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ABSTRACT

A PSYCHOMETRIC INVESTIGATION OF THE SHORT INTERPERSONAL
REACTIONS INVENTORY: AN EXPLORATORY FACTOR ANALYSIS
OF THE SHORT INTERPERSONAL REACTIONS INVENTORY
AND AN ASSESSMENT OF THE VALIDITY
OF THE TYPE 1 (CANCER-PRONE)
PERSONALITY CATEGORY

by

Jason Taller

Chair: Rudolph Bailey

ABSTRACT OF GRADUATE STUDENT RESEARCH

Dissertation

Andrews University

School of Education

Title: A PSYCHOMETRIC INVESTIGATION OF THE SHORT INTERPERSONAL REACTIONS INVENTORY: AN EXPLORATORY FACTOR ANALYSIS OF THE SHORT INTERPERSONAL REACTIONS INVENTORY AND AN ASSESSMENT OF THE VALIDITY OF THE TYPE 1 (CANCER-PRONE) PERSONALITY CATEGORY

Name of researcher: Jason Taller

Name and degree of faculty chair: Rudolph Bailey, Ph. D.

Date completed: September 2018

Purpose

The purpose of this study was to determine if the 6 personality Types, as measured by Grossarth-Maticek and Eysenck's (1990) Short Interpersonal Reactions Inventory (SIRI), were present in a sample of cancer and cancer-free individuals and to examine if the Type 1 personality category (cancer-prone personality) could significantly differentiate cancer from cancer-free subjects. Using an ex post facto research design and a sample of 648 English speaking adults selected from North America, overall findings from a confirmatory factor analysis suggested that contrary to results from some prior studies which validated the 6-personality factor structure of the SIRI, the six personality

Types were not sufficiently present and confirmed in the current sample. This observation was attributed to the uniqueness of the current sample and differences in the operationalization of the SIRS across studies. Accordingly, an exploratory factor analysis led to the extraction of two new factors that underlie the factor structure of the current sample. These factors were consequently described as Unhealthy and Healthy personality types. Results from discriminant analyses suggest that the Unhealthy personality type demonstrated good descriptive and predictive discriminant ability and significantly differentiated individuals with a current diagnosis of cancer from their counterparts who do not have cancer. A further analysis using logistic regression modeling techniques also revealed that the ability of the Unhealthy personality type to predict cancer status is quite robust even after controlling for the effects of other theoretically relevant demographic factors. Age and ethnicity were also found to have predicted higher odds of having a cancer diagnosis in the multivariate context. These findings are discussed in light of existing research and directions for future research are noted.

Andrews University

School of Education

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A Dissertation

Presented in Partial Fulfillment
of the Requirements for the Degree
Doctor of Philosophy

by

Jason Taller

September 2018

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APPROVAL BY THE COMMITTEE:

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Member: Carole Woolford-Hunt

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Date approved

DEDICATION

This dissertation is dedicated to the research participants who gave of their time and energy to assist in gathering the necessary data. I hope the findings from this research will play a part in the future development of psychologically based interventions designed for the prevention of some cancers.

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LIST OF ABBREVIATIONS

CHD	Coronary Heart Disease
CECS	Courtlauld Emotional Control Scale
CES-D	Center for Epidemiologic Studies Depression
CFA	Confirmatory Factor Analyses
CFI	Comparative Fit Index
DEF	Defensive high-anxious
DNA	Deoxyribonucleic Acid
DSM	Diagnostic and Statistical Manual
EFA	Exploratory Factor Analysis
EPESE	Established Populations for Epidemiologic Studies of the Elderly
HA	True high-anxious
LA	True low-anxious
MAS	Taylor Manifest Anxiety Scale
MC	Marlowe-Crowne Social Desirability Scale
MMPI	Minnesota Multiphasic Personality Inventory
NK	Natural Killer Cells
PNI	Psychoneuroimmunology
PSQ	Personality Stress Questionnaire
REP	Repressive

RMSEA	Root Mean Square Error of Approximation
ROS	Reactive Oxygen Species
SCR	Skin conductance response
SEM	Structural Equation Model
SIRI	Short Interpersonal Reactions Inventory
SRMR	Standardized Root Mean Square Residual
TLI	Tucker-Lewis Index
UCLA	University of California, Los Angeles

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I am grateful to all of those with whom I have had the pleasure to work with on this research project. Each of the members of my dissertation committee has provided me extensive personal and professional guidance and taught me a great deal about both scientific research and life in general. I would like to thank my committee chair, Dr. Rudolph Bailey, for his dedication and extreme patience. No matter how difficult I made this process you were always there with support and encouragement. Thank you, Dr. Jimmy Kijai, for walking me through many of my statistical challenges. Dr. Woolford-Hunt, you provided me with a different perspective, reminding me that I was dealing with individuals from different cultures and walks of life.

Nobody has been more important to me in the pursuit of this project than the members of my family and friends. I would like to thank my parents, whose love and guidance are with me in whatever I pursue. I would like to thank God for giving me strength and health throughout this process. Finally, I wish to thank my loving and supportive wife, Nina, who provided unending inspiration.

CHAPTER 1

INTRODUCTION

Although it has been a widely held belief during much of the nineteenth century that psychosocial factors play a prominent part in the causation and development of disease, this idea can be traced back as far as two thousand years ago; to the time of Hippocrates and Galen (Le Shan, 1959). At that time, the role of psychosocial factors in the development of physical diseases was substantiated by careful systematic observations, not statistical or experimental research (which was unknown to clinical medicine at that time). Approximately 2000 years ago, Galen noted in his now famous book *De Tumoribus*, that melancholic women (those who were anxious, depressed, cynical, pessimistic, and hopeless) appeared to be significantly more susceptible to the development of cancer (Grossarth-Maticek & Eysenck, 1991). Throughout the past 300 years, several physicians have confirmed Galen's observations. Gendron (1701; cited in Bahnson, 1980, p. 975) wrote that women with serious depression and high anxiety were prone to cancer. Guy (1759; cited in Bahnson, 1980, p. 975) observed that malignancies occur in women with "hysterical and nervous complaints" and are specific to "the dull, heavy, phlegmatic, and melancholic," especially those who have met with "disasters in life, and on occasion much trouble and grief." Walshe (1846; cited in Bahnson, 1980, p. 975) stated that "moral emotions (habitual gloominess) produce defective innervation which, in its turn, causes the formation of carcinoma." Amussat (1854; cited in Bahnson,

1980, p. 976) wrote, "The influence of grief appears to be the most common cause of cancer." Over the past century, the medical literature has begun to postulate a similar mind-body connection, as evidenced by the comments of Sir William Osler, often referred to as the "Father of English Medicine," when he famously quipped, "it is very often much more important what person has the disease, than what disease the person has" (Grossarth-Maticek et al., 2000, p. 34).

While the observations of physicians established a connection between personality factors and physical disease long ago, attempts to quantifiably establish these links via research has been far slower. In the mid-1970's (Friedman & Rosenman, 1974), personality was first recognized as a major risk factor for coronary heart disease (CHD). An individual whose style of personality put them at an increased risk for developing CHD was said to possess a "Type A" personality (those individuals who are ambitious, rigidly organized, impatient, and quick to anger). In 1985, Greer and Watson added a "Type C" behavior pattern to Friedman and Rosenman's Type A. The principal feature of this new concept was the repression of emotional responses followed by conformity, compliance, unassertiveness, extreme patience, and loneliness leading to feelings of hopelessness/helplessness and depression. Greer and Watson believed that this new personality constellation played a significant role in the initiation of cancer.

The belief that a series of personality factors could increase an individual's risk of developing physical disease served to reinforce the existence of a strong mind-body connection and helped propel the relatively new field of psychoneuroimmunology (PNI) (Riska, 2002). Psychoneuroimmunology describes a multidisciplinary area of research that has, as its focus, the dynamic interactions among behavioral factors, the central

nervous system, and the immune system. Specifically, PNI is the study of the interaction between psychology (i.e. personality factors), disease (i.e. cancer), and the body's defense against external infection and aberrant cell division (the immune system) (Halldorsdottir, 2007).

It is now known that the brain and the body communicate with each other in a multidirectional flow of information that consists of hormones, neurotransmitters, and cytokines (Vitetta, Anton, Cortizo, & Sali, 2005). The cytokines and hormones produced by cells of the immune, nervous, and endocrine systems affect mood, emotions, and personal perception. In addition, an individual's mood and emotional state can affect the amount and type of hormones and cytokines produced by the body. In this way, the brain and immune system form a bidirectional communication network in which the immune system informs the brain about events in the body and vice versa. However, when individuals respond to a life event, they do it with their entire body and persona. Therefore, from the perspective of PNI, an individual is seen as a whole, not a collection of systems. According to PNI, there is no real division between mind and body because of the networks of communication that exist between the brain and the neurological, endocrine, and immune systems (Brower, 2006).

How do negative emotions influence the immune system and how big are the effects? These broad questions have been a major focus of PNI over the past 40 years. Research has demonstrated that distress can slow wound healing, diminish the strength of immune responses to vaccines, enhance susceptibility to infectious diseases, and reactivate latent viruses (Glaser & Kiecolt-Glaser, 2005). Additionally, studies on depression and suppression of emotion have found that they can substantially augment

the production of proinflammatory cytokines that are associated with a spectrum of diseases, chief among them cancer (Kiecolt-Glaser et al., 2003).

Depression and the suppression of emotion have often been reported to have an important role in cancer initiation. Lower Natural Killer (NK) cell activity has been found to be the major reproducible result obtained in studies investigating this connection. Lowered NK cell activity is considered the first line of defense against the clearance of tumor cells and the number of metastasis (Reiche, Morimoto, & Vargas, 2005). In addition, depression has been shown to effect the development and accumulation of genetic instability, leading to an increase in deoxyribonucleic acid (DNA) damage and DNA repair time (Kiecolt-Glaser, McGuire, Robles, & Glaser, 2002).

Research has also suggested that reactive oxygen species (ROS) such as superoxides and hydroxyl radicals play an important role in the pathogenesis of several disorders and diseases, including cancer. As a result, personality factors may contribute to the development of cancer via oxidative stress. Increasing evidence shows that oxidative DNA damage is one of the crucial steps in ROS-related cancer initiation (Reiche et al., 2005). Among the different types of oxidative DNA damage, 8-OH-dG is regarded as the most common and has been shown to cause carcinogenesis (Reiche et al., 2005). Research has shown that depression is strongly and positively associated with higher levels of 8-OH-dG, suggesting that depression is a risk factor for cancer initiation (Irie, Asami, Ikeda, & Kasai, 2003).

Finally, several studies suggest that chronic inflammation is a contributing factor to the development of at least 15% of all cancer cases (Marx, 2004). According to Marx (2004), who reviewed the existing research in this area, the inflammatory cells travel into

a growing tumor and produce numerous substances that can contribute to tumor growth and survival, including some that promote cellular changes that lead to the uncontrolled growth of cancer cells and later changes that help metastatic cells escape from the original tumor and spread to new sites in the body. Marx reported that existing research has established a link between negative emotions and the development of chronic inflammation.

As a result of PNI research that was emerging at the time, in addition to their own unpublished work, Grossarth-Maticek and Eysenck developed a strong belief in the premise that specific personality types were related to specific physical and psychological diseases (Grossarth-Maticek & Eysenck, 1990). With this in mind, they introduced a new theory of personality which proposed the existence of six personality Types. Type 1 is a cancer-prone personality type with characteristics similar to Greer and Watson's "Type C." Type 2 is coronary heart disease-prone, with a reaction to stress of chronic irritation and anger. Type 3 is a psychopathic-prone type characterized by ambivalence and the tendency to alternate between the typical reactions of Types 1 and 2. Type 4 is known as the "healthy" group. These individuals display autonomous behavior. Type 5 is related to endogenous depression and may place an individual at risk for developing a variety (yet to be determined) of physical diseases, while Type 6 demonstrates anti-social, egocentric, and possibly criminal tendencies, with a proneness to drug addiction (Grossarth-Maticek & Eysenck, 1990).

As discussed above, the definition of the Type 1 personality has its roots in the initial definition of the cancer-prone personality as defined by Greer and Watson (1985). The basis of this definition rests in the link between the repression of emotion, depressive

symptoms (i.e. feelings of loneliness and hopelessness), and the initiation of cancer. In this vein, a wide range of data on mind-body research is helping to clarify how emotions generate specific patterns of physical illness. Specifically, repressed emotions and depressive symptoms appear to disrupt the systems of the body that maintains well-being leading to the onset of cancer. Several studies have linked depression and the repression of emotions with cancer incidence among those who were initially healthy (Chida, Hamer, Wardle, & Steptoe, 2008). For example, women who tended to repress their feelings and experienced stressful life events such as divorce, death of a husband, or death of a relative or close friend during a five year baseline period, were more likely to be diagnosed with breast cancer during the next 15 years than those who did not experience those events (Lillberg et al., 2003). In a prospective study of men and women aged 71 and over, those who experienced clinical depression over three separate time points in their life were more likely to develop cancer than those who did not (Penninx et al., 1998).

In order for their new theory to have value, Grossarth-Maticek and Eysenck believed they needed to have a fairly straightforward manner of identifying an individual's personality type (Grossarth-Maticek & Eysenck, 1990). In an effort to accomplish this goal, Grossarth-Maticek and Eysenck developed two questionnaires with similar psychometric properties. The first of these was the 182-item Personality Stress Questionnaire (PSQ). The second was the 70-item Short Interpersonal Reactions Inventory (SIRI). Each of these measures contained a specific number of items with yes/no responses relating to each of the six personality Types. In both of these inventories, Types 1, 2, and 5 were identified as "particularly prone to physical disease,"

while Types 3, 4, and 6 were seen as "relatively immune" to physical disease (Grossarth-Maticek & Eysenck, 1990, p. 363). Grossarth-Maticek and Eysenck recommended the use of the SIRI over the PSQ for all languages as the PSQ was "translated informally from German, while the most correct translation was used for the SIRI" (Grossarth-Maticek & Eysenck, 1990, p. 358). In addition, the authors suggested that the SIRI is a shorter, more user-friendly version of the PSQ (Kirk & Martin, 1998). Specifically, the SIRI consists of 70 items; 10 items for each of the six personality Types. Type 4 is broken down into 10 positively worded and 10 negatively worded statements so as to control for acquiescence in response bias. The items from each scale are presented in strict rotation in 10 blocks of seven. The inventory was translated by Grossarth-Maticek and Eysenck from German to English in 1990 (Roberts, Duffy, & Martin, 1995).

After the introduction of the SIRI in 1990, researchers began using it in a limited number of studies. These researchers focused on establishing the validity of both the SIRI as a whole and the Type 1 personality category. Investigations with a specific goal of establishing the validity of Types 2 through 6 have not yet been undertaken, as the focus of research has been on the cancer-prone personality. While some studies supported the validity of the SIRI and Type 1 category (Grossarth-Maticek & Eysenck, 1990; Quander-Blaznik, 1991; Rundmo, Smedslund, & Gotestam, 1996), others did not (Larsson et al., 1995; Roberts et al., 1995; Schmitz, 1992; Smedslund, 1995). As will be further discussed, differences in results when assessing the validity of the SIRI may well rest on methodological grounds. For example, different researchers have administered the SIRI using different versions (some have administered items from a single personality Type while others have administered items from different combinations of Types), studies have

utilized different methods of inventory administration, research studies have administered the SIRI in four different languages (Grossarth-Maticek and Eysenck have only translated the SIRI from its original Serbo-Croatian to German and then to English; other translations were completed by independent researchers), studies have used a range of ages outside the ones used by Grossarth-Maticek and Eysenck (1990) when they initially validated the inventory, and different studies have utilized different scoring methods (Grossarth-Maticek and Eysenck have only presented one scoring method; two others were developed by independent researchers).

Rationale

The SIRI was designed to address a gap in research. Previous to the development of the SIRI, researchers were establishing the existence of the cancer-prone personality, among other physical and psychological illnesses, through the partial use of a wide range of measures, including structured interview, unpublished personality assessments, and validated personality inventories. None of these inventories were designed to specifically assess the characteristics which define the physical and psychological illnesses included in the Grossarth-Maticek personality theory. As a result, several of these measures defined psychological factors, such as emotional suppression, using a variety of items which often measured different aspects of the personality element in question. The SIRI was designed to address this issue by establishing a single, standardized method for establishing the presence of physical or psychological disease-prone personalities. In developing the Type 1 personality category, the authors did not differentiate between the different types of cancer, instead looking at the various types as existing in a single domain. To date, all of the research, which has been extremely limited, has assessed the

validity of either the SIRI in general, or more specifically, the Type 1 personality category.

Previous studies attempting to assess the validity/efficacy of the SIRI have produced inconsistent results, in large part, the product of inconsistent research protocols (i.e. utilizing different scoring methods, administering only subsections of the SIRI to subjects, the utilization of different administration methods, and utilizing different language versions of the SIRI). As these studies have utilized differing methodologies, several of which were different from those utilized by Grossarth-Maticek when collecting his initial data (Heidelberg, West Germany, 1975), the current study is being conducted in an attempt to clarify the issue of the validity of the SIRI through the use of methodological factors which are as similar as possible to those utilized by Grossarth-Maticek (Grossarth-Maticek & Eysenck, 1991). To accomplish this goal, two English speaking groups of subjects from North America between the ages of 40 and 60, one with a current diagnosis of cancer and a second group who are currently and historically cancer-free, will each be administered the full English version of the SIRI. This study will assess whether all six personality Types of the SIRI are present in the sample (in order to establish validity in the SIRI) and then, if the Type 1 personality category (cancer-prone personality type) is present in this sample, is it able to distinguish the cancer and non-cancer groups from one another (in order to establish validity in the Type 1 personality category). If it can, it would suggest that the Type 1 category is tapping into personality factors that are present at higher levels in those with cancer than those who are cancer-free. Finally, a group of demographic items will be assessed to determine whether any of them modify the efficacy of the Type 1 personality category in identifying

individuals with a current diagnosis of cancer. If it were possible to identify these cancer-prone individuals in advance of developing the disease, they could then receive appropriate psychotherapy geared toward moving an individual's personality toward the healthy type (Type 4), thus reducing or delaying the initiation of cancer (Eysenck, 1988).

Statement of the Problem

The SIRI was developed in order to establish a link between specific personality types and corresponding physical diseases. Since its inception in 1990, research seeking to establish the validity of both the complete SIRI and the Type 1 personality category have produced mixed results. The inconsistency in these findings may well be the result of authors significantly drifting their study methodologies from both each other and those utilized by Grossarth-Maticek when he initially collected his data. In order to clarify the questions surrounding the validity of the SIRI and Type 1 personality category, the current quantitative study will seek to administer the complete English version of the SIRI (all 70 items in one of only two languages in which the authors translated the SIRI) to subjects between the ages of 40 and 60 (the age group in which the authors initially validated the SIRI) in an attempt to determine whether all six of the personality Types are present. Additionally, by administering the SIRI to two groups of subjects (one with a current diagnosis of cancer and one currently and historically cancer-free), the current study will seek to determine the validity of the cancer-prone personality type. If the cancer-prone personality can be established, it could potentially lead to early psychological treatment designed to assist in the prevention of the onset of cancer (Eysenck, 1988).

Purpose of the Study

The purpose of this study is to contribute to the limited body of research with inconsistent results surrounding the validity of the SIRS by using a methodology which is as close as possible to the one utilized by Grossarth-Maticek when he initially collected his data. This will allow the current study to assess the validity of the SIRS and the Type 1 personality category in a way which more closely replicates the data collection procedures of Grossarth-Maticek than any existing SIRS research. Specifically, this dissertation will assess the validity of the SIRS by determining whether the six personality Types, as measured by the SIRS, are present in a sample of cancer and cancer-free individuals. If present in the sample, the validity of the Type 1 personality category (cancer-prone) would then be examined by determining whether it could significantly differentiate cancer from cancer-free subjects. Finally, if the Type 1 category is able to differentiate the two groups from each other, a group of demographic items would be assessed to determine whether any of them modify the efficacy of the Type 1 personality category in identifying individuals with a current diagnosis of cancer. This would provide information regarding the robustness of the findings.

