strong factor loadings (Pett et al., 2003), and the addition of four more items was discussed in the section about revisions of the TWI.

Exercise could be considered as a leisure activity, but the emergence of the separate factor named Using Technology for Physical Health differentiates that type of technology use from the types described in the TWI’s Leisure Scale. Researchers have studied people who monitor exercise and nutrition by using devices such as pedometers connected to the Internet (Faghri et al., 2008), a specific computer-based program (Winett et al., 1999), or an app (Fox & Duggan, 2012), and people receiving motivational messages on a smartphone (Spring et al., 2013) or personal digital assistant (Hurling et al., 2007). To utilize one of these types of technology, a person must be willing to purchase a new device, download an app, or sign up for a program. The mean score for items that loaded on the Using Technology for Physical
Health factor was 2.0, which indicated that most participants disagreed with these items and were not using technology to monitor their exercise or nutrition. Nevertheless, the number of people who agree with these items may increase in the future. Between 2010 and 2012, the number of people accessing health information online doubled across most demographic groups (Fox & Duggan, 2012). Data from the Pew Research Center suggested that the percentage of American adults using apps to track or manage health was 9% in 2010 (Fox, 2010) and that the percentage rose to 19% in 2012 (Fox & Duggan, 2012). Using technology to promote physical health may therefore be an emerging trend that will soon achieve greater popularity, and in the future this factor could explain a greater percentage of the variance in TWI scores.

Although an Excess Use of Technology Factor was not hypothesized, research on overuse of technology does support its role as one of the smaller factors in the TechnoWellness construct. No studies have suggested that most people overuse technology, and researchers disagree about the diagnostic criteria that should be used (Morahan-Martin, 2008). Some practitioners do report diagnoses such as Internet addiction, but prevalence rates have varied due to factors such as Internet access, cultural norms, and different criteria for excessive use (Young, Yue, & Ying, 2011). In spite of the ongoing debate about how to define and diagnose the overuse of technology, a relationship between excessive technology use and psychological, emotional, and social difficulties has been reported in multiple studies (Caplan, 2007; Douglas et al., 2008; Morahan-Martin, 2008; Morahan-Martin & Schumacher, 2003; Walsh et al., 2008). Excess use of technology therefore seems to
influence the wellness of a minority of people, which supports its role as a factor that is significant even though it explains less of the variance in TWI scores than three of the other factors. Overall, the exploratory factor analysis did not support the hypothesis but nevertheless produced five meaningful factors that can be tested further in future studies of TechnoWellness.

**Secondary Research Question 2**

For this question, it was hypothesized that calculating Cronbach’s alpha coefficients would demonstrate the internal consistency reliability of the TWI and its scales. A coefficient alpha of .70 demonstrates internal consistency (Lee & Lim, 2008), and the Cronbach’s alpha for every TWI scale was above .80. The TWI and three of its scales (Leisure, Technostress, and Physical) had alphas above .85. These results supported the reliability of the TWI and all of the TWI scales that were created during the present study. The Cronbach’s alpha for the original Excess Use scale (.520) was below the acceptable range (Lee & Lim, 2008), but removing one item increased the alpha to .811. This change demonstrated the impact that one item can have on internal consistency reliability, especially when evaluating smaller scales. It will therefore be critical to continue monitoring the reliability of the TWI and its scales when the instrument is modified during future studies.

**Secondary Research Question 3**

It was hypothesized that TWI Total TechnoWellness scores would predict 5F-Wel-A Total Wellness scores. A simple linear regression showed a strong positive correlation between the scores ($p < .001$). Since participants’ TWI Total TechnoWellness scores
explained more than 30% of the variance in 5F-Wel-A Total Wellness scores, a strong relationship between participants’ technology use and their holistic wellness was evident. Although additional studies will be necessary to corroborate these data, the results of the current study indicated that a person’s interactions with technology are associated with her or his wellness. These results therefore addressed the Primary Research Question by suggesting that there is a relationship between individuals’ TechnoWellness and their holistic wellness.

**Secondary Research Question 4**

A simple linear regression found that scores on the TWI Physical Scale significantly predicted 5F-Wel-A Physical Self scores ($p < .001$) and explained 9.4% of the variance in scores. Because a person’s physical health largely depends on his or her exercise regimen and food consumption (Myers & Sweeney, 2005c), it is not surprising that the TWI Physical Scale scores were not more predictive of 5F-Wel-A Physical Self scores.

The strong influence of exercise and nutrition on physical health could also explain why the assumption of homoscedasticity did not seem to be met. The residual plot presented in Figure 3 showed that the variance among residuals was greater when participants’ TWI Physical Scale scores were lower. The residuals were less extreme when TWI Physical Scale scores were higher, indicating that the corresponding prediction of a higher 5F-Wel-A Physical Self score was more likely to be accurate. It is logical that people who use technology to encourage physical health would have a greater chance of being healthy, but that many other people who do not use those technologies would still be physically healthy because they exercise and have a healthy diet. Heteroscedasticity may therefore be
conceptually appropriate for a regression of TWI Physical Scale scores on 5F-Wel-A Physical Self scores. However, it must be acknowledged that heteroscedasticity can increase the chances of a Type I error and lead to incorrect inferences about a population (Fay, 2010).

The significant relationship between the two scales could become stronger if apps and other technologies to promote physical health continue to gain in popularity (Fox & Duggan, 2012). Retaining this TWI scale could be important as more people learn how technology can be used to enhance physical wellness. Furthermore, since many participants in the present study may not have been aware of the benefits that these technologies offer, the items on this scale could be useful to individuals who do not know that the technologies exist. Because changes in one wellness factor can also affect holistic wellness (Myers & Sweeney, 2005c), the results of this analysis also supported the Primary Research Question’s hypothesis that a relationship exists between TechnoWellness and holistic wellness.

**Secondary Research Question 5**

It was hypothesized that participants’ scores on all five of the new TWI scales would predict holistic wellness as measured by 5F-Wel-A Total Wellness scores. Although two of the TWI scales were not significant predictors in either the hierarchical or the stepwise multiple regression model, in both models the TWI Leisure Scale, TWI Technostress Scale, and TWI Excess Use Scale significantly predicted 5F-Wel-A Total Wellness scores and explained more than 32% of the variance in scores. Even though the TWI Technostress Scale included fewer items than the TWI Leisure Scale, it explained the most variance in 5F-Wel-A Total Wellness scores (15.8%) in both the hierarchical and stepwise regression
models. If this result is accurate, it could suggest that stressful technology use may have a stronger relationship with wellness than other interactions with technology. However, this outcome will need to be replicated in future studies because the TWI Technostress Scale was entered second in the stepwise regression model and the large amount of variance that it seemed to explain could be inflated (Kennedy, 1998).