Conceptual Framework

The field of PNI provides a prism in which to view the history of the relationship between psychological/personality variables and physical health.

Psychoneuroimmunology is the study of psychological and neural influences on the immune system. The primary concept of PNI is that the central nervous system, neuroendocrine system, and immune system are interlinked. The brain sends messages via the central nervous system. Those messages were once thought to be a one-way

communication device or a response only to outer stimuli. Psychoneuroimmunology allowed researchers to view that communication as two-way, where the brain not only sends novel messages, but also creates responses to incoming internal messages. Over the past 40 years, PNI research has successfully established a connection between emotions and the strength of the immune system. When emotions are not expressed properly, there is an excess of epinephrine (a stress secretion). Epinephrine then causes a chemical breakdown resulting in a weakened immune system and susceptibility to disease, specifically cancer (Seegerstrom & Miller, 2004).

Research Questions

- RQ1: Are the six personality Types of the Short Interpersonal Reactions Inventory (SIRI) present in the current sample?
- RQ2: If the Type 1 personality (cancer-prone) is found to be present in this sample, is it capable of discriminating between the cancer group and the current/historically cancer-free group?
- RQ3: Do specific demographic factors (age, gender, ethnicity, level of physical activity, and smoking behavior) affect the ability of the Type 1 personality category of the Short Interpersonal Reactions Inventory (SIRI) in discriminating between the cancer group and the current/historically cancer-free group?

Significance of the Study

There has been a paucity of research investigating the validity of both the SIRI and the Type 1 category. In fact, only a handful of studies have taken on this challenge.

As mentioned previously, while some studies have supported the validity of the SIRI (Grossarth-Maticek & Eysenck, 1990; Quander-Blaznik, 1991; Rundmo et al., 1996), others have not (Larsson et al., 1995; Roberts et al., 1995; Schmitz, 1992; Smedslund, 1995) and these differences in results may well rest on methodological grounds. This study is significant in that it will use a methodology which is as close as possible to the one utilized by Grossarth-Maticek when he initially collected his data. This, in turn, will allow the current study to assess the validity of the SIRI and the Type 1 personality category in a way which more closely replicates the data collection procedures of Grossarth-Maticek than any previous SIRI research.

Definition of Terms

Cancer. Diseases in which abnormal cells divide without control and are able to invade other tissues.

Cancer-free. An individual who is currently absent of a diagnosis of cancer.

Cancer-prone personality. A personality profile alleged to increase the risk of developing a malignancy secondary to internal conflicts.

Classify. The ability of the SIRI to categorize a group of individuals across the various personality Types.

Construct. An image, idea, or theory, especially a complex one formed from a number of simpler elements.

Differentiate. The ability of the SIRI to make a distinction between two or more groups.

Discriminant Functional Analysis. An analysis used to determine which variables discriminate between two or more naturally occurring groups.

Disease-prone. “unhealthy” individuals who are prone to illness such as cancer or coronary heart disease.

Distinguish. The ability of the SIRI to indicate or show a difference between two groups of individuals (Grossarth-Maticek & Eysenck, 1990).

Endogenous Depression. Depression that seemingly appears out of nowhere and for no reason. It is not attributable to specific events, patterns of behavior, or thought processes.

Ethnicity. Persons related by common descent or heredity.

Gender. The state of being male or female.

Personality Factors. The pattern of collective character, behavioral, temperamental, emotional, and mental traits of a person (Grossarth-Maticek & Eysenck, 1990).

Physical activity. Any bodily movement produced by skeletal muscles that requires energy expenditure.

Smoking. The inhalation of the smoke of burning tobacco encased in cigarettes, pipes, and cigars.

Statistical Significance. In statistics, a result is said to be statistically significant if it was unlikely to have occurred by chance.

Type 1 personality Type. Defined as a cancer-prone personality Type and originally referred to as Type C personality by Greer and Watson in 1985. In 1990, Grossarth-Maticek and Eysenck re-branded Type C personality as Type 1 and defined it as a personality Type where the principle feature is the repression of emotional responses followed by conformity, compliance, unassertiveness, and

extreme patience leading to depression. Grossarth-Maticek and Eysenck believed that this personality Type was predictive of the future development of cancer.

Type 2 personality Type. Refers to a personality Type where an individual is prone to coronary heart disease, with a reaction to stress of chronic irritation and anger.

Type 3 personality Type. This personality type is characterized by ambivalence and the tendency to alternate between the typical reactions of Type 1 and Type 2. The Type 3 personality Type is not considered prone to either CHD or cancer but is considered psychopathic-prone.

Type 4 personality Type. This personality type is the “healthy” group in the typology, displaying autonomous behavior. The Type 4 personality Type is not considered prone to either CHD or cancer.

Type 5 personality Type. This personality type is characterized by rational and anti-emotional tendencies and is prone to endogenous depression.

Type 6 personality Type. This personality type demonstrates anti-social, egocentric, and possibly criminal tendencies, with a proneness to drug addiction.

Validity. The quality of actually measuring the behaviors, which the instrument is designed to measure. In the case of this study, that the Type 1 personality subscale is actually identifying individuals whose personality style places them at a heightened risk for developing cancer.

Limitations

There are several limitations in this study. First, the current study is a snapshot dependent on current conditions. For example, there may be subjects who have cancer

but are currently unaware of this; consequently, they might inadvertently be included in the non-cancer group.

Secondly, the SIRI has limitations in the way in which it was constructed. Research has established many causes, in addition to psychological factors, responsible for the initiation of cancer in humans (i.e. genetics, diet, sun exposure, various environmental carcinogens, etc.). The SIRI was constructed to only consider personality factors when attempting to assess whether an individual is classified as cancer-prone.

Cancer is a multifaceted disease. There are more than 200 different types of cancer. While the SIRI has been designed to identify an individual as possessing a cancer-prone personality, it is not able to distinguish between the different types of cancer that an individual may be at risk of developing. Further, there is currently no research that has determined whether the Type 1 personality is able to identify individuals who are at risk for every type of cancer or just a limited number of different cancer types.

This study will not use Grossarth-Maticek and Eysenck's recommended mode of SIRI administration. While they admitted in their 1990 study that paper-and-pencil administration is most useful for research, they indicated that the preferred method of administration was via interview.

The results will be based on self-reported responses and could include both participant bias and dishonesty.

Participants will not be randomly selected and represent only individuals who are members of SurveyMonkey.

Finally, previous research has not assessed the role of age, ethnicity, gender, level of physical activity, or smoking behavior in the efficacy of the SIRI. These demographic variables could have affected both previous research on the SIRI and the current study. While the age, ethnicity, gender, level of physical activity, and smoking behavior of all study participants will be accrued; they will not be matched on these variables.

Delimitations

This study was delimited to English speaking individuals who are registered with SurveyMonkey. To be included in the study, participants had to have a current diagnosis of cancer or be currently/historically cancer-free. Verification of their cancer status was not done; their reported cancer status was considered sufficient. The questionnaire will only be available on the SurveyMonkey website for a period of two weeks. The data is generated from a measure that has yet to establish a definitive means of administration (e.g. self-report vs. oral presentation). Finally, as the sample includes only those individuals who were willing to participate in this study, it is possible that certain personality Types may be more willing to participate in a research study than others.

Summary

There is interest and need for the creation of evidenced-based assessments to identify individuals whose personality traits may contribute to the future initiation of physical and psychological disease (Greer & Watson, 1985). The SIRI was designed and published by Grossarth-Maticek and Eysenck in 1990 in order to fill this need. The SIRI was initially designed and validated by Grossarth-Maticek and Eysenck (1990) using data collected by Grossarth-Maticek in 1975 (Heidelberg, West Germany). Since 1990, a

handful of studies have assessed the validity and/or efficacy of the SIRI and the Type 1 personality category. These studies have produced inconsistent outcomes, possibly resulting from a failing of the researchers to utilize methodological factors similar to those established by Grossarth-Maticek in his early work. Consequently, the current study will follow the methodological factors utilized by Grosarth-Maticek as closely as possible, allowing for the closest replication of his data collection procedures to date. This includes several methodological elements which previous studies have not included. Specifically, the current study will administer the complete English version of the SIRI to two groups of subjects (one with a current diagnosis of cancer and one currently and historically cancer-free) between the ages of 40 and 60 (the age group in which the authors initially validated the SIRI) to an English speaking North American sample in an attempt to determine whether all six of the personality Types are present. Additionally, the validity of the Type 1 personality category will be assessed by investigating whether it can reliably distinguish individuals with a current diagnosis of cancer from those who are cancer-free.

In summary, the researcher will attempt to determine if all six personality Types are present in the sample and then, if present, will utilize the SIRI Type 1 personality category to attempt to differentiate between a group of subjects with a current diagnosis of cancer and a second group of subjects with no current/historical cancer diagnoses. Next, a group of demographic items will be assessed to determine whether any of them mediate the efficacy of the Type 1 personality category in identifying individuals with a current diagnosis of cancer. If it were possible to identify these cancer-prone individuals in advance of developing the disease, they could then receive appropriate psychotherapy

geared toward moving an individual's personality toward the healthy type (Type 4), thus reducing or delaying the initiation of cancer (Eysenck, 1988).

CHAPTER 2

REVIEW OF THE LITERATURE

Introduction

The occurrence of several diseases and medical conditions including hypertension, coronary heart disease, and cancer has been associated with a number of personality and psychological variables. Research in psychology and behavioral medicine has supported the link between psychology and disease processes. In 1990, Grossarth-Maticek and Eysenck published the SIRI, a new questionnaire designed to measure personality traits predisposing an individual to disease. Most notably, the SIRI included a personality type (Type 1), which the authors claimed, “characterizes cancer patients and is prognostic of the disease” (Grossarth-Maticek & Eysenck, 1990, p. 362). The SIRI was designed to fill a gap in the research. Previous to the development of the SIRI, researchers were establishing the existence of the cancer-prone personality through the use of a wide range of measures, including interview, unpublished personality assessments, and validated personality inventories. The SIRI was designed to establish a single, standardized method for establishing the presence of a disease-prone personality. While the growing field of PNI has provided some supportive research on several of the individual personality characteristics of the Type 1 category, there has been limited research, garnering mixed results, in the assessment of the validity of the SIRI as a whole and the Type 1 category specifically. As the Type 1 category of the SIRI purports to

identify individuals who are at increased risk for developing cancer, it is of significant importance that the cancer-prone personality category be validated.

There are two primary forms of literature reviews which currently dominate the field of behavioral science research; the meta-analytic literature review and the systematic literature review. The meta-analytic literature review is a quantitative form of literature review which “combines results from different studies in the hope of identifying patterns among study results” (Rosenthal, 1995, p. 185). Essentially, meta-analysis is a group of related quantitative procedures for reviewing a body of literature. The meta-analytic procedure includes calculations of effect size estimates and statistical assessment of the strength of relationships between effect size and variables such as population characteristics or aspects of the research design of reported studies (Rosenthal, 1995). In contrast, the systematic literature review is a literature review focused on the research questions which attempts to identify, appraise, select, and synthesize all high quality research evidence relevant to those questions (Baumeister & Leary, 1997). In determining which type of literature review to utilize, a review of the appropriateness of each, with regard to the available literature in the current topic area, was considered. While the meta-analytic literature review is seen as the more objective form of literature review due to the use of quantification, the objectivity of this type of literature review is threatened by the constraints that the meta-analytic procedure places on the literature which is suitable to be included in a review. Unlike a systematic review, the meta-analytic review does not allow for easy integration of the results of certain types of studies. In particular, the specific statistics reported for a study determines whether or not it can be incorporated into a meta-analytic review (Rosenthal, 1995). When considering

the state of the literature on the current topic, because there are so few studies and that most of those studies provide very little statistical information (e.g. population characteristics or research design), if a meta-analytic literature review was chosen, the number of studies included would have been far too few to supply a clear and complete picture of existing research in the field. Consequently, a systematic literature review, which allows the researcher to define the inclusion criteria for study admittance into the literature review, was undertaken.

In order to be included in this dissertation, research studies had to meet the selection criteria established by the author. The following is a list of the inclusion criteria which studies had to meet in order to be included in the literature review: 1) The study had to be available in English, 2) The study had to report quantitative results, 3) If investigating the link between personality factors and cancer, the article had to focus on one of the key components of the definition of the Type 1 personality category (i.e. loneliness, repression of emotions, depressive symptoms), 4) The study had to include age information for the subjects, 5) The article was published in a refereed journal, 6) If the study included the SIRI, it had to utilize the Type 1 category of the SIRI in its entirety, 7) If the article included other inventories (in addition to the SIRI), analysis could not include a mixing of items from the different tests (i.e. the items of the SIRI had to be analyzed on their own), 8) The study had to include items pulled directly from the SIRI, not the longer version PSQ (182 items); the PSQ includes many items from the SIRI, however, they are worded differently, 9) The article contained information concerning methodology, 10) The data from one study did not overlap data from another study, and 11) For studies that used the same data, only the study with the most

comprehensive reporting was included to avoid the overrepresentation of a particular set of data.

Once the inclusion criteria had been established, the collecting of relevant studies for the literature review began. In collecting studies associated with the SIRC, an exhaustive approach was taken. That is to say, all studies that met the inclusion criteria were included. This method was chosen, in contrast to a semi-exhaustive, representative, or pivotal approach, secondary to the paucity of research conducted on the SIRC since its inception in 1990. Research connected to the theory of PNI and the connection between cancer and personality utilized a representative approach.

The literature collection process began with an electronic search of academic databases (PsycINFO and PubPsych). Once relevant articles were identified and obtained, the reference lists of each of these articles were reviewed. Any studies that appeared relevant were obtained and their references were reviewed. The process was repeated until a point of saturation was reached (the point where no new relevant studies came to light). In order to determine which of the articles would ultimately be of value to the current dissertation, the abstract was read. This was successful in eliminating the obviously irrelevant studies. In order to determine which of the remaining articles would be appropriate for inclusion in the current dissertation, each study was read in its entirety and assessed for relevancy.

The following is a review of empirical research related to the link between personality/psychological factors and cancer, the SIRC as a whole, and the cancer-prone personality, specifically. This chapter will be divided into sections that include, a) a review of the field of PNI, b) the Type 1 personality construct and cancer, c) review of

the complete personality theory of Grossarth-Maticek, d) review of the history of the SIRI from its developmental beginnings, e) scoring methods of the SIRI, f) consistency of results in SIRI studies, g) possible causes for the lack of consistent results among SIRI studies, and h) administration of the SIRI.

Psychoneuroimmunology

The field of PNI provides a prism in which to view the history of the relationship between psychological variables and physical health. Psychoneuroimmunology is the study of psychological and neural influences on the immune system. The theory behind PNI is that the central nervous system, neuroendocrine system, and immune system are interlinked. The brain sends messages via the central nervous system. Those messages were once thought to be a one-way communication device or a response only to outer stimuli. Psychoneuroimmunology allowed researchers to view that communication as two-way, where the brain not only sends novel messages, but also creates responses to incoming internal messages. Over the past 40 years, PNI research has successfully established a connection between emotions and the strength of the immune system. When emotions are not expressed appropriately, there is an excess of epinephrine (a stress secretion). Epinephrine then causes a chemical breakdown resulting in a weakened immune system and susceptibility to disease (Segerstrom & Miller, 2004).

In 1975, Adler and Cohen's study pioneered the field of PNI research and was the first to coin the term PNI. They demonstrated that a placebo drug could be used to "trick" the immune system into suppression, in a process similar to the bell eliciting salivation in Pavlov's dog. In their study, the researchers showed that rats who were previously conditioned to the pairing of saccharin and cyclophosphamide (a toxin that causes

suppression of the immune system via a reduction of antibodies) continued to show significantly lower levels of antibodies when the cyclophosphamide was eliminated, and the rats were presented solely with the saccharin solution. While this study was the first to demonstrate that the brain can directly influence the immune system via psychological processes (i.e., classical conditioning), it was not the last. A study by Ghanta et al. (1987) supported the work of Adler and Cohen by demonstrating a clear link between NK cell production and learned behavior. In their study, the authors exposed mice to the odor of camphor before injecting them with a chemical that increased NK cell activity. After nine pairings, the odor alone stimulated NK cell activity. Natural Killer cell activity is of particular interest to PNI researchers because NK cells (a type of macrophage) are a vital part of the immune system. Macrophages fight off invaders such as bacteria, viruses, and cancer cells. If macrophage activity is subject to psychological processes (i.e. classical conditioning), it may help to explain how cancer is initiated in individuals with one set of personality factors more often than those with a different constellation of personality factors.

Specifically, it is research conducted during the past 20 years that accounts for most of what is now known about the relationships among behavioral, neural and endocrine, and immune processes of adaptation. This research has led to the general acknowledgment that, like other physiological processes operating to protect an organism, the immune system is part of an integrated system of adaptive processes and, as a result, is subject to some regulation by the brain (Segerstrom & Miller, 2004). Two pathways link the brain with the immune system: autonomic nervous system activity (a largely involuntary system that regulates heart rate, digestion, respiratory rate, etc.) and

neuroendocrine outflow via the pituitary gland. Both routes provide biologically active molecules that are perceived by the immune system via cell surface or internal receptors on the surface of lymphocytes, monocytes, macrophages, and granulocytes.

Consequently, it is now understood that the neuroendocrine system, where all immunoregulatory processes take place, is “demonstrably sensitive to the influence of an individual’s perception of and response to events occurring in the external world” (Segerstrom & Miller, 2004, p. 616).

Psychoneuroimmunology research has revealed that activation of the immune system is accompanied by changes in hypothalamic, autonomic, and endocrine processes, and changes in behavior (Kiecolt-Glaser et al., 2002). The potential interaction of neuroendocrine and immune processes is further enhanced by the fact that cells of the immune system activated by immunogenic stimuli are capable of producing a variety of neuropeptides. Neuropeptides are small protein-like molecules (peptides) used by neurons to communicate with each other. They are neuronal signaling molecules that influence the activity of the brain in specific ways (i.e. metabolism, learning, memory). These results are supportive of the belief that the exchange of information between the brain and the immune system is bidirectional (Kiecolt-Glaser et al., 2002).

Bidirectional communication is thought to be the driving force behind the influence of the Type 1 personality construct on the initiation of cancer (Kiecolt-Glaser et al., 2002). However, prior to the assessment of the SRI and, more specifically the Type 1 personality construct, the literature which attempted to draw a connection between some of the psychological factors included under the umbrella of the Type 1 personality construct, and their possible contributions to the initiation of cancer, will be reviewed.

The Type 1 Personality Construct and Cancer Initiation

An increasing body of research from the field of PNI supports the idea that psychological/personality factors may play a role in the initiation of cancer (Kiecolt-Glaser et al., 2002). As discussed earlier, the Type 1 category on the SIRS is based on the cancer-prone personality definition of Greer and Watson (1985). This definition postulates a link between the repression of emotion, depressive symptoms (i.e. feelings of loneliness and hopelessness), and an increased risk of cancer. While there has been a paucity of research in this field, in the studies which have taken place, several of the aspects of the Type 1 personality category were utilized as the independent risk factor for cancer. Results from these studies appear to lend support for both the existence of a cancer-prone personality and Grossarth-Maticek and Eysenck's definition of this personality category. In total, 16 studies are discussed here, subdivided into prospective/quasi-prospective studies (seven), case-control/cross-sectional studies (six), and retrospective studies (three).

Prospective/Quasi-Prospective Design

In the following studies, personality factors are assessed before the onset of disease. In prospective studies, the time period between assessment and disease detection can often vary considerably, which can complicate the interpretation of findings. However, as prospective studies are typically quite costly, authors in cancer research have often chosen to utilize a quasi-prospective design, with a few exceptions. In this type of design, personality is assessed shortly before the diagnosis of the disease.

In 1948, Thomas launched a longitudinal study, now referred to as "The John's Hopkins Precursors Study," designed to study risk factors for physical disease (Weiss,

2001). Thomas looked at the health of Johns Hopkins medical students from the classes of 1948 through 1964. The study followed 1337 students over thirty years, to see whether any of the physical and/or psychological factors of the students could be seen as predictors of diseases they may contract later in life. In order to collect data on her subjects, Dr. Thomas gave her students a battery of tests, from a basic physical exam to advanced metabolic tests, as well as psychological surveys. Subjects had to complete a lengthy questionnaire about their parents and siblings, their childhood, their relationships, and their work, play, and eating habits. Dr. Thomas was able to achieve a 95 percent response rate from subjects. Results obtained approximately 30 years after she first began her work, suggested a psychological profile for those subjects who later developed cancer. These individuals appeared to lack closeness to their parents during childhood, reported little demonstrative emotional activity in their families, and were more likely to suppress their emotions (Weiss, 2001). Dr. Thomas' results are especially important and convincing because her work was exclusively prospective, as personality information was collected before, not after, subjects developed physical illness. However, her subjects exclusively consisted of medical students. As a whole, physicians have a considerably higher level of socioeconomic status than the average employee in North America (Krieger, Williams, & Moss, 1997). If socioeconomic status plays a part in the development of cancer (Braveman, 2005), then results from Thomas' work may be skewed.

Thomas' research is supported by the results of similar work by Hagnell (1966) who reported personality information from a group of 2550 (1312 males and 1238 females who ranged in age from 15 to 70+) Swedes who were followed from 1947 to

1957. According to the author, the goal of the study was to, “Make a search in 1957 for evidence of cancer which had occurred during the intermediate 10 years and to compute the incidence of cancer among persons with certain personalities” (Hagnell, 1966, p. 850). Hagnell used Sjobring’s Classification in order to assess the personality type of each subject. Sjobring’s Classification consists of four dimensions; capacity factor (relates to intellectual ability), stability factor (relates to a higher degree of emotional control), solidity factor (relates to the degree of lability in intellectual and emotional functioning), and validity factor (relates to levels of confidence, cautiousness, insecurity, and uncertainty). According to Hagnell, it is assumed that the majority of the population will fall in the middle of the range on each of the four dimensions. In 1957, Hagnell reviewed the cancer status for each of the 2550 subjects. The author found that, between 1947 and 1957 a total of 42 subjects had developed cancer (20 males and 22 females). No associations were found between cancer incidence and rated levels of the capacity factor, solidity factor, or the validity factor. However, the stability factor (level of emotional control) showed a significant trend. Subjects who tended to be more restrictive in their emotional expression were more likely to have developed cancer in the 10 years between measurement of their personality and follow-up of their physical health. While this study appears to support the belief that a lack of expression of emotions may be associated with a diagnosis of cancer, the results need to be viewed cautiously. The sample consisted of 2550 subjects. The fact that just 42 individuals developed cancer, calls into question the strength of the association between emotional expression and cancer status and the ability of the researcher to generalize his results to the population at large. Additionally, Hagnell did not mention which, if any, potential confounding variables he held constant. For

example, the study does not describe the smoking behavior of the sample. This, on its own, could have significantly skewed Hagnell's results. Finally, a review of the literature surrounding Sjobring's Classification failed to yield any results. Consequently, the writer could not determine the reliability or validity of the inventory.

In 1962, Kissen and Eysenck reported on the first double-blind investigation designed to examine the theory that lung cancer patients have difficulties in expressing their emotions and repress or deny them. In order to test this hypothesis, the authors used the Maudsley Personality Inventory (MPI). The MPI was developed by Eysenck in 1959 to measure two personality dimensions; extraversion and neuroticism. As stated by Eysenck, "Extraversion, as opposed to introversion, refers to the individual's outgoing, uninhibited, social proclivities. Neuroticism refers to the individual's general emotional lability, emotional overresponsiveness and liability to neurotic breakdown under stress" (Kissen & Eysenck, 1962, p. 125). Each of these traits is measured by 24 questions, for a total of 48 items. According to the authors, previous research (Eysenck, 1959) has established the validity and the reliability of the MPI. The study consisted of 239 male subjects who were admitted to the Surgical Chest Unit at Southern General Hospital in Glasgow, Scotland for testing designed to diagnose existing symptomology consistent with a variety of chest disorders. All of the subjects were administered the MPI at the Psychological Medicine Unit at Southern General Hospital prior to their appointment with the Surgical Chest Unit. After the screening of the subjects was complete, it was found that 116 of the subjects received a diagnosis of cancer, while 123 of the subjects were found to be cancer-free. The main finding suggested that lung cancer patients have a lower rate of neuroticism than non-cancer patients. The mean score on the neuroticism

dimension of the MPI for the cancer subjects was 3.32, while the mean for the non-cancer group was 5.10. The difference between cancer and non-cancer subjects was significant “beyond the 1 per cent level” (Kissen & Eysenck, 1962, p. 126). According to the authors, “This suggests that lung cancer patients have a diminished outlet for emotional discharge” (Kissen & Eysenck, 1962, p. 126). While results from this study argue that a lack of emotional expression may be present at a significantly higher level in individuals with cancer than those who are cancer-free, there are some concerns surrounding the methodology of this study. All of the subjects chosen for inclusion in this study were previously scheduled for a chest examination secondary to symptomology consistent with lung cancer. The very fact that nearly 50% of the subjects were diagnosed with lung cancer, suggests that the sample was biased. Additionally, there may be other factors which were responsible for the presence of cancer. The authors reported that 97% of the lung cancer patients and 93% of the non-cancer patients were “regular smokers.” However, their definition of “regular smoker” was extremely limited. Kissen and Eysenck considered a subject a “regular smoker” if he smoked at least one cigarette daily for not less than one year. No data was supplied on the average number of cigarettes smoked daily or the average number of years smoked by each group of subjects. There may well be significant differences in past smoking behavior between the cancer and non-cancer subjects, which could have been a major contributing factor in whether a person developed cancer or not.

Schmale and Iker (1966) and Greer and Morris (1975) attempted to replicate the work of Kissen and Eysenck. In 1966, Schmale and Iker investigated whether level of hopelessness could be used to identify cervical cancer before it was diagnosed. The

sample consisted of 40 women (between the ages of 20 and 53) who were admitted to the University of Rochester Medical Centre for a biopsy secondary to repeated cervical smears that revealed cells that were “suspicious” but not diagnostic for cancer. The researchers only included women who were “essentially healthy,” had no gross evidence of cervical disease, and were under the age of 50. In order to establish the psychological make-up of the subjects, the authors utilized “an open-ended, tape recorded interview” (Schmale & Iker, 1966, p. 29). Unfortunately, the exact interview questions were not revealed in the article. Interviews were conducted prior to cancer assessment. Each subject was interviewed for approximately 60 minutes in order to establish their level of hopelessness (a depressive-related symptom). After the interview, the interviewer made note of the data considered relevant in determining the presence or absence of hopelessness. This was followed by a prediction as to whether cancer was present based solely on the presence or absence of hopelessness. According to the authors, the presence of hopelessness is revealed “by a history of long-standing devotion to causes with little or no feeling of success or pleasure, irrespective of actual accomplishment and rarely feels she achieves what she desires to achieve and assumes most of the responsibility for what she considers evidence of failure” (Schmale & Iker, 1966, p. 30). Of the 40 women studied, the authors correctly predicted eight of the 14 subjects who were diagnosed with cancer and 23 of the 26 that were cancer-free. Chi square tests resulted in a P value of 0.007. In discussing their results, Schmale and Iker (1966, p. 33) stated, “Thus, our criteria (feelings of hopelessness) for predicting the presence or absence of cervical cancer appear to be validated.” While this study suggests that hopelessness may indeed be present at a higher rate in cancer patients as opposed to those who are cancer-free,

there are some concerns with this study. Firstly, the authors utilized a small sample size ($n = 40$). If the sample size is too small it is difficult to find significant relationships from the data. Statistical tests normally require a larger sample size to both ensure a representative distribution of the population and to be considered representative of groups of people to whom the results will be generalized or transferred. Next, as all of the subjects were scheduled for cancer testing prior to their interviews, it is reasonable to question whether those who were eventually diagnosed with cancer may have been experiencing more disturbing symptoms or received different information from their private physician. In fact, in the discussion section of Schmale and Iker's paper, they indicate that several of the subjects had been informed by their physician that they likely did or did not have cancer prior to testing. If more of the subjects who went on to test positive for cancer had been told that they likely had the illness prior to testing, it may well have affected their level of hopelessness at the time of their interview. Additionally, the authors did not report on the life history of the subjects. It's possible, for example, that a review of past major life events may have revealed that the cancer group had experienced more significantly negative events in their lives. This may have supplied an alternate explanation for the increased presence of hopelessness in the cancer group. Finally, just as the number of subjects in the study was extremely low, making any generalizations based on the results challenging, the sensitivity of the interview procedure utilized by the authors was also quite low. Based on the presence of hopelessness, the researchers correctly predicted just 57% of the subjects who were later diagnosed with cancer. This level of sensitivity is only slightly above chance (Akoberg, 2006). In terms of the specificity, the authors correctly predicted 88% (23 out of 26) of the subjects as

cancer-free when they were assessed as not being hopeless. While these results suggest that the absence of hopelessness may be more highly correlated with the absence of cancer than hopelessness is with the presence of cancer, again, it is important to recall both the low number of subjects ($n = 40$) included in the study and the lack of any information surrounding the validity of the questions included in the interview procedure. This research demonstrates a need for the utilization of a larger sample size and the creation of a validated inventory for assessing constructs thought to be associated with a cancer-prone personality.

Schmale and Iker's work was extended by Greer and Morris in 1975. Their subjects consisted of 160 women who were less than 70 years of age and had no previous history of breast cancer. All of the subjects were admitted to King's College Hospital for breast tumour biopsy secondary to symptoms consistent with a diagnosis of breast cancer. On the day prior to biopsy, subjects were interviewed using a structured psychiatric interview (no details surrounding this interview were provided) followed by the administration of several psychological inventories, including; the Hamilton Rating Scale, the Mill Hill Test of Verbal Intelligence, the Eysenck Personality Inventory, and the Caine and Foulds Hostility and Direction of Hostility Questionnaire. The psychiatric interview and psychological tests were administered in order to obtain information covering a variety of life experiences and psychological/personality factors. Following biopsy, 69 of the subjects were found to have breast cancer and 91 were found to be cancer-free. Results included two main findings. First, highly significant differences were found between the cancer and cancer-free subjects in the expression of anger and other feelings. The researchers used the following definition to define emotional suppression in

their subjects; “Those who had never or not more than twice during their adult lives openly shown anger, and they had always or nearly always concealed (“bottled up”) other feelings” (Greer & Morris, 1975, p. 776). According to the authors, suppression of anger and other feelings was found in significantly higher proportion of subjects with cancer than those who were found to be cancer-free. Specifically, 47.8% of the cancer subjects were found to suppress anger in comparison to just 15.4% of the cancer-free subjects (significant at the $p < .0001$ level) and 52.2% of the cancer subjects were found to suppress feelings other than anger as compared to 29.7% of the cancer-free subjects (significant at the $p < .0002$ level). Next, a clear age effect was found in the sample for both diagnosis and the suppression of anger and other feelings. In terms of diagnosis, the older a subject was, the more likely a diagnosis of cancer would be returned. Specifically, in subjects under 40 years of age ($n = 30$) 17% were found to have cancer and 83% were found to be cancer-free, in subjects between 40 and 49 years of age ($n = 65$) 28% were found to have cancer and 72% were found to be cancer-free, in subjects between 50 and 59 years of age ($n = 48$) 67% were found to have cancer and 33% were found to be cancer free, and in subjects between 60 and 69 years of age ($n = 17$) 82% were found to have cancer and 18% were found to be cancer-free (all results were found to be significant at the $p < .0005$ level). In terms of emotional expression, in subjects 40 years of age and under, 60% of cancer patients were found to suppress anger as opposed to 16% of cancer-free subjects (significant at the $p < .0001$ level). In subjects above 40 years of age, 69% of cancer subjects were found to suppress anger as compared to 29% of cancer-free subjects (significant at the $p < .001$ level). Further, 40% of cancer subjects were found to suppress emotions other than anger as opposed to 44% of non-cancer

subjects and 76% of cancer subjects above the age of 40 were found to suppress emotions other than anger as opposed to just 39% of non-cancer subjects (significant at the $p < .001$ level). This demonstrates a positive correlation between both age and the presence of cancer and age and the presence of emotional suppression. In essence, as age increases the presence of cancer and level of emotional expression increases. These results suggest that in the future research age needs to be held constant in assessing the role that personality/psychological factors play in the onset of cancer. Specifically, according to results from this study, research assessing the presence of personality/psychological factors in subjects with cancer should focus on individuals who are age 40 and above. While this study has revealed some important findings, there are some limitations to keep in mind. As with several of the studies described above, sample size is an issue with this research. A small sample size can lead to issues with variability, which may lead to significant difficulties with generalizing results to the population at large. The authors included 160 subjects who were scheduled to receive a biopsy in order to confirm or deny a diagnosis of cancer. After diagnosis, those subjects who were found to have cancer formed the cancer group, while those who were found to be “cancer-free” formed the control group. Members of both of these groups had displayed symptoms consistent with breast cancer, which led to the need for a biopsy. It is possible that some of the members of the cancer-free group were pre-cancerous at the time of assessment and, given weeks, months, or years, may eventually return a diagnosis of cancer following testing. This could suggest that the cancer and cancer-free groups are more homogeneous than the study results have suggested. Finally, results from this study offer a couple of interesting observations. First, results suggest that future research exploring the effects of

personality/psychological factors on the initiation of cancer should consider matching subjects for age, as it was clearly found to correlate with the presence of cancer in this study. In the same vein, while most of the observations obtained by this research are consistent with both the study hypothesis and previous research, there is one outlier. In subjects under the age of 40, those with a cancer diagnosis were found to suppress less “other feelings” (those other than anger) than their cancer-free counterparts. However, in subjects above the age of 40 this observation is reversed. It is possible that, while research has suggested that an individual’s personality continues to evolve throughout their lifetime (Srivasta, John, Gosling, & Potter, 2003), the effects of personality are not expressed until after the age of 40 (Friedman, 2008). Essentially, it may take several years for an individual’s personality to have an influence in the development of physical disease. Alternatively, it is possible that, when faced with extreme stress and/or life challenges, an individual more advanced in years, may be more likely to suppress their emotions as opposed to expressing them; for reasons which have yet to be revealed (e.g., life experience, biological processes occurring later in life, changing perspectives on life etc.).

In the same vein as the Kissen and Eysenck (1962), Schmale and Iker (1966), and Greer and Morris (1975) studies, Wirsching, Stierlin, Hoffman, Weber, and Wirsching (1982) examined patients with symptoms consistent with a diagnosis of breast cancer who were scheduled for medical exams to determine the presence of cancer of the breast. The study consisted of 56 women (between the ages of 20 and 76) who were admitted to the surgical clinic in Heidelberg, Germany for the purpose of a biopsy. These women were interviewed on the day prior to their biopsy by a psychotherapeutically trained

physician. The interview lasted between 30 and 50 minutes and was conducted in a semi-structured manner. The interviews followed a guideline which focused on each subject's present situation and behavior. The subjects were assessed on a list of eight variables determined by the authors. Each of the variables was scored for their presence using a 5-point rating scale. The variables were as follows: 1) Engagement and involvement (cancer patients were expected to vacillate between extreme intimacy and extreme aloofness when talking to the interviewer), 2) Expression of feelings (cancer patients were expected to restrain the expression of feelings), 3) Rationalizing attitude (this was expected among cancer patients), 4) Lack of fear (most of the cancer patients were expected not to admit fear of the operation and of the results), 5) Hopelessness (cancer patients were expected to express feelings of hopelessness), 6) Helplessness (cancer patients were expected to express feelings of helplessness), 7) Altruism (cancer patients were expected to show unusually high levels of altruism), and 8) Accommodating behavior patterns of conflict-avoidance (these were expected to occur more frequently in cancer patients). Each of the eight variables were assessed by the interviewer immediately after the interview with the subject and, based on this assessment, the expected diagnosis was predicted. Based on this assessment protocol, Wirsching et al. (1982) correctly identified 83% of the cancer patients and 71% of those who were found to be cancer-free. According to the authors, results revealed that cancer patients displayed significantly increased levels of aloofness ($p < 0.05$ level), hopelessness ($p < 0.01$ level), helplessness ($p < 0.01$ level), and conflict-avoidance ($p < 0.01$ level), while displaying less emotional expression ($p < 0.001$ level). Additionally, the authors indicated that the cancer group was approximately 10 years older than the non-cancer group. However,

they determined that a comparison (t-test) of age-matched pairs of cancer and cancer-free subjects showed that this age difference had no influence on the results ($\alpha = .05$). This study supports the findings of earlier studies, which have suggested that depressive-related symptoms and suppression of emotions are linked to individuals who develop cancer. However, there are several reasons to be cautious in accepting the findings of this study. In reviewing the sample, it is problematic that the authors only included 56 women in their study. This resulted in only 18 cancer cases, a rather small number in which to base any projection to the general population. Another area of concern surrounds the manner in which the personality/psychological factors were assessed. The researchers chose to use a self-created, non-standardized, semi-structured interview. Unfortunately, there is no way to know how effective their interview was at identifying the personality/psychological factors they were attempting to measure. This underlies the need for studies that include both a larger sample and a validated and repeatable measure designed to identify those personality/psychological factors that are believed to put individuals at greater risk for developing cancer.

In 1998, Penninx et al. were the first to examine whether a high level of depressive symptoms, present over a long period of time, were associated with increased risk of cancer in the elderly. The authors gathered their data from the existing Established Populations for Epidemiologic Studies of the Elderly (EPESE). The EPESE was a prospective cohort study that included 4825 individuals (1708 men and 3117 women). During the period from January 1982 through March 1983, a survey was conducted on a sample of the population aged 65 years and older living in East Boston, MA, in two counties in Iowa, and on a random sample in New Haven, CT who did not have a current

diagnosis of cancer and were deemed to be in good health. At the time of the initial EPESE interview at three and six years after the initial interview, trained interviewers administered a 90-minute questionnaire that covered a wide range of psychosocial and health-related issues. In order to assess for the presence of depressive symptoms, the authors administered the Center for Epidemiologic Studies Depression scale (CES-D) to all subjects during baseline and at each of the follow-up interviews (three and six years after baseline). This scale measures depressive feelings and behaviors experienced during the past week (e.g., feelings of sadness or that life has been a failure, lack of appetite, having a restless sleep, or having crying spells). The CES-D consists of 20 items, which are scored on a three point likert-scale with a score range of 0 to 60 (the higher the score, the more present the depressive symptoms). The authors reported that several potentially confounding variables were assessed at the baseline interview, including; age, gender, ethnic origin, cigarette smoking, alcohol intake, physical disability, and body mass index. In order to establish the presence of cancer, the researchers reviewed the medical files of all of the subjects in December of 1992 (a 10 year follow-up). Of the 4825 subjects, 146 (3%) were classified as having a chronically depressed mood. Compared to the non-chronically depressed subjects, chronically depressed subjects were older, more often female, and less often smokers or excessive drinkers. They were more likely to be prescribed antidepressants and to be physically disabled. Additionally, subjects with a chronically depressed mood had a significantly higher rate of cancer than non-chronically depressed subjects (depressed subjects had a cancer rate per 1000 of 30.5 while non-depressed subjects had a cancer rate per 1000 of 21.9, significant at the $p < .05$ level). Overall, depressed subjects were 88% more likely to have cancer than non-depressed

subjects. This study is one of the first to find support for an association between chronic depressive symptoms and cancer risk in the elderly; however, there are a couple of limitations. Despite holding several confounding variables constant, the researchers did not ask subjects about past psychological treatment. If any of the subjects had received psychological therapy and/or psychotropic medication in the past, they may have experienced improvements significant enough to move them from being classified as chronically depressed to not chronically depressed (noting that if a subject scored below the minimum level which indicated the presence of depression on any of the three observation points he/she would be classified as not chronically depressed). This may have resulted in less heterogeneity between the two research groups. Additionally, in reviewing the authors comments concerning the validity of the CES-D (the inventory utilized to identify whether a subject was chronically depressed), they listed the correlation coefficients between the CES-D and other assessments measuring depression at between .42 and .48. According to Gravetter and Wallnau (2013), a correlation of between .40 and .50 represents a weak to moderate relationship between the two measured items. In this case, it means that the relationship between the CES-D and the inventories that were used to validate the CES-D were moderate at best. This observation leads to some concern surrounding how effective the CES-D was at identifying chronic depression in subjects.