Although the TWI Excess Use Scale included only four items, it was a significant predictor of 5F-Wel-A Total Wellness scores and explained more than 4% of the variance in scores in both regression models. Internet gaming disorder was included in Section III of the Diagnostic and Statistical Manual of Mental Health Disorders (5th ed.; DSM-5) as a condition that requires further study, indicating that in the future professional counselors may be expected to diagnose disorders related to overuse of technology. The TWI Excess Use Scale could be an important tool for counselors to use when assessing clients’ overuse of technology and its impact on their wellness. The apparent lack of homoscedasticity when TWI Excess Use Scale scores were regressed on 5F-Wel-A Total Wellness scores is a potential concern (Fay, 2010), and the implications of heteroscedasticity will need to be analyzed further in future studies.

The TWI Physical Scale and the TWI Vocational Scale were not significant predictors of holistic wellness. Despite this result, it would be presumptive to assume that there is no relationship between the physical and vocational factors and holistic wellness. In the multiple regression analysis, the TWI Physical Scale included five items, and the TWI Vocational Scale included three items. The small sizes of both scales would have weakened
their predictive power in the analysis since five or more strongly loading items are recommended when a factor is represented (Costello & Osborne, 2005). The subsequent revisions to the TWI increased the number of items in each scale to seven. Significant relationships between these scales and holistic wellness may be found in future studies as the revised scales are analyzed. As the scales are developed, it will be important to conduct formal tests of linearity and homoscedasticity because the informal tests described in Appendix G suggested that these assumptions may not have been met.

**Secondary Research Question 6**

During the first study of a new assessment instrument, one of the primary goals is to edit or delete items that are poorly written or do not represent the construct that is being examined (Lee & Lim, 2008). Analyses of cross-loaded items, items with moderate and low factor loadings, and misplaced items provided a rationale for the revision of ten TWI items (11.8%) and the deletion of nine items (10.6%). The original 85-item TWI was therefore reduced to 76 items. DeVellis (2012) reported that the percentage of original items that are retained in an instrument varies, but typically the final instrument is less than 50% of the size of the original instrument. Although 66 of the original 85 TWI items (77%) were not revised during the present study, additional items are likely to be modified or deleted in future studies.

Brevity can make an instrument easier for participants to complete, so items are sometimes deleted to reduce an instrument’s length (DeVellis, 2012). In the present study, no items were deleted to shorten the TWI. Worthington and Whittaker (2006) advised that
instruments should not take longer than 50 minutes to complete, and instruments that take longer than 15 to 30 minutes can be problematic in some cases. Because the mean time to complete the 85-item TWI and its demographic survey during pilot testing was 13 minutes, it is unlikely that additional items will need to be removed solely to shorten the instrument. However, future studies may show that some items can be deleted because they are not necessary to measure the intended construct or ensure internal consistency (DeVellis, 2012). The final version of the TWI may therefore be considerably shorter than its current length.

Future studies will provide additional data about each item’s factor loading, and these data could justify eliminating additional items. Generally, items with a loading of .60 or higher are most representative of a factor (Pett et al., 2003); and a scale can be considered strong if it has five or more items with a loading of .50 or higher (Costello & Osborne, 2005). Because the TWI Leisure Scale and TWI Technostress Scale are larger than the other scales, it may be possible to delete a considerable number of items from those two scales and still represent those factors adequately. Items that repeatedly load below .50 in the present study and in subsequent studies would therefore be candidates for deletion.

Because some TWI items that did not have a strong loading (≥ .40) were revised and retained, it will be important to reassess each scale as well as the entire instrument during the next study. Calculating Cronbach’s alphas and conducting regression analyses again will help to ensure that retaining these items did not lower the internal consistency reliability or reduce the construct validity of the items’ new scales or the entire TWI (Hinkin, 1995). An exploratory factor analysis with an oblique rotation and a confirmatory factor analysis will
also be necessary to verify the factor structure of the revised instrument (Pett et al., 2003). These and other implications for future research are discussed later in the chapter.

**Limitations**

The first version of the TWI was analyzed in the present study, and the initial results about the instrument’s reliability and construct validity are encouraging. However, several limitations of the study must be acknowledged. These included sampling limitations, methodological limitations, and limitations concerning the scope of the TWI.

**Sampling Limitations**

Although the sample used in the present survey was large and diverse in some ways, other participant characteristics limited the generalizability of the results. The sample included more women (59.6%) than men (40.4%), so it did not represent the gender ratio in the United States (Howden & Meyer, 2011). All except two of the participants lived in the United States, which suggests that the participants had greater access to technology than many people in some nations and less access than many people in Asian and European nations where certain technologies are more widely available (International Telecommunication Union, 2014; Pew Research Center, Global Attitudes Project, 2014a). Demographic data on participants’ income level were not collected for the present study, but this factor could also affect access to technology (Pew Research Center, Global Attitudes Project, 2014b).

Because all of the participants in the present study were 18 or older, the sample did not include youth who have spent all of their lives in the “digital age” and who may have had
different experiences with technology than older individuals. For example, in comparison to adults, teenagers are more likely to be “cell mostly” Internet users who rely primarily on a mobile device for online access (Madden, Lenhart, Duggan, Cortesi, & Gasser, 2013). Administering the TWI to a younger sample could therefore yield different results.

The use of FindParticipants.com and Qualtrics Panels in the present study meant that all participants were comfortable enough with technology to go on the Internet and sign up to receive study requests by email. Participants may therefore have had an above average level of comfort with technology, and their impressions of technology use may have been more positive than those of people who were unable or unwilling to access the two websites. The use of self-report measures was also a limitation. Heppner et al. (2008) proposed that any self-report measure is susceptible to distortions by the participants, some of which may derive from a participant’s misunderstanding of the items or directions. Data are also vulnerable to response biases since a participant may try to respond in a way that will help the researcher, make himself or herself look good, exaggerate concerns, or conform to societal norms (Heppner et al., 2008).

**Methodological Limitations**

The present study met some of the recommended criteria for developing a new instrument, but it did not include other procedures that are commonly incorporated into psychometric testing. First, the use of an orthogonal factor rotation allowed an easier analysis and initial interpretation of TWI factors, but a limitation was that it treated the factors as uncorrelated (Pett et al., 2003). Correlations between factors could have caused
items to load on different factors, although the fact that most items were contained within interpretable factors suggested that the orthogonal rotation provided an acceptable outcome (Thompson, 2004). Second, Lee and Lim (2008) proposed that a researcher can use exploratory factor analysis to identify the factor structure of the construct that an instrument measures but should then cross-validate the structure by performing a confirmatory factor analysis on data from a second sample. The lack of this procedure limits the implications of the present study, and conducting a confirmatory factor analysis will be necessary in a subsequent study.

Another limitation of the present study is that it did not provide evidence of the TWI’s convergent and discriminant validity. To estimate convergent validity, Lee and Lim (2008) recommended that researchers developing a new instrument also administer assessments that measure a similar construct. High correlations between instruments can therefore provide evidence that the new instrument measures the intended construct. Although a literature review did not reveal any other instruments that measure TechnoWellness, the lack of convergent validity evidence is a limitation of the study. Discriminant validity can be measured by collecting data from instruments that are expected to have low correlations with data from the new instrument (Lee & Lim, 2008). Because the factors within TechnoWellness were still hypothetical, evidence of discriminant validity was not provided in the present study either.
Limitations Concerning the Scope of the TWI

The TWI includes items about a range of popular information and communication technologies, including email, the Internet, social media, mobile phones, smartphones, and apps. Nevertheless, the instrument does not address other technologies that could impact a person’s wellness in some cases, such as automobiles, other electronic devices including home appliances, and machines that some people use in their jobs. The TWI also does not address relationships between technology use and wellness that could be due to a physiological side effect. For example, Computer Vision Syndrome has been reported as a disorder where computer users experience eyestrain, dry eyes, blurred vision, neck and back pain, and headaches (Rosenfield, 2011; Yan, Hu, Chen, & Lu, 2008). Side effects such as Computer Vision Syndrome could certainly affect wellness negatively, but they are not currently addressed in the TWI.

Finally, the TWI describes only technologies that were widely available in 2014. Because new technologies are emerging so rapidly, the current version of the instrument may fail to address additional technologies that will become popular in the next few years. In the United States, use of technologies such as personal computers, mobile phones, and the Internet increased significantly more quickly when compared to the spread of earlier technologies such as telephones, radio, and television (DeSilver, 2014). The emergence of social networking has shown how fast a new technology can become popular: use among young adults increased by 40% between February 2005 and August 2006 (Pew Research Center, Internet and American Life Project, 2013).
It is expected that technology will continue to evolve quickly. In a Pew survey of 1,867 technology experts, many predicted that technological devices that are wearable or embedded in a user’s body will become widespread by 2025 and serve as the next “digital revolution” (Anderson & Rainie, 2014). Rapid changes in technology use could affect the wellness of individuals who have difficulty adapting quickly, and this issue is not extensively addressed in the current TWI; the instrument primarily focuses on a person’s current technology use, and it includes only a few items about learning to use new technologies. The TWI will hopefully be updated as new technologies emerge and become popular, but rapid changes in technology use could quickly limit the implications of the present study.

**Implications for Future Research**

Future research studies will focus on providing additional reliability and validity evidence for the TWI, and several implications can be derived from the limitations of the present study. The study’s sampling limitations could be addressed by administering the TWI to equal numbers of men and women, people from cultures outside of the United States, participants who are younger than 18, and individuals who are not recruited from the Internet. A paper and pencil version of the TWI could be developed so that participants are not required to use technology to complete it. In addition to showing whether research without these sampling limitations would produce the same results, these studies could allow a researcher to begin analyzing whether TWI scores are similar across different demographic groups.
Methodological limitations of the present study also present areas for future research. Since an orthogonal factor rotation was used in the study, conducting an exploratory factor analysis with an oblique factor rotation should be the next step in confirming the current factor structure of the TWI (Pett et al., 2003; Thompson, 2004). If correlations between the current TWI scales affected the results of that analysis, changes to the proposed scales could be considered. A confirmatory factor analysis of a new sample will also be needed to provide additional validation of the factor structure identified in the present study (Lee & Lim, 2008). This procedure will test the fit of the proposed factor model and enable the degree of fit to be quantified, thereby providing evidence that the proposed structure is accurate (Thompson, 2004). The next study to develop the TWI will include those procedures. Internal consistency reliability will also need to be tested again, especially because the current TWI Excess Use Scale includes only four items (Costello & Osborne, 2005). Additional items may need to be added and tested to strengthen that scale.

Because scales for the TWI have now been created, some convergent validity evidence could be collected in future studies by comparing TWI scale scores with instruments that measure similar constructs (Lee & Lim, 2008). Higher scores on the Computer Aversion, Attitudes, and Familiarity Index (CAAFI) suggest greater affinity for computers (Schulenberg & Melton, 2008), and scores on that instrument may be positively correlated with TWI Technostress Scale scores because higher scores on the TWI scale indicate less stress in using technology. Obtaining discriminant validity evidence may also be possible because instruments assessing maladaptive technology are measuring constructs
that would be expected to contrast with TechnoWellness (Lee & Lim, 2008). For example, Caplan’s Generalized Problematic Internet Use Scale 2 (GPIUS2; 2010) identifies problematic Internet use. It would probably have a negative correlation with one or more of the TWI scales. Correlational analyses could therefore be conducted in a future study to support the convergent and discriminant validity of the TWI (Lee & Lim, 2008). If additional instruments to assess TechnoWellness are developed in the future, convergent validity evidence for the entire instrument could also be provided.

**Implications for Counseling Practice**

The results of the present study have important implications for professional counselors. The strong relationship between participants’ TWI scores and 5F-Wel-A scores suggests that counselors must carefully consider clients’ use of technology as they seek to help clients attain higher levels of wellness. Sweeney and Myers (2005) proposed four steps for wellness counseling that include introducing a wellness model, administering an assessment of wellness, developing a personal wellness plan with interventions to increase the client’s wellness, and conducting evaluation and follow-up. Although additional research is necessary before the TWI can be presented as a formal assessment instrument, professional counselors can still conduct informal assessments of a client’s TechnoWellness and include relevant interventions in clients’ wellness plans.

If a professional counselor meets with a new client who has concerns related to wellness, Sweeney and Myers (2005) recommended that the counselor initiate the first step of wellness counseling by introducing the concept of wellness. At the same time, the
counselor could briefly explain the concept of TechnoWellness too. Sweeney and Myers suggested that as the second step a subsequent session be used to conduct an assessment of the client’s wellness, which could include an informal assessment or a formal assessment using an instrument such as the 5F-Wel-A. This session would be an ideal time to also ask the client about her or his TechnoWellness. During a discussion of the client’s wellness scores, the counselor could include questions that will provide an informal assessment of whether interactions with technology are affecting wellness in any of the areas where the client has low wellness scores. Based on the results of the present study, the counselor may want to include questions about technology use during both leisure hours and at work, stress-provoking interactions with technology, use of technology to promote physical health, and the amount of time that the client spends using technology.