In 1994, Fox, Harper, Hyner, and Lyle designed a study to determine if loneliness, a tendency to repress emotions, poor marital quality, and major life changes were associated with an increased likelihood of a breast cancer diagnosis. The subjects included 826 females who were obtained from female volunteers aged 22 to 79 awaiting

normal preventative mammograms at the Indianapolis Breast Center, Indianapolis, Indiana. When patients arrived for their mammograms they were asked if they would be willing to participate in the study. Neither the subject nor the researcher knew the subject's diagnosis at the time the questionnaires were administered. After the questionnaires were completed, the Indianapolis Breast Cancer staff recorded the diagnosis and returned the questionnaires to the researcher. Subjects were then placed in either a "cancer" group or a "cancer-free" group based on results from their mammogram. The following questionnaires were included in the survey instrument presented to subjects: 1) Social Readjustment Rating Scale, 2) Dyadic Adjustment Scale, 3) University of California, Los Angeles (UCLA) Loneliness Scale, and 4) Courtlauld Emotional Control Scale (CECS). These scales measured major life changes, marital quality, loneliness, and emotional repression, respectively. The scales required the subjects to rate various statements on a 5-point likert scale, indicating how often they experienced a particular feeling or reaction. According to the authors, each of the scales had established validity and high statistical reliability. The complete survey took approximately 20 to 25 minutes to complete. Of the 826 women who underwent a mammogram, 20 subjects were diagnosed with breast cancer. Results revealed two major findings. First, the mean emotional repression score was significantly higher (a higher score refers to more suppression of emotions) for the cancer group than the non-cancer group (64.3 vs. 41.9, with a significance at the $p < .0001$ level). Secondly, the mean loneliness score was significantly higher (a higher score indicates increased loneliness) for the cancer group than the non-cancer group (54.0 vs. 39.0, with a significance at the $p < .0001$ level). This study established that a group of women with a diagnosis of breast

cancer had a significantly higher level of emotional suppression than a group of women who were cancer-free. However, there are a few areas of concern with this study. As with some of the earlier studies reviewed, small sample size is a major limitation. The authors were only able to identify 20 subjects with a diagnosis of cancer. This makes any generalization to the population at large extremely limited. Additionally, as with previous studies (Kissen & Eysenck, 1962; Schmale & Iker, 1966; Greer & Morris, 1975; Wirsching et al., 1982), subjects were asked to complete questionnaires measuring psychological factors immediately prior to receiving a medical test designed to assess them for the presence or absence of cancer. As was seen in the Schmale and Iker (1966) study, there is a legitimate concern as to whether subjects who received a positive diagnosis for cancer had some forewarning of their diagnosis based on either symptomology or prior discussion with their physician. If this was the case, then it could reasonably explain the overrepresentation of emotional suppression and loneliness in the cancer group. In order to minimize the effects of this phenomenon, it may be advisable for future research to avoid designing a research protocol where subjects are being assessed for psychological factors immediately prior to undergoing medical testing designed to establish the presence of disease. Finally, Fox et al. did not assess for the possible effects that age may have had on their results. As was revealed by Schmale and Iker (1975) and Wirsching et al. (1982), there appears to be a correlation between age and the presence of the suppression of emotions (i.e. depression, and loneliness). If Fox et al. had further examined their cancer and cancer-free groups to include age-related information; it may have altered the significance of their results. Despite the limitations of this study, it is important to note that the results are in agreement with previous

research in this field, which have examined the link between breast cancer and emotional suppression and loneliness.

Finally, Gross, Gallo, and Eaton (2010) employed highly structured interviews designed to produce diagnoses of Major Depression according to the criteria established by the American Psychiatric Association, in order to study whether individuals meeting these criteria were at increased risk for the development of cancer 24 years later. Data for this study was obtained through the Epidemiologic Catchment Area Program. The Epidemiologic Catchment Area program was a coordinated multi-site epidemiologic survey of community adults, carried out by collaborators between 1980 and 1984 at five university-based sites in the United States. Subjects agreeing to take part in the study were administered, via interview, the Diagnostic Interview Schedule to determine which subjects met Diagnostic and Statistical Manual-III (DSM) criteria for major depression. The authors chose to focus on the 3177 subjects who had been interviewed in the Baltimore, Maryland area in 1981. However, information on baseline depression status and cancer at follow-up was only available for 2017 subjects. All subjects with a diagnosis of cancer that pre-dated the initial interview process in 1981 were excluded from study in order to allow the researchers to begin the observation interval with a group of individuals who were lifetime cancer-free. In order to measure subjects for the presence of depression, a computer algorithm was designed to determine whether the symptom pattern reported in the Diagnostic Interview Schedule for each subject met the criteria, as established in the DSM-III, for major depression. The presence of cancer at 24 year follow-up was determined either by the self-report of surviving subjects or by a review of physician certified death certificates. Results showed that at 24 year follow-up,

a significant relationship was found to exist between a lifetime history of DSM-III defined major depression and the presence of cancer. Specifically, the researchers found that subjects with a history of major depression were approximately four times more likely to have developed cancer than subjects who did not meet the criteria for major depression. These results support earlier work on the link between depression and cancer. However, there is one significant difference. While previous studies have assessed subjects for depressive symptoms (e.g., level of sadness and hopelessness), Gross et al. (2010) identified those subjects who met the DSM diagnostic criteria for major depressive disorder. An individual who meets the diagnostic criteria for major depressive disorder is likely to experience a significantly higher number of more extreme depressive symptoms than an individual who is experiencing depressive-related symptoms and does not meet the DSM diagnostic criteria for major depressive disorder (Kessler, Berglund, Demler, & Kretz, 2003). While it is likely that some of the subjects taking part in earlier studies investigating the link between depression and cancer met the criteria for major depressive disorder, it is safe to say, given the prevalence rate of 6.7% for the disorder in the general population (NIMH, 2010), that they were a minority. As the authors only used subjects who met the diagnostic criteria for major depressive disorder, it may be that they were studying individuals who were located at the end of the depression continuum. As a result, this may have led to a more pronounced relationship between depression and cancer.

While these studies provided an association between lack of expression of emotion/depressive symptoms/loneliness and cancer, they were unable to definitively establish that the symptoms caused the initiation of cancer. At best, it can be surmised

that cancer initiation and the psychological factors studied were correlated. Additionally, the studies discussed above failed to utilize a common personality assessment. Some of the studies used interviews (i.e., Greer & Morris, 1975) while others utilized standardized personality inventories (i.e., Kissen & Eysenck, 1962). It is not possible to know whether the method of personality assessment utilized by, for example, Kissen and Eysenck (1962) would have produced the results obtained in the Schmale and Iker study. This suggests the need for a standard and validated inventory for assessing the generally accepted elements of the cancer-prone personality. Finally, work by Schmale and Iker (1975) and Wirsching et al. (1982) have demonstrated that a correlation may exist between age and the presence of psychological factors associated with the cancer-prone personality (Grossarth-Maticek & Eysenck, 1990). This suggests a need for future research to hold age constant, as it may be a confounding variable in assessing the relationship between personality and cancer-proneness. Next, a review will be undertaken of studies that incorporated a case-control/cross-sectional design in attempting to link emotional repression and depressive symptoms with cancer development.

Case-Control/Cross-Sectional Design

There have been six studies that have utilized a case-control/cross-sectional design in order to attempt to establish a connection between the repression of emotions/depressive symptoms and cancer initiation. In 1984, two studies attempted to test the results obtained by some of the prospective/quasi-prospective studies discussed above. Unfortunately, both of these studies included very low sample sizes. In the first of these studies, Pettingale, Watson, and Greer (1984) compared 30 breast cancer patients recruited approximately 3 months after diagnosis with 27 controls from London,

England. Facial reactions to two stress videos were taped and coded on global expressiveness both in terms of frequency of response and intensity. Tape 1 depicted the emotional upheaval of parents and children who have been separated because the courts have decided that the parents are unfit to care for the children. Tape 2 showed the results of several industrial accidents. Subjects also completed the CECS and the Marlowe-Crowne Scale. On personality variables, the cancer group reported a significantly greater tendency to control reactions when angry. On behavioral measures, cancer patients were significantly less expressive than controls during both stress tapes. According to the authors, individuals with these characteristics tend to control their emotions and to adopt a rational, non-emotional approach to life. While this study demonstrated that individuals with a current diagnosis of breast cancer were more likely to repress their emotions than individuals who were cancer-free, the relationship of these responses to the development of cancer is less clear. The repression of emotions may coexist with cancer but be completely unrelated to its onset. Additionally, age-related information was not provided for the subjects. As has been suggested in other studies (i.e., Greer & Morris, 1975), the cancer-prone personality may not develop or be measurable until an individual reaches a more mature age (possibly 40 years of age). As in previous studies assessing personality variables believed to be associated with the cancer-prone personality, Pettingale et al. utilized a variety of tools to measure the presence of emotional control in individuals with cancer (these measures had not been utilized for this purpose in prior research). Consequently, it is not possible to ascertain whether individuals who were classified as withholding emotional expression in this study would have been similarly classified in previous studies which used different inventories for assessment. This highlights the need

for a single validated measure designed to assess an individual on the psychological factors that have been established in prior research to be associated with cancer-proneness. In the second study, Kneir and Temoshok (1984) added a new wrinkle. Instead of looking at only individuals who had a current diagnosis of cancer and comparing them to those who were cancer-free, the authors added a group of subjects with a current diagnosis of cardiovascular disease in an attempt to differentiate the personality traits of the suspected cancer personality type from CHD. The study included patients with malignant melanoma ($n = 20$), patients with cardiovascular disease ($n = 20$), and subjects who were disease free ($n = 20$). All of the subjects were recruited at the University of California, San Francisco Hospital. The members of the control group were friends or family of the patients. All cancer and CHD subjects had received their diagnosis at least three months prior to their follow-up clinic visit at University of California, San Francisco Hospital. For the cancer subjects, the time-since-diagnosis mean was 17.6 months. For the cardiovascular disease subjects, the time-since-diagnosis mean was 20.2 months. The three groups were matched by age and gender. There were 14 men and six women in each group and the age range of the subjects was between 40 and 65. According to the authors, the age range was chosen because “the modal age range for melanoma patients is younger than for cardiovascular disease patients” (Kneir & Temoshok, 1984, p. 150). Level of emotional repression was measured by self-report and electrodermal responses when subjects were presented with 50 psychologically based statements. Examples of these statements included “annoying, depressing, or insulting comments (e.g. “No one loves you,” “You’re ugly,” “You only have yourself to blame”)” (Kneir & Temoshok, 1984). Each statement was projected on a screen for 5 seconds

while the dermograph monitored the subject's skin conductance reaction. According to the authors, "As each statement was presented, it would often elicit a skin conductance response (SCR), which was interpreted as a physiological indicator of how much the statement bothered or aroused the subject. The subjects then marked the self-report scale after each statement was shown" (Kneir & Temoshok, 1984, p. 151). The self-report scale ranged from 0, for "not at all," to 10, for "extremely" for how much each statement bothered the subject. Consequently, the study procedure provided two indices of arousal evoked by each statement: 1) SCR and, 2) the subject's self-report. A repressive coping response to a specific statement was defined as a SCR above the mean SCR across all statements for that individual subject along with a self-report of anxiety below that individual subject's mean self-report score across all statements. The number of times these observations were seen among all of a subject's responses constituted that subject's repressive coping score. Results showed that the cancer group exhibited more repressive coping behavior than the cardiovascular disease group or the control group. A t-test comparison of the groups revealed that the differences between the cancer and the cardiovascular and control groups were significant at the $p < 0.01$ level. While, according to the authors, "This study found that patients with malignant melanoma displayed coping reactions and tendencies that could be described as indicating repressiveness...which were significantly different from patients with cardiovascular disease or those occupying the control group" (Kneir & Temoshok, 1984, p. 153), there are a couple of concerns with this study. First, sample size is a significant concern. There were only 20 subjects in each of the three groups. This sample size is far too low in order to allow any generalizations to the population at large to be made (Guest, Bunce, &

Johnson, 2006). Another concern rests with the way in which the presence of repression for each subject was assessed. The method utilized was developed by the authors and was not consistent with any prior research. As in previous research in this field, the authors assessed the level of repression in a subject using measures that completely different from all other research. Again, this underlines the need for a single validated measure designed to assess an individual on the psychological factors that have been established in prior research to be associated with cancer-proneness.

While the studies discussed above have attempted to connect the repression of emotions with the presence of cancer, a few important studies have attempted to assess the effects of repression of emotions and depression directly on the functioning of the immune system. In these studies, the researchers looked to link this personality factor with changes in immunofunctioning thought to have an influence on the future development of cancer. In the first of these studies, Jamner, Schwartz, and Leigh (1988) attempted to test the opioid peptide hypothesis of repression. The opioid peptide hypothesis predicts that repressive coping is associated with increased functional endorphin levels in the brain, which can result in decreased immunocompetence. In this study, the authors reviewed the medical records of 312 patients (mean age of 40 years) who were seen over the past five years at the Yale Behavioral Medical Clinic, an outpatient service that evaluates and treats stress-related disorders. All patients who attend the clinic receive an initial psychological assessment and routine blood and urine tests prior to being examined by a physician. The study participants were classified as repressive (REP; $n = 79$), defensive high-anxious (DEF; $n = 69$), true high-anxious (HA; $n = 124$), and true low-anxious (LA; $n = 40$) on the basis of their scores on the Marlowe-

Crowne Social Desirability Scale (MC) and Taylor Manifest Anxiety Scale (MAS), which were administered as part of the initial psychological assessment. REP was defined as those with MAS scores less than nine and MC scores of 17 or greater. LA was defined as those with MAS less than nine and MC scores less than 17. DEF was defined as those with MAS of nine or greater and MC of 17 or greater. Finally, HA was defined as those with MAS of nine or greater and MC below 17. On the day the psychological assessments were administered, blood samples were drawn and medical histories were obtained for all subjects. According to the authors, results from this study “extend earlier research documenting the influence of coping styles on hypothalamo-pituitary-adrenal to challenge by demonstrating that individual differences in coping styles are related to basal differences in these systems as well” (Jamner et al., 1988, p. 571). Specifically, blood test results for individuals who were categorized in the repressive group (REP; $n = 79$) showed reduced monocyte counts. Past research has shown this to represent an important role in resistance against infection and neoplasia making this finding “particularly interesting” (Jamner et al., 1988, p. 573). In their final synopsis, the authors stated, “The results of this study reinforce the idea that repressive coping may reduce resistance to neoplastic disease which often becomes malignant (cancerous)” (Jamner et al., 1988, p. 574). In a follow-up study, Todarello et al. (1997) attempted to find a correlation between alexithymia (difficulty in expressing emotions) and immune functioning. The study included 62 females (36 healthy women and 26 women with cervical cancer) in order to assess a possible relationship between alexithymia, the presence of cervical cancer, and lymphocytic functions. The presence of determined using the 20-item Schalling-Sifneos Personality Scale. The results of the research

revealed that alexithymic women showed lower rates of immune functioning compared to non-alexithymic ones. The authors stated, “On the whole, these preliminary results seem to confirm the hypothesis that a certain personality trait characterized by emotional inhibition is related to greater cancer vulnerability” (Todarello et al., 1997, p. 212). In their 2000 study, Barger, Bachen, Marsland, and Manuck made similar conclusions to that of both Jamner et al. (1988) and Todarello et al. (1997). In this study the authors investigated the relationship between repressive coping and a variety of health related variables, including; insulin, lipids, catecholamines, and cellular immune components. The sample included 83 male college students (aged 18–22) who were placed under acute stress in the laboratory. Stress was induced using the Stroop Task. In this task a subject is required to say the color of a presented word, not what the word says (i.e., for the word “red,” which is written in blue ink, the subject would respond “blue”). With regards to the assessment of subjects as repressors or non-repressors, scores were obtained on the MC and the State Trait Anxiety Inventory. Repressors were defined as scoring below the median anxiety (< 17) on the State Trait Anxiety Inventory while also scoring above the median (> 15) on the MC. Results revealed the presence of 24 repressors and 59 non-repressors. Once each of the subjects were categorized into either the repressor or non-repressor group, the Stroop Task was administered for a total of 20 minutes in which the health related variables (insulin, lipids, catecholamines, and cellular immune components) were continually measured. In describing the results, the authors stated, “We observed quantitative immune differences between repressors and non-repressors, with the former having lower numbers of T-helper and higher numbers of NK cells in general circulation” (Barger et al., 2000, p. 1630). According to the authors, these results

suggested that individuals who utilize a repressive coping style are at an increased risk for developing physical illness. While presenting evidence for a link between physical disease and the utilization of repression as a coping strategy, the previous three studies have some weaknesses associated with them. Firstly, while results demonstrate a difference in immunocompetency between repressors and non-repressors, the studies have yet to determine whether these results have real world consequences. It is interesting when a study finds a connection between personality/behavior and the functioning of specific cells in the immune system, however, it is another matter to determine whether these differences effect the rates of illness in human beings. Secondly, none of the studies mentioned the racial breakdown of their subjects but all discussed the necessity to have their results replicated in subject samples with different demographic characteristics (e.g., males, non-whites). Finally, all of these studies utilized fairly small sample sizes. While Jamner et al. (1988) included only 312 participants, Barger et al. (2000) had just 83 and Todarello et al. (1997) included just 62 subjects.

In a recent study which looked at loneliness (which is associated with depression) instead of the repression of emotions, Jaremka et al. (2013) explored the relationship between loneliness and a number of dysfunctional immune responses and diseases. They suggested that being lonely has the potential to harm overall health. The researchers studied two populations: a healthy group of overweight middle-aged adults and a group of breast cancer survivors. They measured loneliness in all subjects using the UCLA Loneliness Scale; a questionnaire that assesses perceptions of social isolation and loneliness. Participants consisted of 100 breast cancer survivors who were between two months and three years past completion of cancer treatment with an average age of 51

years. Their blood was analyzed for the presence of antibodies against cytomegalovirus. Lonelier participants had higher levels of antibodies against cytomegalovirus than did less lonely participants, and those higher antibody levels were related to more pain, depression, and fatigue symptoms. Additionally, the researchers sought to determine how loneliness affected the production of proinflammatory proteins, or cytokines, in response to stress. Baseline blood samples were taken from all participants who were then subjected to stress; they were asked to deliver an impromptu five-minute speech and perform a mental arithmetic task in front of a video camera and three panelists. Researchers then stimulated the participants' immune systems with lipopolysaccharide, a compound found on bacterial cell walls that is known to trigger an immune response. In both populations, those who were lonelier produced significantly higher levels of a cytokine called interleukin-6, or IL-6, in response to acute stress than did participants who were more socially connected, suggesting that psychological factors (specifically loneliness) may well result in physical alterations to an individual's immune system, ultimately leading to disease.