After a client’s wellness has been assessed, the third step proposed by Sweeney and Myers (2005) is for the counselor to help the client create a personal wellness plan. The client selects a manageable number of goals in areas where he or she would like to increase wellness. If the client’s interactions with technology could be enhanced in a way that is conducive to wellness, the counselor could recommend that the client integrate changes in technology use into a wellness goal or even develop a personal TechnoWellness plan. Counselors should remain mindful that TechnoWellness exists on a continuum, and goals focusing on both avoiding maladaptive interactions with technology and using technology to enhance wellness are possible.
During the fourth step in wellness counseling, Sweeney and Myers (2005) recommended that counselors and their clients focus on evaluating progress towards each wellness goal and adjusting the wellness plan if necessary. Evaluation and follow-up of TechnoWellness goals could occur in a similar manner. By acknowledging the relationship between TechnoWellness and holistic wellness, professional counselors will be able to help clients interact with technology in ways that will increase their wellness. If future studies establish that the TWI is a reliable and valid instrument, it could serve as a formal assessment of TechnoWellness during the second step in wellness counseling.

**Conclusion**

The purpose of the present study was to operationalize the TechnoWellness construct by creating the TechnoWellness Inventory (TWI), administering it to a sample of participants, and examining the relationship between scores on the TWI and the Five Factor Wellness Inventory (5F-Wel-A). Although the hypothesis that factors would be identical across both instruments was not supported, the study revealed five factors that were used to create TWI scales: the TWI Leisure Scale, the TWI Technostress Scale, the TWI Physical Scale, the TWI Excess Use Scale, and the TWI Vocational Scale. The study’s primary research hypothesis predicted a relationship between TechnoWellness and holistic wellness, and this hypothesis was supported by regression analyses showing that scores on the TWI and three of its scales predicted 5F-Wel-A Total Wellness scores. Evidence of internal consistency reliability for the TWI and its five scales was also strong. Future studies will be
needed to provide additional evidence of the TWI’s reliability, test its validity, and confirm whether its factor structure represents the construct of TechnoWellness.
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[http://quickfacts.census.gov](http://quickfacts.census.gov)


APPENDICES
Appendix A

Informed Consent Form

North Carolina State University
INFORMED CONSENT FORM for RESEARCH

The TechnoWellness Inventory (TWI): Development of an Instrument to Assess a New Wellness Construct

Stephen D. Kennedy (Principal Investigator)     Dr. Stanley B. Baker (Faculty Sponsor)

What are some general things you should know about research studies?
You are being asked to take part in a research study. Your participation in this study is voluntary. You have the right to be a part of this study, to choose not to participate or to stop participating at any time without penalty. The purpose of research studies is to gain a better understanding of a certain topic or issue. You are not guaranteed any personal benefits from being in a study. Research studies also may pose risks to those that participate. In this consent form you will find specific details about the research in which you are being asked to participate. If you do not understand something in this form, it is your right to ask the researcher for clarification or more information. A copy of this consent form will be provided to you. If at any time you have questions about your participation, do not hesitate to contact the researchers named above.

What is the purpose of this study?
The Principal Investigator is developing a new assessment tool called the TechnoWellness Inventory (TWI), and the purpose of this study is to test the instrument. Data collected in this study will be used to revise the TWI and explore the relationship between technology use and wellness.

What will happen if you take part in the study?
If you agree to participate in this study, you will be asked to complete two online surveys. The first survey is the TechnoWellness Inventory (TWI), the instrument that the researcher is testing in this study. The second survey is the Five Factor Wellness Inventory – Adult (5F-Wel-A), an instrument that tests wellness. Several demographic questions are included at the end of the 5F-Wel-A. Completing the two surveys is expected to take 25-40 minutes.

You can withdraw from the study at any time without penalty. If you start any of the surveys and decide that you do not wish to complete them, you can close your Internet browser to leave the survey early.
**Risks**
The risks associated with this research are minimal. You will be asked about your experiences using technology, which could evoke thoughts and feelings associated with past experiences. You will also be asked to consider habits that may influence your wellness.

**Benefits**
This study will offer no direct benefits to you although the questions may help you to reflect on your own technology use and wellness. By participating, you will help the Principal Investigator complete research that will contribute to professional literature and assist counselors in their work.

**Confidentiality**
The information in the study records will be kept confidential to the full extent allowed by law. You will not need to enter your name on this consent form, and your name will not be requested at any other time during the study. The files with your survey responses will identify you with an ID number instead of by name. Your survey responses will be stored securely on the researcher’s computer hard drive, which is password protected. If you choose to enter your email address to participate in the gift card drawing described below, your email will be collected using a separate survey, and your email will not be associated with your survey responses.

Results from this study will be summarized in the Principal Investigator’s dissertation and related publications, but identifying information will not be included. No reference will be made in oral or written reports that could link you to the study.

**Compensation**
You will not receive any compensation for participating in this study, but participants will be entered into a drawing to receive one of ten $50 Amazon.com gift cards. After you complete both the TechnoWellness Inventory and the Five Factor Wellness Inventory – Adult, you will receive a link to a separate survey where you can enter your email address. You will be contacted by email if you are selected in the drawing.

**What if you are a NCSU student?**
Participation in this study is not a course requirement and your participation or lack thereof will not affect your class standing or grades at NC State.

**What if you have questions about this study?**
If you have questions at any time about the study or the procedures, you may contact the researcher, Stephen Kennedy, at 336/209-7327 or sdkenned@ncsu.edu.

**What if you have questions about your rights as a research participant?**
If you feel you have not been treated according to the descriptions in this form, or your rights as a participant in research have been violated during the course of this project, you may contact Deb Paxton, Regulatory Compliance Administrator, Box 7514, NCSU Campus (919/515-4514).

**Consent To Participate**

“I have read and understand the above information. I have received a copy of this form. I agree to participate in this study with the understanding that I may choose not to participate or to stop participating at any time without penalty or loss of benefits to which I am otherwise entitled.”

- Yes, I consent to participate in this study.  
  Date ________________

- No, I do not consent to participate in this study.  
  Date ________________

Investigator’s signature ____________________________  Date ________________
Appendix B

TechnoWellness Inventory (TWI)

The purpose of the TWI is to help you consider how your use of technology is affecting your health and well-being. Technology refers to computer-based technologies such as personal computers, tablet computers, and smartphones. It also includes information and communication technologies such as the Internet and social networking websites, mobile phones, apps, and other technologies that allow you to communicate virtually in text, audio, or face-to-face formats. Being “online” refers to using these information and communication technologies. Please consider your use of technology for multiple activities including work, school, and leisure.

The TWI has 85 items and takes approximately 20 minutes to complete. For each item, select only one answer using the following scale:

- Answer **Strongly Agree** if the item is true for you most of the time.
- Answer **Agree** if the item is true for you some of the time.
- Answer **Disagree** if the item is mostly not true for you.
- Answer **Strongly Disagree** if the item is never true for you.

Sample Item: I enjoy using technology.

If you enjoy using technology most of the time, you would select “Strongly Agree” as shown below.

Sample Item: I enjoy using technology.  
☐ Strongly Agree  
☐ Agree  
☐ Disagree  
☐ Strongly Disagree

Sample Item: Technology frustrates me.

If technology frustrates you some of the time, you would select “Agree” as shown below.

Sample Item: Technology frustrates me.  
☐ Strongly Agree  
☐ Agree  
☐ Disagree  
☐ Strongly Disagree
1. I use technology to stay in touch with family members.
2. I sometimes do not get enough sleep because of the time I spend online.
3. I use websites with content that is funny without being hurtful.
4. I find information online that helps me appreciate my culture.
5. I spend more time communicating with friends online than in person.
6. I go online for leisure and become so absorbed I lose track of time.
7. I go online for information about healthy nutrition.
8. I try to avoid using computers or other technology in my work.
9. I use technology to connect with new friends I have met in person.
10. Learning to use new technologies makes me feel good about myself.
11. Using computers helps me solve problems.
12. I worry about my ability to use new technologies.
13. Participating in online groups helps me to be proud of who I am.
14. I feel less motivated when I need to use some types of technology for my work.
15. I consider how reliable a website is before using medical information it provides.
16. I feel a sense of community when I participate in an online group.
17. I am careful to keep my personal information secure online.
18. I often miss meals when I play video games or online games.
19. I feel uncomfortable when I cannot check my social networking sites.
20. Spending time online can be intellectually stimulating.
21. Communicating with others online gives me a stronger sense of cultural identity.
22. I use apps that help me to exercise.

23. Keeping up with email makes my work more stressful.

24. I use technology to strengthen my relationships with family members.

25. Using some apps helps me to reflect about my spiritual beliefs.

26. I find communicating with friends online easier than communicating with friends in person.

27. I have experienced bullying through social media.

28. I use technology to communicate with others who encourage me to be more physically well.

29. I use technology to make new friends online.

30. Using some types of technology makes me feel less confident about my abilities.

31. I believe that having good computer skills could help me in several ways.

32. I like using technology to share funny experiences with others.

33. I use apps that help me to track my diet.

34. I experience stress from dealing with the demands of work-related technologies while I am at home.

35. Communicating with friends online instead of in person gives me more control over the relationships.

36. Using some apps can be helpful in managing stressors.

37. Social networking sites give me an opportunity to show who I am.

38. I sometimes forget to take time to eat when I am online.

39. I believe that learning to use new technologies gives me a sense of accomplishment.

40. I have conflicts with family members about the amount of time I spend online.
41. Using computers and other technology helps me to feel more in control of my work.

42. I use technology to communicate with others about my spiritual beliefs.

43. I find keeping up with email a distraction from my work.

44. I use technology to find information about places I can go to exercise.

45. I avoid using technologies I have not used before.

46. Going online to relax helps me to feel less tense.

47. Using computers and other technology helps me to learn things that I need to know.

48. Sharing information about my cultural identity is easier online than it is in person.

49. I use technology to stay in touch with close friends.

50. I use apps to help me maintain a healthy weight.

51. Having to use technology in my work can make it harder to complete.

52. I think an online romantic relationship can be more gratifying than an offline romantic relationship.

53. I almost always trust websites that provide suggestions to improve my health.

54. I go online when I am feeling sad or upset.

55. I use technology to strengthen my relationships with friends I have met in person.

56. I find computers useful in my work.

57. I sometimes do not get enough sleep because I am playing video games or online games.

58. I find information online that helps me avoid risks to my safety.

59. I go online for amusement and fun.

60. Online work commitments when I am home reduce my time spent with family.
61. Going online makes me feel good about myself.
62. I believe that I am unable to learn to use any new technologies.
63. Using technology to communicate with others is helpful in my work.
64. I find interacting with family members online easier than communicating with them in person.
65. When I use technology at work, I feel less in control of my work.
66. Participating in online support groups helps me to cope with stressful situations.
67. Sharing information about my gender identity is easier online than it is in person.
68. Using some types of technology helps me feel more confident about my abilities.
69. I go online for information related to my spiritual beliefs.
70. Keeping up with social media makes my work more stressful.
71. Communicating with others online gives me a stronger sense of gender identity.
72. My online activities prevent me from keeping up with work I need to do.
73. Communicating with family and friends through social media helps me to manage stress.
74. My online activities prevent me from spending time with friends.
75. I use technological devices that help me monitor my blood pressure or heart rate.
76. I experience stress when I need to use new technologies.
77. I use websites that focus on solving environmental problems.
78. I find keeping up social media a distraction from my work.
79. I believe that I can avoid computers and have the same employment options.
80. I feel more motivated to complete my work when I use some types of technology.
81. I do not have time to exercise because of the time I spend online.

82. I use technology to let family members know I care about them.

83. I feel less lonely because I have online friendships that substitute for in-person friendships.

84. I feel guilty about the amount of time I spend online.

85. I go online for information about how to exercise.
Appendix C

Expert Reviewers and Reviewer Questions

The panel of experts who reviewed the first version of the TWI included three Licensed Professional Counselors (LPC) with doctoral degrees in counselor education. All three experts have used wellness models when counseling clients. Two of the experts have published refereed journal articles on wellness counseling, and the third expert has conducted a literature review of instruments that assess wellness.

Expert Review Questionnaire

Thank you for serving as an expert reviewer for the TechnoWellness Inventory (TWI). The goal of these reviews is to determine whether the instrument is clearly written and measures the construct that it is supposed to measure.

Please review the TWI and respond to the following questions:

1. Does the TWI’s introductory paragraph adequately explain the purpose of the instrument and define technology appropriately?

   • If not, what changes would you suggest?

2. Are the directions for completing the instrument clear and easy to understand?

   • If not, what changes would you suggest?

3. Are all items on the TWI written clearly and easy to understand?
• If not, which items were unclear or difficult to understand?

4. Based on your knowledge of wellness models used in counseling, are all items on the TWI related to wellness?
   • If not, which items are not clearly related to wellness?

5. Do any items on the TWI seem to be redundant?
   • If so, which pairs or groups of items seem to be redundant?

6. Based on your knowledge of wellness models and/or technology use, can you think of any topics that seem to be missing?
   • If so, what topic(s) should be addressed in new items?

7. Do any items seem biased with regard to a participant’s cultural background or other characteristics?
   • If so, which items seem biased?

8. Do you have any additional feedback about the TWI?
Appendix D

TechnoWellness Inventory (TWI) Feedback Survey

Thank you for completing the TechnoWellness Inventory (TWI) and providing your feedback about the instrument’s directions and items.

Please respond to the following questions about the TWI. If you need to review the directions and items on the TWI, you can find them listed below this survey.

1. Does the TWI’s introductory paragraph adequately explain the purpose of the instrument?
   • If not, what changes would you suggest?