The studies described above suggest that there is an association between the repression of emotions/depressive symptoms and compromised functioning of the immune system. Consequently, the authors have hypothesized that these changes in immunofunctioning have direct effects on the possible future initiation of cancer. These studies were plagued by many of the same limitations as the prospective studies (i.e., correlation vs. causation) and also left similar questions unanswered. As in the prospective research, these studies did not assess for any known carcinogenic factors. It would have been informative to have seen whether smoking behavior would have

affected the results of the research. Additionally, the authors did not comment on the affect that age, gender, or ethnic differences might have had on their results. Finally, and most saliently, while these studies have provided evidence supporting the long held belief that repression and depression are linked to the development of cancer, they utilized different methods for evaluating the presence of repression, depression, and/or loneliness. As previously discussed, there is no way of determining whether the measures utilized in each study would have been effective in identifying the same presence of repression and/or depressive symptoms across all of the different studies. This further highlights a clear need for a validated way of assessing for the generally accepted components of the cancer-prone personality.

Retrospective Design

Although methodologically less reliable, retrospective studies can be a source of valuable information. As has been demonstrated above, repressiveness and depression appear to play a role in the initiation of cancer. In the first of three retrospective studies, Le Shan (1959) tested and interviewed over 450 individuals with a current diagnosis of cancer and found that 72% of them had particular personality characteristics that occurred in only 10% of a non-cancer control group. As he explored their case histories, he determined that these personality characteristics preceded the onset of cancer by many years and were generally developed in childhood. Specifically, the cancer patients were found to repress their emotions and suffered from depressive symptoms. Kune et al. (1991) sought to confirm the work of Le Shan. The authors studied the association of repressiveness on the development of colorectal cancer in a sample of 346 male patients, 291 female patients, 391 male controls, and 323 female controls in Melbourne, Australia

(with a mean age of 65 for all study participants). The authors utilized data collected in the Melbourne Colorectal Cancer Study between April 21, 1980 and April 20, 1981. As part of the Melbourne Colorectal Cancer Study, the Minnesota Multiphasic Personality Inventory (MMPI) was administered to the subjects verbally. Kune et al. (1991) utilized responses to items 6-22 of the MMPI in order to assess the presence of repression. In reviewing the responses of each of the subjects to the specified items, each was scored a “yes” or “no” for the repression of emotions. For example, in the item “I have never intensely disliked anyone,” a “yes” response would be seen as indicative of the suppression of emotion. According to the authors, results indicated a statistically significant difference ($p < 0.001$) in the hypothesized direction between the patients and the controls. The researchers stated, “The combined score for questions 6-22 shows a highly statistically significant difference in the expected direction ($p < 0.001$), indicating that the ‘cancer personality’ questions do discriminate between cases and controls” (Kune et al., 1991, p. 28). Additionally, when examining gender in relation to these results, no difference was found between males and females. While the study showed significant differences between patients and controls in response to MMPI items specified by the authors, there are some concerns. Firstly, no validation of the items from the MMPI was performed against other measures which measure the presence of repressiveness. The individual items selected from the MMPI by the authors were never intended to be utilized in this way so the validity and reliability have not been established. Next, researchers have not established the effect that the presence of cancer may have on personality. It’s possible that the presence of cancer may alter an individual’s personality leading to a more repressive style. Finally, the study included two sets of individuals; a

group that were currently aware of their cancer diagnosis and a group that, to their knowledge, was cancer-free. The effect of the knowledge that one has cancer on how that individual experiences and/or approaches the outside world is not currently known. Research has not established whether the knowledge of a current diagnosis of cancer will alter an individual's level of repressiveness.

Finally, in a retrospective study which focused on repression utilizing subjects who were diagnosed with cancer anywhere from one to 10 years after initial psychological testing, Dattore, Shantz, and Coyne (1980) compared pre-morbid MMPI scores for veterans who later developed various cancers ($n = 75$), other diseases ($n = 100$), or healthy controls ($n = 25$). Their analysis used the repression-sensitization scale. The authors found that cancer patients had significantly greater repression scores on the MMPI repression-sensitization scale than the other two groups.

The studies described above suggest that the repression of emotion and presence of depressive symptoms, either early in life or years prior to a cancer diagnosis, may lead to changes in the functioning of the immune system which may help to create favorable conditions for the initiation of cancer in the future. While these types of studies allow for the measuring of several outcomes and are fairly quick to complete, they have some drawbacks. Firstly, the investigators had no control over exposure to various confounding variables. For example, while the above studies confirmed that the early presence of repression and depressive symptoms were associated with the presence of cancer, it is possible that other variables may be present that were at least partially responsible for these observations. This includes the age of diagnosis or the presence of current/historical carcinogenic factors. Next, while these studies have once again made a strong case for the

influence of certain personality characteristics in the initiation of cancer, they have each assessed the presence of repression of emotions and depressive symptoms using different methods.

The prospective/quasi-prospective, case-control/cross-sectional, and retrospective research described above suggests a possible link between the presence of depressive symptoms and the use of emotional repression as a coping mechanism with favorable conditions for the future initiation of cancer. However, studies have used several measures to assess the personality factors of their subjects. The different tests require varying degrees of administration methods and times. Additionally, they assess the personality factors they are attempting to identify in a broad sense, as the inventories were not designed for the specific purpose in which they are being used (i.e. the MMPI is designed to comment on depression in the context of a complete personality assessment). Consequently, a valid inventory that includes several well-constructed items specifically designed to determine to what extent an individual's personality fits into the cancer-prone construct is needed. While Grossarth-Maticek and Eysenck have developed such a test (SIRI), the validity of this inventory has yet to be convincingly established.

The Grossarth-Maticek Personality Theory

As research began to successfully establish a link between several of the personality factors present in the Type 1 construct (i.e., repression of emotions, depressive symptoms, and loneliness) and the development of cancer, a researcher in the Netherlands, Dr. Ronald Grossarth-Maticek, began developing a personality theory which attempted to explain the results other researchers were uncovering.

In order to demonstrate that personality factors could place a person at an increased risk of developing cancer, Grossarth-Maticek developed a personality theory which linked personality to physical and psychological health. The Grossarth-Maticek personality theory is in lock step with the development of the SIRI, with the two clearly complementing one another. The theory suggests the existence of six separate personality types (Type 1 through Type 6). Type 1 (also referred to as Type C) constitutes cancer-prone behavior, Type 2 (also referred to as Type A) coronary heart disease-prone behavior, Type 3 psychopathic-prone personality, Type 4 healthy, autonomous behavior, Type 5 rational, anti-emotional behavior, and Type 6 sociopathic behavior.

According to Grossarth-Maticek, these six personality Types are preprogrammed for health, illness, or social deviance. Type 1 individuals are hypothesized to regard an emotionally highly valued object as the most important condition for their own well-being and happiness. Great stress is produced if they fail to achieve nearness to the desired object or person or fail to be successful in a highly valued occupation. They seek harmony and a lack of autonomy in relationships. Type 1 individuals have a tendency to suppress their emotions and be unassertive; leading to depressive and helpless tendencies, immunosuppression, and the eventual development of cancer. Type 2 individuals are hypothesized to regard an emotionally highly valued person or object as the most important cause for their particular distress and unhappiness. Failing to achieve disengagement from the object causes anger, aggression, and arousal. These individuals show a lack of autonomy but are helplessly dependent in relationships. Type 2 is associated with CHD. Type 3 is ambivalent, unadjusted, ego-centered expression. Type 3 refers to individuals who constantly shift from typical Type 1 to typical Type 2 reactions.

These individuals vacillate between feelings of helplessness and anger when faced with relational problems. Type 3 is hypothesized to be relatively resistant to physical illness because the Type 1 and Type 2 parts of their personality counteract one another. Type 4 individuals show a successful integration of inhibition and excitation processes in a “harmonious balance, a pattern which is expected to be associated with health and autonomy” (Amelang, 1997, p. 1252). These individuals are able to self-regulate their behavior and are hypothesized to have a disposition towards being healthy as they avoid the stress reactions commonly experienced by Type 1 and Type 2 individuals. Type 5 is rational-antiemotional expression. These individuals are thought to be prone to endogenous depression. While Type 5 individuals share the feature of emotional suppression with Type 1 individuals, they are different in their non-emotional and rational tendencies. This is believed to place them at risk for the development of several, yet to be determined, physical illnesses. Anti-social personality or Type 6 refers to individuals who exhibit psychopathic, impulsive, rebellious, and hostile behaviors. These individuals are considered to have dispositions towards criminal behavior and drug addiction. Types 3, 5, and 6 are hypothesized to be disposed to psychoticism, rationalism, and antisocial tendencies, respectively. No research to date has shown an association between Types 3, 5, or 6 and any specific physical health outcome (Amelang, 1997).

Once Grossarth-Maticek had developed his new personality theory, he and Hans Eysenck began work on creating a personality inventory. This new inventory would be used to identify individuals whose personality “Type” placed them at an increased risk for developing certain psychological and physical diseases. In developing their new measure, Grossarth-Maticek and Eysenck used data collected in Heidelberg, West

Germany (1975) from longitudinal community research (Grossarth-Maticek, Eysenck, & Vetter, 1988). One of the “Type” categories they would create, Type 1, was developed to classify individuals who were seen as cancer-prone, which is the focus of the current study.

The Development of the Short Interpersonal Reactions Inventory

In the late-1980's, Grossarth-Maticek and Eysenck began work on the development of an inventory which could classify individuals into different groups based on interpersonal reaction patterns. In their 1990 study, Grossarth-Maticek and Eysenck discussed the construction of this new personality inventory. Data for the construction of this new inventory was mined from an early Grossarth-Maticek studie (1975), which built off the work of earlier research (Crvenka, Yugoslavia, 1967). Unfortunately, a thorough examination of the literature has produced few details concerning Grossarth-Maticek's early work. To briefly summarize available information, in his initial study in 1967 (the study which led to the more detailed Heidelberg study), Grossarth-Maticek interviewed a sample of 1353 people between the ages of 40 and 66 (with few over the age of 60) living in the small town of Crvenka in the former Yugoslavia. The subjects were assessed using a catalogue of 450 items that measured, among other things, psychosocial stress and inhibited expression of emotions in social settings. Based on statistical analyses, Grossarth-Maticek predicted that 38 persons would eventually develop cancer. Upon five year follow-up, it was shown that 37 of 38 cases were “hits.” This is a hit rate of 97.3%. The corresponding hit rate for CHD was 92.1% (Amelang, 1997). No further details from this work are present in the literature. In 1975, Grossarth-Maticek began collecting data

in the second of his longitudinal community studies (Heidelberg, Germany). This is the study on which he and Hans Eysenck would later base the development of the SIRI (this study was referred to in Grossarth-Maticek's German language 1977 study, but was not independently published). Grossarth-Maticek reported that data was collected from a total of nearly 30,000 subjects. As with the 1967 Crvenka study, the subjects were almost exclusively between the ages of 40 and 60. Unfortunately, the procedures of the study was not clearly reported. From the scant available information, it appears that subjects completed either (i) a German version of the original questionnaire (from 1967), (ii) an interview covering the same content, or (iii) both the questionnaire and the interview. The initial results from the Heidelberg study were almost as powerful as those in the original Crvenka study. On 10-year follow-up, 17.4% of the normal sample and 38.4% of the cancer-prone sample died from cancer, whereas only 1.8% and 7% of these two samples, respectively, died from CHD. In contrast, of individuals identified as having a predisposition toward CHD, 13.5% of the normal sample and 27.8% of the CHD-prone sample died from CHD, whereas only 5.9% and 2.3% of these samples, respectively, died from cancer (Amelang, 1997).

In 1990, Grossarth-Maticek and Eysenck introduced the final form of the SIRI. The subjects involved in the 1990 study were originally administered the 70 items that would constitute the newly developed SIRI in the Heidelberg, West Germany study in 1975. It is important to note that the 70 items, which make up the SIRI, were initially subsumed among 450 other items that Grossarth-Maticek presented to subjects in his Heidelberg study. Also of importance, Grossarth-Maticek and Eysenck did not share the selection criteria used to select the 70 items, which now constitute the SIRI. According to

the authors, 216 subjects were selected from the original sample of approximately 16000 men and 14000 women from Heidelberg, West Germany. The subjects consisted of half men and half women, equated for age (all were between the ages of 40 and 60), on the basis of their scores on the SIRI. The authors stated, “Our aim was to find equal numbers for each of the six Types, such that a person given a Type was characterized by having a perfect score of 10 for that Type, and no score higher than two on any other Type” (Grossarth-Maticek & Eysenck, 1990, p. 360). The researchers reviewed the health of the subjects after a 10-year period, with mortality and incidence of disease as the dependent variables. Results were consistent with prediction. Subjects who developed cancer were most frequently found to be diagnosed with a Type 1 personality, with more than 50% of the subjects who were classified as Type 1 having developed cancer. Coronary heart disease was found to be approximately three times more frequent in subjects who were classified in the Type 2 personality category. In 1993, Grossarth-Maticek, Eysenck, and Barrett published the results of a 1988 follow-up of the same individuals (from the 1975 studies in Heidelberg, Germany). As in the 1990 study, the authors scored the subjects on each of the six personality types of the SIRI (the authors included the same subjects that had been assessed in Grossarth-Maticek’s 1990 study; with the difference being that they were followed-up after 13 years instead of 10). The authors found that Type 1 was associated with cancer significantly better than all other Types combined. Of Type 1 scorers, 35 out of 326 died of cancer (10.74%) as opposed to all other Types in which only 45 out of 1395 subjects died of cancer (3.23%). The authors reported that the difference in the results are significant at the $p < .00001$ level. They stated, “This

difference is significant and in line with prediction” (Grossarth-Maticek et al., 1993, p. 955).

While the results obtained by Grossarth-Maticek and Eysenck are impressive, their study methodology raises some important questions. Grossarth-Maticek has never released the initial instruments he used in earlier unpublished research (Crvenka or Heidelberg) to construct the SIRI. In the same vein, the authors did not disclose the selection criteria for the items which governed the creation of the SIRI. Finally, in attempting to establish the validity of the SIRI, Grossarth-Maticek and Eysenck pre-selected 216 subjects out of the original 30,000. These subjects were not selected using random assignment. Instead the authors chose the first 216 subjects who could be successfully classified using their scoring method. Future studies (i.e., Roberts et al., 1995) have revealed that the scoring method recommended by Grossarth-Maticek and Eysenck allows few subjects, if any, to be successfully categorized into any of the SIRI personality Types. As they only included the first 216 subjects who were successfully classified by the SIRI using their preferred scoring method, the authors were unable to comment on the efficacy of this scoring method.

Specifically, the SIRI contains 70 randomized items, divided into six sub groups, which define six different types of personality proneness to different physical and psychological illnesses (10 items per personality Type; the healthy Type is assessed by a 10 item scale with positively worded items and a 10 item scale with negatively worded items; allowing the investigators to test for agreement between the two sets of items). The 6 Types were described as cancer prone (Type 1), CHD prone (Type 2), psychopathic

behavior (Type 3), healthy personality (Type 4), endogenous depression (Type 5), and addiction prone (Type 6).

Scoring Methods for the SIRI and the Classification of Subjects to Types

As stated by Derogatis (2013, p. 1871), “One of the most demanding exercises in the development of any typology is the derivation of an algorithm for assignment to type membership.” In the SIRI, clear and uniform scoring rules are lacking for assigning subjects to a specific Type. Since the formal development of the SIRI in 1990, two different scoring methods have been utilized. The first scoring method used by Grossarth-Maticek and Eysenck (1990) was quite restrictive. Under this method, the allocation of a subject to a given personality Type was characterized by having a perfect score of 10 for that Type and no score higher than 2 on any other Type. This scoring method has been objected to by several authors as it often leaves most, if not all, of the subjects unclassified (Schmitz, 1992; Amelang and Schmidt-Rathjens, 1992; Roberts et al., 1995; Smedslund, 1995).

The second scoring method was devised by Schmitz (1992). Under this scoring method, the assignment of a subject into a respective Type is based on whether his/her score falls into the highest quartile on just one Type. A subject who scores in the top quartile of two or more Types cannot be classified. This scoring method seems to be an improvement over the Grossarth-Maticek and Eysenck method described above, as the strict rules of classification have been loosened, which increases the proportion of subjects classified. However, this scoring method also has its weaknesses. Although Schmitz did mention that some of the subjects in his sample could not be classified

because they had scores which did not fall into the highest quartile of any of the six Types, he did not comment on subjects who had scores in the highest quartile of more than one scale. Further, Schmitz did not reveal either the exact number of subjects classified or the number of persons per Type. While it does lead to more subjects being classified than the Grossarth-Maticek and Eysenck method, it has been demonstrated to result in up to 70% of the subjects remaining unclassified (Roberts et al., 1995).

In order to avoid the confusion surrounding scoring method and the significant weaknesses found in each, the mean scores in each of the three groups across each of the personality Types will be used in order to compare the results for each of the groups (as previously done by Amelang & Schmidt-Rathjens, 1992 and Rundmo et al., 1996) This will be used to establish the extent to which each of the six personality Types are present in the sample. In this way, scales with higher mean scores (within each of the three groups) will be seen as more present in the sample than those with lower mean scores. The current study will be utilizing the means, which are based on a summary measure of all the items associated with each personality Type, in order to establish the extent to which each of the six personality Types are present in the sample. In this way, scales with higher mean scores will be seen as more present in the sample than those with lower mean scores. Consequently, this will allow the researcher to avoid the current confusion in the literature surrounding the different scoring methods. If the existing scoring methods are used to determine whether each Type is present in the sample, there may be a large part of the sample who do not meet the criteria for being placed in a single Type and/or may need to be removed from analysis due to scoring rules. Preliminary analysis and assessment of this limitation confirmed this expectation. The application of the two

scoring methods used in previous research led to the vast majority of subjects not being classified. The advantage of using the current method is that it allows for the representation of every subject on the continuum, from those individuals with low scores across all of the Types to those who have scores equal on more than one Type.

In summary, since its inception, secondary to complications in classifying subjects into discrete personality categories, researchers have developed two different methods of scoring the SIRI. This, in addition to a lack of methodological consistency (i.e., administering different sets of limited items from the SIRI and using different modes of administration), which will be discussed below, has resulted in confusion in the literature that, in turn, has contributed to marked discrepancies in results between studies utilizing the SIRI. Next, an examination of the mixed results generated by a handful of studies, which have attempted to assess the psychometric properties of the SIRI, will be reviewed.

Results of Studies Utilizing the Short Interpersonal Reactions Inventory

Since Grossarth-Maticek and Eysenk's 1990 study, which showed that the Type 1 personality category of the SIRI correlated highly with cancer, the limited research seeking to confirm their findings has produced mixed results.