2. Is the term “technology” defined appropriately with clear examples?
   • If not, what changes would you suggest?

3. Are the directions for completing the instrument clear and easy to understand?
   • If not, what changes would you suggest?

4. Is it easy to understand and mark the response choices (Strongly Agree, Agree, Disagree, Strongly Disagree)?
   • If not, what changes would you suggest?

5. Are all items on the TWI written clearly and easy to understand?
• If not, which items were unclear or difficult to understand?

6. Do any items on the TWI seem redundant?

• If so, which pairs or groups of items seem redundant?

7. How long (in minutes) did it take for you to complete the TWI?

8. Do you have any additional feedback about the TWI?
Appendix E

Five Factor Wellness Inventory, Adult (5F-Wel-A) Demographic Survey Questions

(Myers & Sweeney, 2008a)

1. What is your current marital status?
   A. married/partnered
   B. single
   C. separated
   D. divorced
   E. widowed

2. What is your current employment status?
   A. employed full time
   B. employed part time
   C. retired, not working
   D. retired, working part time
   E. not working

3. Are you currently a student?
   A. yes, in high school
   B. yes, working on undergraduate degree
   C. yes, working on graduate degree
   D. yes, taking courses for fun
   E. no, not currently a student

4. What is the highest level of education you have completed?
   A. less than high school
   B. high school graduate
   C. trade/technical school/A.A. Degree
   D. Bachelor’s Degree
   E. Advanced Degree

5. If you have an advanced degree, please specify your highest degree.
   A. Master’s Degree
   B. Specialist Degree
   C. Professional Degree (DDS, JD, MD)
   D. Doctorate Degree (Ph.D., Ed.D.)
6. What is your biological sex?
   A. Male
   B. Female

7. Are you biracial?
   A. Yes
   B. No

8. What is the primary cultural background with which you most closely identify?
   A. Native American
   B. Asian or Pacific Islander
   C. African American
   D. Caucasian
   E. Hispanic/Latino/Latina

9. What is your sexual/affectional orientation?
   A. gay
   B. lesbian
   C. bisexual
   D. heterosexual
Appendix F

Tests of Normality, Linearity, and Homoscedasticity for a Simple Linear Regression of TWI Total TechnoWellness Scores on 5F-Wel-A Total Wellness Scores

This appendix describes procedures used to test the assumptions of normality, linearity, and homoscedasticity when conducting the simple linear regression of TWI Total TechnoWellness scores on 5F-Wel-A Total Wellness scores.

Test of the Assumption of Normality

The assumption of normality can be tested by examining a histogram of the residuals, which are the differences between the observed and predicted values (Fox, 1991). The histogram of residuals for the regression of TWI Total TechnoWellness scores on 5F-Wel-A Total Wellness scores is shown in Figure F1. Because the distribution of residuals resembles a normal curve, it can be assumed that the data are normally distributed.
Figure F1. Histogram of the residuals for the regression of TWI Total TechnoWellness scores on 5F-Wel-A Total Wellness scores.

Test of the Assumption of Linearity

To test whether the relationship between an independent variable and a dependent variable is linear, Osborne and Waters (2002) proposed that a residual plot can be examined. A scatterplot can be used to show the standardized residuals as a function of standardized predicted values. The scatterplot is shown in Figure F2. Because most residuals are distributed around the fit line instead of forming a nonlinear shape such as a curve or a parabola, it can be assumed that the relationship between TWI Total TechnoWellness scores on 5F-Wel-A Total Wellness scores is linear (Weisberg, 2005).
Test of the Assumption of Homoscedasticity

If a distribution has homoscedasticity, the dependent variable varies equally for every value of the predictor variable (Harris, 1998). Osborne & Waters (2002) suggested that, as with linearity, homoscedasticity can be assessed by examining a scatterplot of the standardized residuals as a function of standardized predicted values. When
homoscedasticity exists, residuals are scattered randomly around the fit line instead of appearing in a shape such as a bow-tie or fan (Osborne & Waters, 2002). Because the residuals in Figure F2 are scattered relatively evenly and do not form a discernable shape, it can be inferred that the assumption of homoscedasticity was met.
Appendix G

Tests of Normality, Linearity, and Homoscedasticity for a Simple Linear Regression of TWI Physical Scale Scores on 5F-Wel-A Physical Self Scores

This appendix discusses how the assumptions of normality, linearity, and homoscedasticity were tested when regressing TWI Physical Scale scores on 5F-Wel-A Physical Self scores.

Test of the Assumption of Normality

A histogram of the residuals was used to provide an informal test of normality (Fox, 1991). Figure G1 shows the distribution of residuals for the simple linear regression of TWI Physical Scale scores on 5F-Wel-A Physical Self scores. Because the shape of the distribution approximates a normal curve, it can be assumed that the assumption of normality was met (Fox, 1991).
Figure G1. Histogram of the residuals for the regression of TWI Physical Scale scores on 5F-Wel-A Physical Self scores.

Tests of the Assumptions of Linearity and Homoscedasticity

Residuals for the regression of TWI Physical Scale scores on 5F-Wel-A Physical Self scores are shown in Figure G2. The scatterplot suggests that the assumption of linearity was met because most residuals are close to the fit line and do not form a nonlinear shape such as a curve or parabola (Weisberg, 2005). However, the residuals form a discernable fan shape.
with a greater number of residuals corresponding to a standardized predicted value of 0 or below, and this indicates that homoscedasticity should not be assumed. When a residual plot shows the shape of a fan, it is likely that heteroscedasticity is occurring (Osborne & Waters, 2002).

Figure G2. Scatterplot of the standardized residuals as a function of standardized predicted values for the regression of TWI Physical Scale scores on 5F-Wel-A Physical Self scores.
Appendix H

Tests of Normality, Linearity, and Homoscedasticity for a Multiple Regression of TWI Scale Scores on 5F-Wel-A Total Wellness Scores

This appendix describes procedures used to test the assumptions of normality, linearity, and homoscedasticity when conducting hierarchical and stepwise multiple regression of scores from the five TWI scales (Leisure, Technostress, Physical, Excess Use, and Vocational) on 5F-Wel-A Total Wellness scores. Each of the five scales was regressed on 5F-Wel-A Total Wellness scores to allow the necessary analyses.

**Test of the Assumption of Normality**

First, a histogram of the residuals for each scale was used to examine the assumption of normality. Figure H1 shows the residuals for a regression of TWI Leisure Scale scores on 5F-Wel-A Total Wellness scores; Figure H2 shows the residuals for a regression of TWI Technostress Scale scores on 5F-Wel-A Total Wellness scores; Figure H3 shows the residuals for a regression of TWI Physical Scale scores on 5F-Wel-A Total Wellness scores; Figure H4 shows the residuals for a regression of TWI Excess Use Scale scores on 5F-Wel-A Total Wellness scores; and Figure H5 shows the residuals for a regression of TWI Vocational Scale scores on 5F-Wel-A Total Wellness scores. All five histograms suggested a normal distribution, which indicated that the assumption of normality was met (Fox, 1991).
Figure H1. Histogram of the residuals for the regression of TWI Leisure Scale scores on 5F-Wel-A Total Wellness scores.
Figure H2. Histogram of the residuals for the regression of TWI Technostress Scale scores on 5F-Wel-A Total Wellness scores.
Figure H3. Histogram of the residuals for the regression of TWI Physical Scale scores on 5F-Wel-A Total Wellness scores.

Mean = -1.84E-15
Std. Dev. = 0.998
N = 312
Figure H4. Histogram of the residuals for the regression of TWI Excess Use Scale scores on 5F-Wel-A Total Wellness scores.
Figure H5. Histogram of the residuals for the regression of TWI Vocational Scale scores on 5F-Wel-A Total Wellness scores.
Tests of the Assumptions of Linearity and Homoscedasticity

After simple linear regressions of each TWI scale on 5F-Wel-A Total Wellness Scores were conducted, scatterplots of the residuals were used to test linearity and homoscedasticity. Figure H6 shows residuals for the regression of TWI Leisure Scale scores on 5F-Wel-A Total Wellness scores; Figure H7 shows residuals for the regression of TWI Technostress Scale scores on 5F-Wel-A Total Wellness scores; Figure H8 shows residuals for the regression of TWI Physical Scale scores on 5F-Wel-A Total Wellness scores; Figure H9 shows residuals for the regression of TWI Excess Use Scale scores on 5F-Wel-A Total Wellness scores; and Figure H10 shows residuals for the regression of TWI Vocational Scale scores on 5F-Wel-A Total Wellness scores. Most residuals for the first four scales were distributed around the fit line instead of forming a curved or parabolic shape, which suggested that the assumption of linearity was met (Weisberg, 2005). However, the residuals in Figure H10 form a slight U-shape instead of being distributed equally on both sides of the fit line, which could challenge the assumption of linearity for the regression of TWI Vocational Scale scores on 5F-Wel-A Total Wellness scores.

Residuals appear to be scattered randomly in Figures H6 and H7, indicating that the assumption of homoscedasticity was met for the regressions of TWI Leisure Scale scores and TWI Technostress Scale scores on 5F-Wel-A Total Wellness scores (Osborne & Waters, 2002). However, the shape of the other scatterplots indicated that the assumption of homoscedasticity was violated when the three remaining TWI scales were regressed on 5F-Wel-A Total Wellness scores. In Figure H8, the residuals for the simple linear regression of
TWI Physical Scale scores on 5F-Wel-A Total Wellness scores appear in a shape of a fan with most standardized predicted values having a value of 0 or below. Figure H9, which examined residuals for the simple linear regression of TWI Excess Use Scale scores on 5F-Wel-A Total Wellness scores, also shows the shape of a fan with more predicted values above -0.5 than below that value. The residuals for the regression of TWI Vocational Scale scores on 5F-Wel-A Total Wellness scores are shown in Figure H10, and a disproportionate number of predicted values were higher than 0. The fan shapes on these three scatterplots suggested that homoscedasticity should not be assumed for these three regressions (Osborne & Waters, 2002).
Figure H6. Scatterplot of the standardized residuals as a function of standardized predicted values for the regression of TWI Leisure Scale scores on 5F-Wel-A Total Wellness scores.
Figure H7. Scatterplot of the standardized residuals as a function of standardized predicted values for the regression of TWI Technostress Scale scores on 5F-Wel-A Total Wellness scores.
Figure H8. Scatterplot of the standardized residuals as a function of standardized predicted values for the regression of TWI Physical Scale scores on 5F-Wel-A Total Wellness scores.
Figure H9. Scatterplot of the standardized residuals as a function of standardized predicted values for the regression of TWI Excess Use Scale scores on 5F-Wel-A Total Wellness scores.
Figure H10. Scatterplot of the standardized residuals as a function of standardized predicted values for the regression of TWI Vocational Scale scores on 5F-Wel-A Total Wellness scores.
Appendix I

TechnoWellness Inventory (TWI) Scales

**TWI Leisure Scale**

1. I use technology to stay in touch with family members.

3. I use websites with content that is funny without being hurtful.

4. I find information online that helps me appreciate my culture.

5. I spend more time communicating with friends online than in person.

9. I use technology to connect with new friends I have met in person.

10. Learning to use new technologies makes me feel good about myself.

13. Participating in online groups helps me to be proud of who I am.

16. I feel a sense of community when I participate in an online group.

19. I feel uncomfortable when I cannot check my social networking sites.

20. Spending time online can be intellectually stimulating.

21. Communicating with others online gives me a stronger sense of cultural identity.

24. I use technology to strengthen my relationships with family members.

25. Using technology sometimes helps me to reflect about my spiritual beliefs.

26. I find communicating with friends online easier than communicating with friends in person.

28. I use technology to communicate with others who encourage me to be more physically well.

29. I use technology to make new friends online.
32. I like using technology to share funny experiences with others.

35. Communicating with friends online instead of in person gives me more control over the relationships.

36. Using some apps can be helpful in managing stressors.

37. Social networking sites give me an opportunity to show who I am.

42. I use technology to communicate with others about my spiritual beliefs.

46. Going online to relax helps me to feel less tense.

48. Sharing information about my cultural identity is easier online than it is in person.

49. I use technology to stay in touch with close friends.

52. An online romantic relationship can be more gratifying than an offline romantic relationship.

54. I go online when I am feeling sad or upset.

55. I use technology to strengthen my relationships with friends I have met in person.

58. I find information online that helps me avoid risks to my safety.

61. Going online makes me feel good about myself.

64. Interacting with family members online is easier than communicating with them in person.

66. Participating in online support groups helps me to cope with stressful situations.

67. Sharing information about my gender identity is easier online than it is in person.

68. Using some types of technology helps me feel more confident about my abilities.

69. I go online for information related to my spiritual beliefs.

71. Communicating with others online gives me a stronger sense of gender identity.

73. Communicating with family and friends through social media helps me to manage stress.
77. I use websites that focus on solving environmental problems.

82. I use technology to let family members know I care about them.

83. I feel less lonely because I have online friendships that substitute for in-person friendships.

**TWI Technostress Scale**

12. I worry about my ability to use new technologies.

14. I feel less motivated when I need to use some types of technology for my work.

23. Keeping up with email makes my work more stressful.

27. I have experienced bullying through social media.

30. Using some types of technology makes me feel less confident about my abilities.

34. I experience stress from dealing with the demands of work-related technologies while I am at home.

40. I have conflicts with family members about the amount of time I spend online.

43. I find keeping up with email a distraction from my work.

45. I avoid using technologies I have not used before.

51. Having to use technology in my work can make it harder to complete.

60. Online work commitments when I am home reduce my time spent with family.

62. I believe that I am unable to learn to use any new technologies.

65. When I use technology at work, I feel less in control of my work.

70. Keeping up with social media makes my work more stressful.

72. My online activities prevent me from keeping up with work I need to do.
74. My online activities prevent me from spending time with friends.