The first of three studies that produced results supporting those in Grossarth-Maticek and Eysenck's 1990 study was conducted by Quander-Blaznik (1991). The author conducted a quasi-prospective study that attempted to predict the presence or absence of lung cancer. Quander-Blaznik chose to utilize only the items associated with the Type 1 personality category of the German language version of the SIRI (10

statements). The study included 64 patients (no age-related data was provided) who resided at the Heckeshorn Lung Hospital in West Germany. The patients had been referred to the hospital for suspected lung cancer. The subjects completed the Type 1 items from the SIRI prior to receiving a diagnosis. The authors concluded that the 10 items which make up the Type 1 category on the SIRI correlated significantly with a diagnosis of cancer and, as a group, these 10 items predicted the future presence of cancer in 78% of the cases. The results of this study confirmed results found in the 1990 study by Grossarth-Maticek and Eysenck, specifically, the efficacy of the SIRI to correctly identify individuals with cancer as possessing a cancer-prone personality Type. However, the authors only utilized 10 of the 70 items from the SIRI and the sample size was quite small.

Next, in a sample of 414 university students between the ages of 18 and 27 who were administered the 10 items from the Type 1 personality category of the SIRI, Sandin, Chorot, Santed, and Jimenez (1993) found a positive relationship between immune-related problems (associated with cancer) and the Type 1 personality category of the SIRI, thus providing some support for the validity of the Type 1 personality category. The authors concluded that their findings “generally support the differential psychosomatic model proposed by Eysenck and Grossarth-Maticek” (Sandin et al., 1993, p. 435).

The final study demonstrating support for Grossarth-Maticek and Eysenck’s 1990 results was conducted by Rundmo et al. (1996). In their study they randomly sampled 10,000 individuals aged 19 and older (with a mean age of 42.2 and a SD of 16.2) from a small Norwegian town of which 5014 agreed to take part. The SIRI (Dutch language

version) was part of a larger group of questionnaires that were mailed to the subjects. The authors were looking for associations between stress, personality, and smoking. The SIRI was utilized to assess cancer-prone personality (Type 1), CHD personality (Type 2) and healthy personality (Type 4). As a result, only the items from Type 1, Type 2, and Type 4 were utilized, resulting in subjects being administered a total of 40 items from the SIRI. In this study, the mean score on the cancer-prone personality Type was used as a method of comparing subjects with a history of cancer from those with no history of the disease. Consequently, subjects were not classified into a specific personality Type. Results indicated that subjects with a current or previous diagnosis of cancer scored nearly three times higher on the cancer-prone personality Type mean score than on Type 2 or Type 4, thus supporting the early work of Grossarth-Maticek and Eysenck. There were a few shortcomings in this study. First, the researchers left out 30 test items from the SIRI that may have influenced the responses of the subjects on the 40 items they were given. Similarly, as mentioned earlier, the validation of the SIRI by Grossarth-Maticek and Eysenck was done using all of the personality categories. They did not validate the SIRI using only a subsection of the personality categories or a limited number of the 70 items. Finally, the authors used a Dutch version of the SIRI. Grossarth-Maticek and Eysenck did not translate the SIRI into Dutch (only English and German). Therefore, the version of the inventory utilized by Rundmo et al. (1996) must have been translated by them, not the creators of the SIRI. As will be discussed later, research is fairly clear in the necessity of utilizing a clear, concise, and organized process when translating a validated instrument into a new language. Rundmo et al. did not include any details discussing the process surrounding their translation of the SIRI to Dutch.

There are three studies that have produced results that are not supportive, to varying degrees, of Grossarth-Maticek and Eysenck's 1990 study. The first of these studies was conducted by Amelang and Schmidt-Rathjens (1992). They utilized items from the SIRI to investigate the relationship between the Type 1 and Type 2 personality scales. Their subjects included 204 individuals between the ages of 19 and 72 that were administered the items from the Type 1 and Type 2 categories (20 items in total), which were subsumed among items from other personality measures. In this sample, there were 10 individuals with a current diagnosis of cancer and 20 with a current diagnosis of coronary heart disease. Factor analysis revealed that Types 1 and 2 both loaded positively on one dimension. As previous research by Grossarth-Maticek and Eysenck had demonstrated high discriminant validity, Amelang and Schmidt-Rathjens (1992, p. 1253) examined whether on "an item basis any separation into two factors according to the scales could be observed." In a common factor analysis of the items belonging to Types 1 and 2, the authors were only able to extract one factor, which explained 43% of the variance. They found that, "with very few exceptions, all items loaded positively on this single factor." The authors reported the mean loading for items belonging to Type 1 as 50% and for Type 2 as 58%. Even with extraction of additional factors, no differentiation into Types 1 and 2 could be found. When Ameland and Schmidt-Rathjens compared the subjects with a current medical diagnosis (10 cancer and 20 coronary heart disease) they found that in a comparison of means for persons with cancer or CHD and healthy subjects, Types 1 and 2 differentiated significantly between healthy and unhealthy subjects. However, they could not differentiate between groups with cancer and coronary heart disease. This is consistent with the work of Booth-Kewley and Friedman (1987)

who proposed the existence of a generic “disease-prone” personality that involves depression, anger/hostility, anxiety, and possibly other aspects of personality. Amelang and Schmidt-Rathjens results were clearly not in line with the work of Grossarth-Maticek and Eysenck. However, Amelang and Schmidt-Rathjens failed to follow much of the methodology utilized by Grossarth-Maticek and Eysenck in their 1990 study. They used a relatively small sample size (especially in the illness groups), only administered 20 of the 70 SRI items, and subsumed the items they did administer within a questionnaire which included items from other personality measures.

In their 1995 study, Roberts et al. examined the psychometric properties of the SRI in a sample of Australian twins. The aim of their study was to test the claimed psychometric properties of the constructs using a large sample. The study included a sample of 762 individuals from seven cities throughout Australia. The age range of the sample was 19 to 76 years, with an average of 36.4 years. The authors attempted to utilize both of the scoring methods previously used in research. When they attempted to apply the Grossarth-Maticek and Eysenck scoring method (a score of 10 on one personality Type while not scoring more than two on any other of the Types) they found that they were unable to classify any of the subjects. When Roberts et al. (1995) applied the Schmitz scoring method (when a subject scores in the top quartile on a single personality Type) they were able to classify approximately 30% of the sample. Consequently, they chose to apply the Schmitz scoring method. Results revealed that the Type 1 scale was correlated significantly with the Type 2 and 3 scales. Additionally, the researchers found that there was a very low correlation between Type 4a and Type 4b (correlation of .17). The authors reported these results as “disturbing.” They stated,

“These scales are supposed to be measuring different constructs, but the analysis reveals that this may not be the case” (Roberts et al., 1995, p. 318). The findings of these researchers were inconsistent with those of Grossarth-Maticek and Eysenck (1990) as Roberts et al. (1995) determined that there was significant correlation between the Types 1, 2, and 3 scales. Previous research from Grossarth-Maticek and Eysenck (1990) had suggested that each of the 6 personality Types were distinct from one another, measuring different constructs. A significant issue with this study was the challenge surrounding scoring method. The authors were only able to analyze the results of 30% of their sample. The disqualification of 70% of subjects secondary to the scoring method of an instrument is troubling. In order to avoid this issue in the current study, the mean scores in each of the three groups across each of the personality Types will be used in order to compare the results for each of the groups.

In 1995, Smedslund developed a study designed to report the prevalence data for the SIRI in a normal population sample. However, he did not record the prevalence of all six Types, instead focusing on Type 1, 2, and 4 in a sample of approximately 5000 subjects 18 years and older from Norway. The SIRI was mailed to subjects and their participation was rewarded with an enrollment in a lottery in which one of several prizes could be won. In addition to the questions from Types 1, 2, and 4 (a total of 40 items), demographic data was also collected. This included information surrounding age, marital status, income, education, smoking behavior, level of physical exercise, and the presence of illness (six types of cancer and heart disease). In terms of a scoring method, Smedslund (1995, p. 695) stated,

If score 1 was the highest, the person was categorized as a Type 1. If Score 2 was the highest, the person was categorized as Type 2. If score 4-A or Score 4-B was the

highest, the person was categorized as Type 4. If two or more scores were highest and equal, the person was not assigned a Type.”

Smedslund reported that approximately 50% of the subjects could not be categorized. In terms of the distribution of the three Types in the sample, results showed that 92.5% of the respondents were categorized as Type 4, 4.3% as Type 1, and 3.6% as Type 2.

Further, as previously noted, while Smedslund did not control for cancer history, this information was requested, along with history of heart disease. Results revealed that, even though the differences between the Types for the presence of cancer history was not significant (1.1% of Type 1 subjects had a history of cancer, 2.5% of Type 2, and 1.1% of Type 4), there was a higher percentage of subjects who were classified as Type 2 (CHD-prone) and had a history of cancer than Type 1 (cancer-prone). Finally, Smedslund found that, while undifferentiated from one another, the Type 1 and Type 2 categories had significantly more history of illness than Type 4. The author hypothesized that, similarly to Amelang and Schmidt-Rathjens (1992) and Roberts et al. (1995), while the SIRI may not have the power to predict specific diseases, it may have the ability to predict the development of disease in general. As with the two studies above, the results from this study do not support the work of Grossarth-Maticek and Eysenck. This may be the result of administering items from only three of the six personality Types, only being able to classify 50% or less of the sample, and/or administering the SIRI in a language that was not translated by the authors of the SIRI.

The studies above highlight the inconsistent findings generated by the SIRI. The Grossarth-Maticek and Eysenck (1990) study, and those studies that support their results, suggest that the Type 1 and Type 2 personality categories are capable of identifying those individuals at an elevated risk of developing a specific disease. However, the studies

which do not support their results suggest that the Type 1 and Type 2 personality categories are unable to identify individuals who are at risk of developing a specific disease. Instead, these authors suggest the possibility that the Type 1 and Type 2 scales, taken together, may be predictive of an increased risk of developing disease in general. This is consistent with the work of Booth-Kewley and Friedman (1987) who proposed the existence of a generic “disease-prone” personality that involves depression, anger/hostility, anxiety, and possibly other aspects of personality. These discrepancies may be the result of many factors. The next section will review some of these and identify how the current study will deal with these challenges.

Possible Explanations for the Lack of Consistent Results in Studies Utilizing the SIRI

The disparity of results between studies utilizing the SIRI is a cause for concern. There are several potential explanations for these discrepancies. First, these studies have utilized different scoring methods. Until Schmitz began using the upper-quartile scoring method in 1992, previous studies used the original scoring method of Grossarth-Maticek and Eysenck. The use of different scoring methods can have drastic effects, not only on which personality Type an individual is classified into, but also whether that person is able to be classified at all. When attempting to classify 419 pairs of Australian twins with a history of asthma across the six personality types of the SIRI, Roberts et al. (1995) discovered that the scoring method applied to the sample was of vital importance. In their study, the authors used the two scoring methods utilized by previous researchers. The first was the Grossarth-Maticek and Eysenck (1990) method in which subjects were assigned to a Type if they had a perfect score of 10 on one of the Types along with scores

lower than two on all other Types. This scoring method did not allow the authors to classify any of the subjects. For the second method, they used the Schmitz criterion, with the assignment of subjects into their respective types based on whether their scores fell into the highest quartile on just one Type. They found that a high percentage of subjects had scores in the highest quartile of more than one scale (57%), with 90% falling into the highest quartile of at least one of the six Types (10% did not score in the highest quartile of any of the Types). In the end, just 30% of the sample was classified into a single Type on the basis of the Schmitz scoring method. Clearly, neither of these scoring methods provided an acceptable way of determining which of the personality Types a subject was a member. A situation where only 30% of the subjects in a research study are retained is certainly problematic.

Another potential cause for differing results in SIRI studies are the differences in the age of the subjects included across these studies. Studies included participants who ranged in age from late teens to 72 years of age. This is inconsistent with the age restrictions utilized by Grossarth-Maticek (40-66 with the vast majority of subjects falling between 40 and 60 years of age) when initially gathering his data in 1975 (Heidelberg, West Germany). Critically, this data would eventually be used in the development and validation of the SIRI. A deviation from the age range of the subjects on which the SIRI was initially validated could have significant effects on the results obtained by researchers. For example, it is possible that these personality factors do not crystallize into a recognizable/measurable pattern which the SIRI is able to identify until later in life (after 40 years of age).

Next, all of the studies utilized different versions of the SIRI. For example, while Quander-Blaznik only administered the items from the Type 1 personality category (10 items in total), Smedslund administered Types 1, 2, and 4 of the SIRI (40 items in total). The initial validation of the SIRI by Grossarth-Maticek and Eysenck was done using all of the personality categories. They did not validate the SIRI using only a subsection of the personality categories. As no other researchers have sought to establish the validity of a truncated version of the SIRI, the validity of these alternate versions of the SIRI are not currently known. It may be that the Type 1 category is only effective in identifying individuals with a cancer-prone personality when administered in the context of the entire SIRI.

Another challenge rests in the administration of the SIRI. While they suggest that paper-and-pencil administration is appropriate for research purposes, Grossarth-Maticek and Eysenck (1990) recommend that the SIRI be administered via interview. This type of administration makes it possible for the interviewee to ask questions about the items and allows the interviewer to answer the questions and clarify the meanings of items. A written questionnaire heightens the risk of misunderstandings. On the other hand, the interview method is burdened by the risk of experimental artifacts like evaluation apprehension, demand characteristics, and interviewer bias.

Finally, while the SIRI was originally published and validated in the German language (after the items were translated from Serbo-Croatian), studies utilizing the SIRI have used Norwegian, Swedish, and Danish versions. These other versions were not translated by the developers of the SIRI (Grossarth-Maticek and Eysenck) and the authors of these follow-up studies did not provide details surrounding the process associated with

the translation of the inventory. Research is fairly clear in the necessity of utilizing a clear, concise, and organized process when translating a validated instrument into a new language. According to Butcher, Derksen, Sloore, and Sirigatti (2003), when translating a psychological measure, there are several generally accepted principles that must be demonstrated by the researcher. These principles are as follows; the test administration procedures need to be equivalent in the target culture and the culture of origin, construct equivalence needs to be assured in order to guarantee that the constructs that the inventory was designed to measure apply in the new setting, careful translation procedures must be assured to capture the intended meaning of the items in the original test instrument to make them comparable, the tasks involved in the completion of the inventory must be equivalent (i.e., similar administration techniques), and it is important to assure that the variables being assessed operate in the same way in each of the cultures (i.e., if studying the personality variable of depression, it is important to determine if the relevant components of that trait and the meanings of it in each culture are equivalent). Essentially, in order to assure the equivalence of an inventory being adapted into other languages and cultures, the constructs underlying the test need to be equivalent in both cultures and means of assessing those constructs need to be shown to be equivalent. In reviewing all studies which included the SIRI, no evidence was presented indicating that any of the steps outlined by Butcher et al. were undertaken by researchers who translated the SIRI for use in their study.

It is reasonable to hypothesize that much of the conflicting results surrounding the SIRI are due to the methodological issues described above. Consequently, the current study will attempt to deal with these challenges by following as many of the procedures

from the original data collection from Grossarth-Maticek (Heidelberg, West Germany in 1975) as possible. This includes administration of all 70 items of the SIRI, using subjects who fall between the ages of 40 and 60, and administering the SIRI in one of the two languages (English) in which it was translated by the authors. However, as there has been a particular issue identified by researchers surrounding the use of an appropriate scoring method for the SIRI, the current study will use a similar method (mean scores) to the one utilized by Amelang & Schmidt-Rathjens (1992) and Rundmo et al (1996), as discussed earlier.

Administration of the Short Interpersonal Reactions Inventory

In their 1990 study, Grossarth-Maticek and Eysenck suggested that the best practice for administration of the SIRI was via interview. However, for research purposes, they postulated that a paper-and-pencil administration was acceptable. When using the self-administration method, Grossarth-Maticek and Eysenck recommended the following instructions should be provided:

Here are a number of questions covering your attitudes and emotions in relation to people and situations which have great significance for you. Try to answer 'Yes' or 'No' to each question, according to your first impression; do not think too long about the precise meaning of the question. Leave the answer blank only if it is quite impossible for you to answer 'Yes' or 'No.'" (Grossarth-Maticek & Eysenck, 1990, p. 360).

Summary

A review of the literature began by using PNI research to establish the existence of a link between the physical body and psychological state. Psychoneuroimmunology research has established evidence suggesting that communication between the brain and

the immune system is bidirectional, leading to the distinct probability that each is affected by the other. Under this notion, an individual who represses his/her emotions and experiences depressive symptoms may well alter the efficacy of their immune system, thus leading to the initiation of physical disease.

Next, the Grossarth-Maticek personality theory was reviewed. This is the basis on which the SIRI was established. It includes the six personality types which are now seen on the SIRI and describes how each of the Types is preprogrammed for health, illness, or social deviance. Of particular interest for this study is the Type 1 personality category, whose members have a tendency to suppress their emotions and be unassertive; leading to feelings of depression and helplessness, immunosuppression, and the eventual development of cancer.

The development of the SIRI was then discussed. The SIRI, which was published in 1990, was developed using data mined from early research by Grossarth-Maticek in Heidelberg, West Germany (1975). Outcomes from the Heidelberg study produced impressive results. with hit rates for identifying future cancer development of approximately 97.3%. Unfortunately, there are concerns surrounding Grossarth-Maticek's early work. Chief among them is a failure to release the initial instruments used in these studies and a lack of information surrounding the selection criteria established for choosing the 70 items (which were subsumed among 450 items) that were used to develop the SIRI. These concerns suggest the need for future research in the direction of establishing the validity of the SIRI as a whole and each of the Type categories individually. The current study has chosen to begin this process by assessing

the SIRI in general and the Type 1 personality category specifically, as it is the only Type which has been the focus of past research.

The two established scoring methods for the SIRI were then reviewed. The first is the Grossarth-Maticek and Eysenck method, which was revealed in their 1990 study. According to this method, the allocation of a subject to a given personality Type was characterized by having a perfect score of 10 for that Type and no score higher than two on any other Type. This scoring method has been objected to by several authors as it often leaves most, if not all, of the subjects unclassified. The second scoring method was devised by Schmitz (1992). Under this scoring method, the assignment of a subject into a respective Type is based on whether his/her score falls in the highest quartile of that Type. Unfortunately, research by Roberts et al. (1995), which utilized this scoring method to assign subjects to a specific Type, found that only 30% of subjects could be successfully classified. As a result of these challenges, the current study has opted to utilize the means of each Type, which are based on a summary measure of all the items associated with each personality Type, in order to establish the extent to which each of the 6 personality Types are present in the sample. In this way, scales with higher mean scores will be seen as more present in the sample than those with lower mean scores. The advantage of this method is that it allows for the representation of every subject on the continuum, from those individuals with low scores across all of the Types to those who have scores equal on more than one Type.

Finally, the inconsistent results of studies utilizing the SIRI were discussed and possible explanations for the lack of consistent results were investigated. Those studies supporting Grossarth-Maticek and Eysenck (1990) have suggested that the Type 1 and

Type 2 personality categories are capable of identifying whether an individual is at heightened risk of developing a specific illness. However, those studies which do not support the findings of Grossarth-Maticek and Eysenck (1990), have found that the Type 1 and Type 2 personality scales are intercorrelated and, consequently, are not capable of identifying an individual at risk for a specific illness. The lack of agreement between these studies may be secondary to the absence of a single effective scoring method, differences in the age of subjects included across the different SIRI studies, the different versions of the SIRI utilized by researchers, differences in the mode of SIRI administration, and issues in the translation of the SIRI across several languages. Because authors who have utilized the SIRI in research have selected several methodological components which are in contrast to those chosen by Grossarth-Maticek in his early data collection, it has created a significant obstacle when attempting to assess the validity of the SIRI. There is a clear need for research which attempts to follow, as closely as possible, the methodology chosen by Grossarth-Maticek in his early work in attempting to determine the existence of a connection between personality/psychological state and specific physical disease. The current study will do this by administering the complete SIRI, which was directly translated by the authors into English, to a sample of individuals who are similar in age to those utilized by Grossarth-Maticek in his 1967 and 1975 research. A study which matches the methodology of Grossarth-Maticek as closely as the current study has not been pursued in prior research.