76. I experience stress when I need to use new technologies.

78. I find keeping up social media a distraction from my work.

84. I feel guilty about the amount of time I spend online.

**TWI Physical Scale**

7. I go online to find information about healthy nutrition.

22. I use apps that help me to exercise.

33. I use apps that help me to track my diet.

44. I use technology to find information about places I can go to exercise.

50. I use apps to help me maintain a healthy weight.

75. I use devices that help me monitor my blood pressure or heart rate.

85. I go online for information about how to exercise.

**TWI Vocational Scale**

8. I avoid using computers or other technology in my work.

11. Using computers helps me solve problems at work.

41. Using computers and other technology helps me to feel more in control of my work.

56. I find computers useful in my work.

63. Using technology to communicate with others is helpful in my work.

79. I can avoid computers and have the same employment options.

80. I am more motivated to complete my work when I use some types of technology.
TWI Excess Use Scale

2. I sometimes do not get enough sleep because of the time I spend online.

18. I often miss meals when I play video games or online games.

38. I sometimes miss meals when I am online.

57. I sometimes do not get enough sleep because I am playing video games or online games.
Appendix J

TechnoWellness Inventory (TWI): Revised Version

The purpose of the TWI is to help you consider how your use of technology is affecting your health and well-being. Technology refers to computer-based technologies such as personal computers, tablet computers, and smartphones. It also includes information and communication technologies such as the Internet and social networking websites, mobile phones, apps, and other technologies that allow you to communicate virtually in text, audio, or face-to-face formats. Being “online” refers to using these information and communication technologies. Please consider your use of technology for multiple activities including work, school, and leisure.

The TWI has 76 items and takes approximately 20 minutes to complete. For each item, select only one answer using the following scale:

Answer **Strongly Agree** if the item is true for you most of the time.
Answer **Agree** if the item is true for you some of the time.
Answer **Disagree** if the item is mostly not true for you.
Answer **Strongly Disagree** if the item is never true for you.

Sample Item: I enjoy using technology.

If you enjoy using technology most of the time, you would select “Strongly Agree” as shown below.

Sample Item: I enjoy using technology. ☑ Strongly Agree □ Agree □ Disagree □ Strongly Disagree

Sample Item: Technology frustrates me.

If technology frustrates you some of the time, you would select “Agree” as shown below.

Sample Item: Technology frustrates me. □ Strongly Agree ☑ Agree □ Disagree □ Strongly Disagree
1. I use technology to stay in touch with family members.

2. I sometimes do not get enough sleep because of the time I spend online.

3. I use websites with content that is funny without being hurtful.

4. I find information online that helps me appreciate my culture.

5. I spend more time communicating with friends online than in person.

6. I go online to find information about healthy nutrition.

7. I avoid using computers or other technology in my work.

8. I use technology to connect with new friends I have met in person.

9. Learning to use new technologies makes me feel good about myself.

10. Using computers helps me solve problems at work.

11. I worry about my ability to use new technologies.

12. Participating in online groups helps me to be proud of who I am.

13. I feel less motivated when I need to use some types of technology for my work.

14. I feel a sense of community when I participate in an online group.

15. I often miss meals when I play video games or online games.

16. I feel uncomfortable when I cannot check my social networking sites.

17. Spending time online can be intellectually stimulating.

18. Communicating with others online gives me a stronger sense of cultural identity.

19. I use apps that help me to exercise.

20. Keeping up with email makes my work more stressful.

21. I use technology to strengthen my relationships with family members.
22. Using technology sometimes helps me to reflect about my spiritual beliefs.

23. I find communicating with friends online easier than communicating with friends in person.

24. I have experienced bullying through social media.

25. I use technology to communicate with others who encourage me to be more physically well.

26. I use technology to make new friends online.

27. Using some types of technology makes me feel less confident about my abilities.

28. I like using technology to share funny experiences with others.

29. I use apps that help me to track my diet.

30. I experience stress from dealing with the demands of work-related technologies while I am at home.

31. Communicating with friends online instead of in person gives me more control over the relationships.

32. Using some apps can be helpful in managing stressors.

33. Social networking sites give me an opportunity to show who I am.

34. I sometimes miss meals when I am online.

35. I have conflicts with family members about the amount of time I spend online.

36. Using computers and other technology helps me to feel more in control of my work.

37. I use technology to communicate with others about my spiritual beliefs.

38. I find keeping up with email a distraction from my work.

39. I use technology to find information about places I can go to exercise.

40. I avoid using technologies I have not used before.
41. Going online to relax helps me to feel less tense.
42. Sharing information about my cultural identity is easier online than it is in person.
43. I use technology to stay in touch with close friends.
44. I use apps to help me maintain a healthy weight.
45. Having to use technology in my work can make it harder to complete.
46. An online romantic relationship can be more gratifying than an offline romantic relationship.
47. I go online when I am feeling sad or upset.
48. I use technology to strengthen my relationships with friends I have met in person.
49. I find computers useful in my work.
50. I sometimes do not get enough sleep because I am playing video games or online games.
51. I find information online that helps me avoid risks to my safety.
52. Online work commitments when I am home reduce my time spent with family.
53. Going online makes me feel good about myself.
54. I believe that I am unable to learn to use any new technologies.
55. Using technology to communicate with others is helpful in my work.
56. Interacting with family members online is easier than communicating with them in person.
57. When I use technology at work, I feel less in control of my work.
58. Participating in online support groups helps me to cope with stressful situations.
59. Sharing information about my gender identity is easier online than it is in person.
60. Using some types of technology helps me feel more confident about my abilities.
61. I go online for information related to my spiritual beliefs.
62. Keeping up with social media makes my work more stressful.
63. Communicating with others online gives me a stronger sense of gender identity.
64. My online activities prevent me from keeping up with work I need to do.
65. Communicating with family and friends through social media helps me to manage stress.
66. My online activities prevent me from spending time with friends.
67. I use devices that help me monitor my blood pressure or heart rate.
68. I experience stress when I need to use new technologies.
69. I use websites that focus on solving environmental problems.
70. I find keeping up social media a distraction from my work.
71. I can avoid computers and have the same employment options.
72. I am more motivated to complete my work when I use some types of technology.
73. I use technology to let family members know I care about them.
74. I feel less lonely because I have online friendships that substitute for in-person friendships.
75. I feel guilty about the amount of time I spend online.
76. I go online for information about how to exercise.