In summary, PNI research appears to suggest that personality/psychological state have a specific effect on the physical health of an individual. The SIRI has been designed to identify those individuals who are at a heightened risk of developing a specific illness.

Unfortunately, while some studies have confirmed the early success of Grossarth-Maticek and Eysenck in utilizing the SIRI for this purpose, other studies have found strikingly different results. This lack in consistency of results must be addressed in order to determine whether the SIRI is, in fact, able to accurately identify those at increased risk for developing a specific physical illness, as proposed by Grossarth-Maticek and Eysenck (1990). As the limited research utilizing the SIRI has focused on the Type 1 (cancer-prone) personality category, the focus of the current study will address the validity of this scale. As discussed earlier, there may be potential benefits to having the ability to identify individuals who are at a heightened risk for the future development of cancer. Namely, as demonstrated by Grossarth-Maticek et al. (2000), a specific prophylactic treatment could be utilized to reduce the risk of an individual identified with a Type 1 personality for the future development of cancer.

CHAPTER 3

METHODOLOGY

Introduction

A review of the literature regarding the interactions between psychological/personality factors on the immune system and their link to cancer was provided in Chapter 2. Specific emphasis was given to the Type 1 personality category of the SIRI (cancer-prone personality) and its link to cancer initiation. Literature on the Grossarth-Maticek personality theory, the development, scoring methods, validity, and admission of the SIRI, and the consistency of results in research assessing the SIRI was reviewed. The purpose of this chapter is to delineate the research questions, design, participants, instrumentation, procedure, treatment of data, and data analysis.

Research Questions

- RQ1: Are the six personality Types of the Short Interpersonal Reactions Inventory (SIRI) present in the current sample?
- RQ2: If the Type 1 personality (cancer-prone) is found to be present in this sample, is it capable of discriminating between the cancer group and the current/historically cancer-free group?

RQ3: Do specific demographic factors (age, gender, ethnicity, level of physical activity, and smoking behavior) effect the ability of the Type 1 personality category of the Short Interpersonal Reactions Inventory (SIRI) in discriminating between the cancer group and the current/historically cancer-free group?

Research Design

The researcher will utilize an ex post facto research design. An ex post facto design is a non-experimental research technique in which preexisting groups are compared on some dependent variable. In this design, the assignment of participants to the levels of the independent variable is based on events that occurred in the past. This non-experimental research is similar to an experiment because it compares two or more groups of individuals who were exposed to different conditions as a result of their natural histories.

According to Simon and Goes (2013, p. 77),

Ex post facto research shares with experiment design some of its basic logic of inquiry. For example, attempts are made to explain a consequence based on antecedent conditions, determine the influence of a variable on another variable, and test a claim using statistical analysis.

Kerlinger and Rint (1986, p. 24) explained that in the context of social science research an ex post facto investigation, "Seeks to reveal possible relationships by observing an existing condition or state of affairs and searching back in time for plausible contributing factors." Cohen, Manion, and Morison (2000) noted that instead of taking groups that are equivalent and subjecting them to different treatments to determine differences in the dependent variable, an ex post facto experiment begins with groups that are already

different in some respect and searches in retrospect for factors that brought about those differences.

Weaknesses of an ex post facto research design include no random assignment to treatment, leaving open the possibility that there could be inherent confounds in the variables studied and, since the sample cannot be considered random, generalization may be limited. Some advantages of conducting an ex post facto designed study include; allowing the researcher to explore cause and effect relationships, obtain data in situations where ethical considerations would preclude other alternatives, and the ability to obtain permission to conduct a study and attain subjects tends to be less involved in terms of time and the ability to secure subjects, than in experimental research.

In terms of the current study, the ex post facto design is ideal for several reasons. First, this is not a typical experiment where the researcher is going to manipulate the independent variable to see a corresponding change in the dependent variable. The dependent variable in this study (cancer status) is a pre-existing condition and the independent variables of interest (mean scores on SIRS personality categories 1-6, age, gender, ethnicity, level of physical activity, and smoking status) will be expected to determine the likelihood of whether a subject will have a current diagnosis of cancer.

Next, an ex post facto design is ideal when a clear cause and effect relationship is being explored. In the current study, the researcher is attempting to investigate some of the possibilities surrounding potential psychological differences between a group of individuals with a current cancer diagnosis and another group of individuals who are currently and historically cancer-free.

Finally, ex post facto design is optimal in situations where both the effect and the alleged cause have already occurred and must be studied in retrospect. In the current research, the participants enter the study already possessing both a current cancer status and a fully formed set of personality characteristics. This research will attempt to determine whether the factors that make up an individual's personality have a role in whether that person will develop cancer.

Population and Sample

The sample for this study consisted of 648 English speaking male ($n = 235$) and female ($n = 413$) adults who are between 40 and 60 years of age. The subjects resided in one of two groups. The first group consisted of 216 individuals with a current diagnosis of cancer. The second group includes 432 individuals who are currently/historically cancer-free.

The particular age range (40 to 60 years of age) was selected for two reasons. First, this was the age range utilized by Grossarth-Maticek when he collected the data on which the SIRI would later be based. Secondly, this age range was chosen based on Canadian and American cancer incident rates for 2011, which was provided by Statistics Canada (Canadian Cancer Society, 2011) and the American Cancer Society (American Cancer Society, 2011). According to Statistics Canada and the American Cancer Society, there is an increase of 76.6 individuals in the rate per 100,000 of cancer incidence between the age groups of 35-39 and 40-44. This is the first significant rise in cancer rates between successive age groups. It is generally accepted in the literature that the vast majority of cancers that are contracted early in life are, at best, minimally affected by personality or psychological factors. The belief is that the effects of a cancer-prone

personality likely take decades to lead to the initiation of cancer (Bleiker, Van der Ploeg, Ader, & Van Daal, 1995; Cohen, 2014; Fisher, 1995; Jansen & Muenz, 1984; Linden, Vodermaier, Mackenzie, & Greig, 2012). The next significant rise in cancer incidence between successive age groups is seen when comparing 55 – 59 year olds and 60 – 64 year olds (a difference of 397.4 individuals with cancer per 100,000). Previous research has suggested that after the age of 60, there is a significant increase in the diagnosis of cancer secondary to age-related complications (Derogatis, 2013; Kennedy, Loeb, & Herr, 2012; Serrano & Blasco, 2007; Vijg, Busuttil, Bahar, & Dolle, 2005). In terms of each subject's current diagnosis of cancer, as is common in research; the self-report of participants will be deemed sufficient (Kintz, 1975).

Instrumentation

The measure utilized in this study is the SIRI. The SIRI has been used in previous disease prediction research (Amelang & Schmidt-Rathjens, 1992; Grossarth-Maticek & Eysenck, 1990; Grossarth-Maticek et al., 1993; Quander-Blaznik, 1991; Roberts et al., 1995; Rundmo et al., 1996; Sandin et al., 1993; Smedslund, 1995).

Grossarth-Maticek and Eysenck first published the SIRI, in its current form, in 1990. The items currently included in the SIRI were initially part of a much larger German language personality assessment used in Grossarth-Maticek's 1975 Heidelberg, West Germany research. The SIRI was constructed on the premise that personality is causally related to certain physical and psychological diseases. The SIRI contains 70 randomized items which are responded to using a yes or no response. These items are divided into six sub groups, which define six different types of personalities, each with proneness to a specific diseases (10 items per personality Type; the healthy Type is

assessed by a 10 item scale with positively worded items and a 10 item scale with negatively worded items; allowing the investigators to test for agreement between the two sets of items). Type 1 is cancer-prone; Type 2 is coronary heart disease-prone; Type 3 shows psychopathic behavior and is unlikely to die of cancer or heart disease; Type 4 is the healthy Type of personality; Type 5 shows rational and antiemotional tendencies and is prone to depression; and Type 6 is antisocial personality, prone to drug addiction (Grossarth-Maticek & Eysenck, 1990). Examples of items include; “I find it very difficult to stand up for myself”, “I am unable to express my feelings and needs openly to other people, certain people keep interfering with my personal development”, “I can usually change my behavior to suit conditions”, and “I always try to express my needs and desires in a rational and reasonable manner”.

In addition to the SIRI, the subjects for this study were asked to complete a demographic form which was utilized by the researcher to provide information on potential confounding variables, including; age, gender, ethnicity, level of physical activity, and smoking behavior.

Validity of the SIRI

There has been a paucity of research utilizing the SIRI. Of the studies which have been done, several have attempted to establish the validity of the SIRI, with mixed results. The only complete statistical analysis of the SIRI was a retrospective study published in 1990 by Grossarth-Maticek and Eysenck in which they described some of the origins of the SIRI and assessed its validity and reliability. The authors reported that they used items initially administered by Grossarth-Maticek in 1975 to 30,000 subjects in Heidelberg, Germany. From this sample they selected half men and half women equated

for age on the basis of their scores on the questionnaire. According to Grossarth-Maticek and Eysenck, their aim was to find equal numbers for each of the six Types, such that a person given a Type was characterized by having a perfect score of 10 for that Type and no score higher than two on any other Type. These selection rules resulted in the inclusion of 216 subjects. Subjects from the 1975 research were followed-up 10 years later. At that time, mortality and incidence of a variety of disorders were investigated. Diagnoses were obtained from the subjects' personal physicians. When a subject had passed away, death certificates were examined. Results from this retrospective study (Grossarth-Maticek & Eysenck, 1990) revealed that, as predicted, cancer was most frequently diagnosed in Type 1 individuals, CHD was most frequent in Type 2 subjects, and those classified as Type 4 were found to be relatively healthy with few medical diagnoses. Specifically, results indicated that, 1) approximately 26% of subjects who were classified as Type 1 personality were either diagnosed with cancer or died of cancer upon follow-up, while only 7.6% of all other Types were diagnosed/died of cancer, 2) approximately 33% of subjects who were classified as Type 2 personality were either diagnosed with CHD or died of CHD upon follow-up, while only 5.6% of all other Types were diagnosed/died of CHD, and 3) approximately 1.3% of subjects who were classified as Type 4 personality were either diagnosed or died from a medical disease. A closer look at the results revealed that nearly 42% of subjects who were classified as possessing a Type 1 personality were found to have been diagnosed or died of cancer upon follow-up. Eysenck concluded that, "The questionnaire does possess a certain amount of validity, the major diagnostic criteria for the different Types agreeing with prediction derived from previous research" (Grossarth-Maticek & Eysenck, 1990, p. 361).

The first of three studies that produced results on the validity of the SIRI supporting those in Grossarth-Maticek and Eysenck's 1990 study was conducted by Quander-Blaznik (1991). The author conducted a quasi-prospective study that attempted to predict the presence or absence of lung cancer. Quander-Blaznik chose to utilize only the items associated with the Type 1 personality category of the German language version of the SIRI (10 statements). The study included 64 patients (no age related data was provided) who resided at the Heckeshorn Lung Hospital in West Germany. The patients had been referred to the hospital for suspected lung cancer. The subjects completed the Type 1 items from the SIRI prior to receiving a diagnosis. The authors concluded that the 10 items which make up the Type 1 category on the SIRI correlated significantly with a diagnosis of cancer and, as a group, these 10 items predicted the future presence of cancer in 78% of the cases.

Next, in a sample of 414 university students between the ages of 18 and 27 who, as in the Quander-Blaznik study, were administered only the 10 items from the Type 1 personality category of the SIRI, Sandin et al. (1993) found a positive relationship between immune-related problems (associated with cancer) and the Type 1 personality category of the SIRI, thus providing some support for the validity of the Type 1 personality category. The authors concluded that their findings generally support the differential psychosomatic model proposed by Eysenck and Grossarth-Maticek (Sandin et al., 1993).

The final study demonstrating support for Grossarth-Maticek and Eysenck's 1990 results was conducted by Rundmo et al. (1996). In their study they randomly sampled 10,000 individuals aged 19 and older (with a mean age of 42.2 and a SD of 16.2) from a

small Norwegian town of which 5014 agreed to take part. The SIRI (Dutch language version) was part of a larger group of questionnaires that were mailed to the subjects. The authors were looking for associations between stress, personality, and smoking. The SIRI was utilized to assess cancer-prone personality (Type 1), CHD personality (Type 2) and healthy personality (Type 4). As a result, only the items from Type 1, Type 2, and Type 4 were utilized, resulting in subjects being administered a total of 40 items from the SIRI. In this study, the mean score on the cancer-prone personality Type was used as a method of comparing subjects with a history of cancer from those with no history of the disease. Consequently, subjects were not classified into a specific personality Type. Results indicated that subjects with a current or previous diagnosis of cancer scored nearly three times higher on the cancer-prone personality Type mean score than on Type 2 or Type 4, thus supporting the early work of Grossarth-Maticek and Eysenck.

There are three studies that have produced results that are not supportive, to varying degrees, of Grossarth-Maticek and Eysenck's 1990 SIRI validity study. The first of these studies was conducted by Amelang and Schmidt-Rathjens (1992). They utilized items from the SIRI to investigate the relationship between the Type 1 and Type 2 personality scales. Their subjects included 204 individuals between the ages of 19 and 72 that were administered the items from the Type 1 and Type 2 categories (20 items in total). The authors found that Types 1 and 2 were intercorrelated, showing little internal differentiation (correlation of .78). They concluded that the Type 1 and 2 personality scales constituted a common bipolar dimension of which Health/Autonomy marks the opposite pole. The results were clearly not in line with the early work of Grossarth-Maticek and Eysenck.

As part of a study examining risk factors associated with the presence of asthma, Roberts et al. (1995) attempted to test the psychometric properties of the constructs of the SIRI using 419 complete twin pairs between the ages of 19 and 76 who suffered from wheeze/asthma. The subjects were given a skin prick test and asked to complete the Eysenckian Dimensions of Extraversion, Neuroticism, Psychoticism, and Social Desirability and the SIRI. The authors attempted to utilize both of the scoring methods previously used in research. When they attempted to apply the Grossarth-Maticek and Eysenck scoring method (a score of 10 on one personality Type while not scoring more than two on any other of the Types) they found that they were unable to classify any of the subjects. When Roberts et al. (1995) applied the Schmitz scoring method (when a subject scores in the top quartile on a single personality Type) they were only able to classify approximately 30% of the sample. Consequently, they chose to apply the Schmitz scoring method to their sample. Results revealed that the Type 1 scale was correlated significantly with the Type 2 and 3 scales and negatively correlated with Type 4a. Additionally, the researchers found that there was a very low correlation between Type 4a and Type 4b (correlation of .17). The authors reported these results as “disturbing.” They stated, “These scales are supposed to be measuring different constructs, but the analysis reveals that this may not be the case” (Roberts et al., 1995, p. 319). The results from Roberts et al. (2005) were inconsistent with those of Grossarth-Maticek and Eysenck (1990).

In 1995, Smedslund developed the first study to report the prevalence data for the SIRI in a normal population sample. However, he did not record the prevalence of all six Types, instead focusing on Type 1, 2, and 4 in a sample of approximately 5000 subjects

18 years and older from Norway. Smedslund found that 92.5% of the respondents were categorized as Type 4, 4.3% as Type 1, and 3.6% as Type 2. Further, while Smedslund did not control for cancer history, this information was requested, along with history of heart disease, in a demographic questionnaire. Results showed that, even though the differences between the Types for the presence of a history of cancer was not significant (1.1% of Type 1 subjects had a history of cancer, 2.5% of Type 2, and 1.1% of Type 4), there was a higher percentage of subjects who were classified as Type 2 (CHD-prone) and had a history of cancer than Type 1 (cancer-prone). According to Smedslund, the overall reported number of cancer cases was low. Finally, Smedslund found that, while undifferentiated from one another, the Type 1 and Type 2 categories had significantly more history of illness than Type 4. The author hypothesized that while the SIRI may not have the power to predict specific diseases, it may have the ability to predict the development of disease in general. These results are inconsistent with the early work of Grossarth-Maticek and Eysenck.

The studies above highlight the inconsistent findings generated by research attempting to establish the validity of the SIRI. The Grossarth-Maticek and Eysenck (1990) study, and those studies that support their results, suggest that the Type 1 and Type 2 personality categories are capable of identifying those individuals at an elevated risk of developing a specific disease. However, the studies which do not support their results suggest that the Type 1 and Type 2 personality categories are unable to identify individuals who are at risk of developing a specific disease.

Reliability of the SIRI

In terms of reliability, Grossarth-Maticek and Eysenck reported that, as part of their 1990 study, they administered the SIRI to a group of subjects on two separate occasions. Each of the administrations was separated by six months. According to the authors, “The test-retest correlations are all in excess of 0.80 and so quite satisfactory” (Grossarth-Maticek & Eysenck, 1990, p. 367).

The Variables

In order to ensure the validity of the study, the independent and dependent variables were defined conceptually, instrumentally, and operationally. Table 1 shows how the independent variable and dependent variables have been operationalized to define how each was measured and expressed quantitatively. The dependent variable was cancer/no cancer. The independent variables included each of the personality Types from the SIRI (Type 1, Type 2, Type 3, Type 4, Type 5, and Type 6), the subjects responses to each of the SIRI items, age, gender, ethnicity, level of physical activity, and smoking behavior.

Data Collection and Procedures

Subjects were acquired using convenience sampling. Convenience sampling is a non-probability sampling technique where subjects are selected because of their convenient accessibility and proximity to the researcher. Convenience sampling can lead to the under-representation or over-representation of particular groups within the sample because subjects are not randomly selected, thus limiting the ability to make generalizations to the population at large. However, it is easy to carry out, there are less

Table 1

Operationalization of Variables

Variable	Conceptual Definition	Instrumental Definition	Operational Definition
Cancer	Cancer indicated whether a subject had a current diagnosis of cancer or was cancer-free.	This variable was determined by response to the following question: Do you have a current diagnosis of cancer? Yes = 1 No = 0	Responses were categorized as a nominal scale score as follows: Yes = 1 No = 0
Type 1	Type 1 is a personality type which categorizes a subject as cancer-prone.	This variable was determined by responses to inventory questions: 1, 8, 15, 22, 29, 36, 43, 50, 57, and 64 of the SIRI on a dichotomous scale as follows: Yes = 1 No = 0	Responses to each item will be summed making this a continuous variable: Yes = 1 No = 0
Type 2	Type 2 is a personality type which categorizes a subject as CHD-prone.	This variable was determined by responses to inventory questions: 2, 9, 16, 23, 30, 37, 44, 51, 58, and 65 of the SIRI on a dichotomous scale as follows: Yes = 1 No = 0	Responses to each item will be summed making this a continuous variable: Yes = 1 No = 0
Type 3	Type 3 is a personality type which categorizes a subject as psychopathic behavior-prone.	This variable was determined by responses to inventory questions: 3, 10, 17, 24, 31, 38, 45, 52, 59, and 66 of the SIRI on a dichotomous scale as follows: Yes = 1 No = 0	Responses to each item will be summed making this a continuous variable: Yes = 1 No = 0
Type 4a	Type 4a is the first half of the personality type which categorizes a subject as possessing a healthy personality. The items are positively worded.	The variable was determined by responses to inventory questions: 4, 11, 18, 25, 32, 39, 46, 53, 60, and 67 of the SIRI on a dichotomous scale as follows: Yes = 1 No = 0	Responses to each item will be summed making this a continuous variable: Yes = 1 No = 0
Type 4b	Type 4b is the second half of the personality type which categorizes a subject as possessing a healthy personality. The items are negatively worded.	The variable was determined by responses to inventory questions: 7, 14, 21, 28, 35, 42, 49, 56, 63, and 70 of the SIRI on a dichotomous scale as follows: Yes = 1 No = 0	Responses to each item will be summed making this a continuous variable: Yes = 1 No = 0
Type 5	Type 5 is a personality type which categorizes a subject as prone to endogenous depression.	This variable was determined by responses to inventory questions: 5, 12, 19, 26, 33, 40, 47, 54, 61, and 68 of the SIRI on a dichotomous scale as follows: Yes = 1 No = 0	Responses to each item will be summed making this a continuous variable: Yes = 1 No = 0
Type 6	Type 6 is a personality type which categorizes a subject as prone to drug addiction.	This variable was determined by responses to inventory questions: 6, 13, 20, 27, 34, 41, 48, 55, 62, and 69 of the SIRI on a dichotomous scale as follows: Yes = 1 No = 0	Responses to each item will be summed making this a continuous variable: Yes = 1 No = 0

Table 1—*Continued*

Variable	Conceptual Definition	Instrumental Definition	Operational Definition
Gender	Gender refers to whether a subject self-reports as being male or female.	The variable was determined by response to the following question: Gender (please select one). Male = 1 Female = 2	Responses were categorized as a nominal scale score as follows: Male = 1 Female = 2
Age	Age refers to how old a subject self-reports he/she was on their last birthday.	The variable has a range of 40 - 60 years of age. The variable was determined by response to the following question: How old were you on your last birthday?	Responses were categorized as a continuous variable.
Smoking	Smoking refers to how often a subject reports smoking cigarettes.	The variable was determined by response to the following question: Which of the following statements best describes your smoking status? 1) Current every day smoker 2) Current some day smoker 3) Former smoker 4) Never smoker	Responses to this item are ordered, making this an ordinal variable as follows: Current every day smoker = 1 Current some day smoker = 2 Former Smoker = 3 Never smoker = 4
Physical Activity	Physical activity refers to how often a subject engages in exercise behaviors per week.	The variable was determined by response to the following question: Which of the following categories best describes your current level of physical activity? 1) Sedentary (less than 30 minutes of exercise per week) 2) Occasional (30-60 minutes of exercise per week) 3) Intermediate (1-3 hours per week) 4) Conditioning (3+ hours per week)	Responses to this item are ordered, making this an ordinal variable as follows: Sedentary = 1 Occasional = 2 Intermediate = 3 Conditioning = 4
Ethnicity	Ethnicity refers to which of the provided ethnic groups a subject places him/herself.	The variable was determined by response to the following question: Ethnicity (Please select one). Caucasian = 1 Hispanic = 2 African American = 3 Native American = 4 Asian American = 5 Other (specify) = 6	Responses were categorized as a nominal scale score as follows: Caucasian = 1 Hispanic = 2 African American = 3 Native American = 4 Asian American = 5 Other (specify) = 6

rules governing how the sample should be collected, and the cost and time required to achieve the sample size are small in comparison to probability sampling techniques (Jupp, 2009; Lucas, 2014).

There are a several factors that made convenience sampling ideal for the current study. First, it can be expensive to obtain lists of random participants for probability sampling. With a non-funded dissertation, the cost can easily become prohibitive. A convenience sample allowed the researcher to find appropriate subjects at an affordable price.

Next, convenience sampling was advantageous in the current study as it was difficult to gain access to individuals, from the population at large, who met the specific parameters necessary for membership in the cancer group (between the ages of 40 and 60 with a current diagnosis of cancer) and secure their participation in the research study. Convenience sampling allowed the researcher easier access to potential subjects.

Finally, convenience sampling is an effective tool to use when the validity of a survey or inventory is still being established (Salkind, 2010). Research investigating the validity of the SIRI has been extremely limited. As such, this study provided preliminary data on the validity of the SIRI and Type 1 personality category.

The researcher utilized an online survey format for data collection. SurveyMonkey was chosen to host this study as it met the needs of the researcher. The program was easy to use and economical. A professional subscription was obtained for a minimal fee per month which allowed the researcher to upload the SIRI, demographic questionnaire, and Informed Consent to a specific website where subjects were be able to complete the surveys. In order to encourage study participation by subjects who met the inclusion criteria, the researcher utilized the SurveyMonkey Audience program. SurveyMonkey Audience was launched in late 2011 to assist researchers in reaching a specific target population. In SurveyMonkey Audience, the researcher designates the

criteria which subjects must meet in order to be included in his/her study. SurveyMonkey then distributes the survey to all of the individuals in their database who meet the researchers specifications. The researcher pays a flat fee per respondent.

According the SurveyMonkey, SurveyMonkey Audience was designed to assist both professional organizations and dissertation students in conducting research. Consequently, it meets the criteria of most university IRB's for collecting survey research. SurveyMonkey includes an SSL encryption feature in order to protect sensitive data as it moves along communication pathways between the respondent's computer and the SurveyMonkey servers. Additionally, IP addresses are masked from the survey author. Finally, SurveyMonkey guarantees that it will hold all information collected from surveys in the strictest confidence. All results are delivered directly to the researcher in aggregate and anonymous form. The complete SurveyMonkey privacy policy is available on their website, www.surveymonkey.com.

The SurveyMonkey Audience process for the current study was quite straightforward. Potential subjects received an email from SurveyMonkey informing them that they met the criteria for inclusion in a dissertation study. The email provided the individual with a link to the researcher's webpage. Upon arrival at the webpage, the subject was met with the informed consent, followed by the demographic questionnaire, and finally, the survey (SIRI). In the informed consent to the study, participants were informed that the current study was designed to explore how different types of personality may or may not be associated with the development of cancer. Subjects were assured that their participation was voluntary, that they could withdraw their participation at any time without prejudice, and that their personal information would be kept under

strict confidence. If the individual chose to participate in the study, he/she was asked to click the "agree" button on the informed consent (known as the waiver of documentation consent when it is obtained electronically) and he/she was then advanced to the demographic questionnaire followed by the SIRI. However, if the subject declined, SurveyMonkey sent the subject directly to a "Declined Participation" page where he/she was presented with the following statement, "Thank you for your interest in the current study. Unfortunately, you cannot complete the questionnaire and inventory without providing your informed consent for the process." For those who agreed to participate in the study, once they completed the survey, the results were securely emailed to the researcher and the participant received a donation to the charity of his/her choice (made by SurveyMonkey on their behalf) and entry into an instant win sweepstake.

As discussed previously, The SIRI questionnaire consists of 70 items with yes or no responses. There are 10 items for each of Type 1 (cancer-prone), Type 2 (heart disease-prone), Type 3 (psychopathic behavior-prone), Type 5 (endogenous depression-prone), and Type 6 (antisocial-prone), while Type 4 (healthy) is assessed by a 10 item scale with positively worded items and a 10 item scale with negatively worded items; allowing the investigators to test for agreement between the two sets of items. The SIRI requires approximately 15-20 minutes to complete.

Instructions from Grossarth-Maticek and Eysenck (1990) will be followed during administration of the SIRI. In their 1990 study, Grossarth-Maticek and Eysenck suggested the following instruction be given to subjects completing the SIRI via paper and pencil administration:

Here are a number of questions covering your attitudes and emotions in relation to people and situations which have great significance for you. Try to answer "Yes" or

“No” to each question, according to your first impression; do not think too long about the precise meaning of the question. Leave the answer blank only if it is quite impossible for you to answer “Yes” or “No.”

In order to avoid the confusion surrounding scoring method and the significant weakness found in each, the current study utilized the means, which are based on a summary measure of all the items associated with each personality type, in order to establish the extent to which each of the six personality Types are present in the sample. In this way, scales with higher mean scores were seen as more present in the sample than those with lower mean scores. Consequently, this allowed the researcher to avoid the current confusion in the literature surrounding the different scoring methods. Preliminary analysis confirmed previous research (Roberts et al., 1995), as the existing scoring methods would have led to a large number of subjects being removed from analysis, as they did not meet the criteria for being placed in a single personality Type. The advantage of using the current classification method is that it allows for the representation of every subject on the continuum, from those individuals with low scores across all of the Types to those who have scores equal on more than one Type. If a subject failed to complete the SIRI and/or demographic questionnaire in its entirety, he/she would be removed from the study. However, as all respondents completed the survey in its entirety, there was no missing or incomplete data.

Data Analysis

The purpose of the present study, initially, is to determine whether the six personality Types of the SIRI are present in the current sample. Next, if the Type 1 personality Type is found to be present in the sample, is it capable of discriminating between the cancer group and the current/historically cancer-free group? Finally, the

researcher will attempt to determine whether specific demographic factors (age, gender, ethnicity, level of physical activity, and smoking behavior) affect the ability of the Type 1 personality category of the SIRS in discriminating between the cancer group and the current/historically cancer-free group. The data used in this study will be analyzed in three phases to accomplish this goal.

The first phase will include a confirmatory factor analysis (CFA) to determine if the six personality types of the SIRS are present in the sample. In the event that the six personality types are not confirmed in the present sample, an exploratory factor analysis (EFA), using an oblimin rotation, will be carried out to reveal the unique dimensions in the sample. Unique factors will be extracted based on the most commonly acceptable eigenvalue criteria. My primary interest will be in determining whether the Type 1 (cancer-prone) personality category exists in the sample.

If the Type 1 category is found to exist in the sample, it will also be of interest to assess the validity of the Type 1 category by determining whether the cancer-prone personality can reliably distinguish subjects who have a current diagnosis of cancer from those who are currently/historically cancer-free. To accomplish this, descriptive and predictive discriminant analyses will be performed. Discriminant functional analysis is useful in determining whether a set of variables is effective in predicting category membership.

Consistent with the third research question, which seeks to determine the ability of the Type 1 category to predict a current diagnosis of cancer within the context of relevant covariates and demographic factors, a series of binary logistic regression models will be specified (given that the dependent variable is dichotomous). By using the logistic

regression model, the researcher will be able to predict whether an individual is more likely to have a current diagnosis of cancer after controlling for the effects of all theoretically relevant covariates (such as personality types and demographic variables). First, and sequentially, a logistic regression model (Model 1) examining the likelihood of having a current diagnosis of cancer with the Type 1 category as the only predictor variable will be estimated. Secondly, a model (Model 2) in which the effects of the other personality types (Types 1-6) are controlled for will be specified. Finally, a third model (Model 3) that controls for all the covariates of interests including the demographic factors (age, gender, ethnicity, level of physical activity, and smoking status) will be estimated to examine the independent effect of the Type 1 category.

Summary

This chapter discussed the research design and the procedures that will be followed to complete this study. The ex post facto research design was explained and the population sample was described. This was followed by a description of the data collection methods, the variables, the process of data analysis, and the limitations of the study design.

CHAPTER 4

RESULTS

Introduction

The purpose of this dissertation was threefold. Firstly, to assess the validity of the SIRI by assessing whether the six personality Types included on the SIRI were present in the current sample. Secondly, if found to be present in the sample, evaluate the validity of the Type 1 personality category by determining whether it could distinguish a group of subjects with a current diagnosis of cancer from a group who had no current/historical cancer diagnosis. Finally, to determine whether relevant covariates and/or specific demographic factors (age, gender, ethnicity, level of physical activity, and smoking behavior) affect the ability of the Type 1 personality category of the SIRI in discriminating between the cancer group and the current/historically cancer-free group. A group of subjects with a current diagnosis of cancer and a second group with no current/historical cancer diagnoses completed an online version of the SIRI and a demographic questionnaire.

This section provides a step-by-step discussion of how the data were analyzed to answer the following research questions:

1. Are the six personality Types of the SIRI present in the current sample?

2. If the Type 1 personality (cancer-prone) is found to be present in this sample, is it capable of discriminating between the cancer group and the current/historically cancer-free group?
3. Can the Type 1 personality category of the SIRI discriminate between the cancer group and the current/historically cancer-free group within the context of relevant covariates and/or specific demographic factors (age, gender, ethnicity, level of physical activity, and smoking behavior)?

The statistical analyses performed on the data included univariate descriptive statistics, CFA, EFA, discriminant analysis, and binary logistic regression.

Description of the Sample

Participants in this study ($n = 648$) were between the ages of 40 and 60 and located across North America. There were two groups of subjects present in the sample; one group had a current diagnosis of cancer (216 subjects) and the second group had no current/historical cancer diagnoses (432 subjects). Both groups of participants completed an online version of the SIRI and a Demographic Questionnaire via the SurveyMonkey website.

An examination of the demographic variables revealed that more than half (63.7%) of the sample is female with a total subject mean age of 50 years. The sample consists of mostly Caucasian individuals (85.5%) with over half (53.2%) reporting at least some current/historical smoking behavior (current every day smoker, current some day smoker, or former smoker). The level of current physical activity for all subjects was fairly evenly distributed with 25% leading a sedentary lifestyle (less than 30 minutes of exercise per week), 31.6% leading an occasional physically active lifestyle (between 30

and 60 minutes of exercise per week), 26.9% leading an intermediate physically active lifestyle (between one and three hours of exercise per week), and 16.5% leading a conditioned physically active lifestyle (three or more hours of exercise per week).

In contrast to expectations, a review of the mean scores for each of the personality Types of the SIRI (Table 2), revealed that the Type 1 personality category had the third highest mean (Type 4a = 5.87; Type 5 = 5.48; Type 1 = 3.39). As approximately 33% of the sample consisted of individuals with a current diagnosis of cancer, it was expected that the cancer-prone personality would be more present in the current sample (as seen by a higher Type 1 mean score). Additionally, the mean scores for scales 4a (mean = 5.87) and 4b (mean = 3.00) were quite different. As Grossarth-Maticek and Eysenck's theory suggests that both scales measure a healthy personality, it would be expected that the means for the two scales would be more similar.

Results by Research Question

In communicating the results from this study, each of the research questions will be assessed separately. Research Question 1 attempted to determine if the six personality Types of the SIRI were present in the sample. Research Question 2 endeavored to assess whether the Type 1 personality category (if determined to be present in the sample) could reliably distinguish between the two experimental groups. Finally, if the Type 1 personality category was shown to be present in the sample and effectively distinguish between the two groups, Research Question 3 would attempt to determine whether relevant covariates and/or demographic factors would mediate the efficacy of the Type 1 personality category.

Table 2

Participant^a Characteristics

Variable	Range	Mean	Percent (%)	Standard Deviation
1. Type 1	1-10	3.39		2.67
2. Type 2	1-10	3.23		2.98
3. Type 3	1-10	2.94		2.24
4. Type 4a	1-10	5.87		2.15
5. Type 4b	1-10	3.00		2.76
6. Type 5	1-10	5.48		2.00
7. Type 6	1-10	1.84		2.17
8. Cancer Status (Non-Cancer Status = 0)	0-1	.333		.472
9. Age	40-60	50.66		5.86
10. Females	0-1		63.7	.481
11. White Ethnicity	0-1		85.5	.352
12. Other Ethnicity	0-1		14.6	.352
13. Physical Activity Occasional	0-1		31.6	.465
14. Physical Activity Intermediate	0-1		26.9	.444
15. Physical Activity Conditioning	0-1		16.5	.372
16. Ever Smoked	0-1		53.2	.499

^an=648

Research Question 1: Presence in the Sample

To determine the presence of each of the personality Types of the SIRI in the sample, confirmatory factor analyses were first carried out to determine the extent to which the 70 SIRI items tap into each of the six personality Types as advocated by the authors of the SIRI. Results from the CFA revealed that the six personality Types were only weakly confirmed as present in the sample. In the context of this interpretation (as demonstrated below), it has been shown that, generally, the model provides a poor fit with respect to the three groups examined in the current study.

In all the three samples, the p-values associated with the chi-square test of model fitness ($p < 0.001$) suggests that the null hypothesis (no difference between the patterns observed in the samples) and the CFA model specified should be rejected at an alpha value of 0.05. However, while the Chi-Squared test is popular as a fit statistic (Hooper, Coughlan, & Mullen, 2008), there is a limitation in its use. Because the Chi-Square

statistic is, in essence, a statistical significance test, it is sensitive to sample size, which means that the Chi-Square statistic may reject the model when larger samples are used, as is the case in the current study (Bentler & Bonnet, 1980; Jöreskog and Sörbom, 1993). Due to this restriction in the use of the Chi-Square, researchers have sought alternative indices to confirm the results of the Chi-Square statistic. As there are several fit indices, researchers have recommended using a cross section of them when determining the level of fitness of an SEM. The current study will explore the Root Mean Square Error of Approximation (RMSEA), the Comparative Fit Index (CFI), the Tucker-Lewis Index (TLI), and the Standardized Root Mean Square Residual (SRMR).

Unlike Chi-Square, the RMSEA avoids the issue of sample size by analyzing the discrepancy between the hypothesized models, with optimally chosen parameter estimates, and the population covariance matrix (Hooper, Coughlan, & Mullen, 2008). Root Mean Square Error of Approximation is a model adaptation index. Root Mean Square Error of Approximation scores range from 0 to 1 with smaller values indicating a better model fit. MacCallum, Browne and Sugawara (1996) have suggested the use of 0.01, 0.05, and 0.08 to indicate excellent, good, and mediocre fit, respectively. The CFA results in Table 3 reveal that the fit statistics associated with the RMSEA in the cancer, non-cancer, and overall samples are indicative of a well fitted model as their RMSEA's are all hovering around 0.05. The RMSEA results provide evidence to suggest that the six factor structure associated with the SIRS inventory should be validated in the current samples.

Next, the model was examined through an assessment of the SRMR. The SRMR is an absolute measure of fit and is defined as the standardized difference between the

Table 3

CFA Results for Cancer, Non-Cancer, and Overall Results

CFA	Cancer	Non-Cancer	Overall
Number of Observations	216	432	648
Estimator	ML	ML	ML
Min Function Test Stat	3743.604	4516.003	5070.802
Degrees of Freedom	2324	2324	2324
P-value (Chi Square)	0.0001	0.0001	0.001
Model Test Baseline Model:			
Minimum Function Test Stat	6877.402	10108.516	14279.722
Degrees of Freedom	2415	2415	2415
P-value	0.0001	0.0001	0.0001
User Model versus Baseline Model:			
Comparative Fit Index (CFI)	0.682	0.715	0.768
Tucker-Lewis Index (TLI)	0.669	0.704	0.759
Root Mean Square Error of Approximation:			
RMSEA	0.053	0.047	0.043
90 percent Confidence Interval	0.050 - 0.056	0.045 - 0.049	0.041 - 0.044
P-value RMSEA ≤ 0.05	0.048	0.996	1
Standardized Root Mean Square Residual:			
SRMR	0.083	0.079	0.081

observed correlation and the predicted correlation. It is a positively biased measure, however, the bias is greater for smaller samples (Kenny, Kaniskan, and McCoach, 2014). Scores on the SRMR range from 0 to 1 with values of .08 or less indicating a good model. The CFA results in Table 3 reveal that the fit statistics associated with the SRMR in the non-cancer group (.079) exceeds the minimum score for what is considered a good model fit. However, the score on the cancer group (.083) and the overall group (.081) are above the cutoff score, indicating a poor model fit. Overall, the SRMR scores from two (cancer and overall groups) of the three groups indicate a poor fit while results from the third group (non-cancer group) suggests a borderline fit for the SEM. These results are

not consistent with those of the RMSEA and, in fact, are more supportive of the Chi-Square results.

Following the poor to borderline results of the SRMR, support for the Structural Equation Model (SEM) was sought using the CFI. The CFI analyzes the model fit by examining the discrepancy between the data and the hypothesized model, while adjusting for the issues of sample size inherent in the chi-squared test of model fit and the normed fit index. Comparative Fit Index values range from 0 to 1, with larger values indicating better fit (Kenny et al., 2014). Studies have indicated that a value greater than .95 is acceptable as an indicator of good fit (Hu & Bentler, 1999). The CFA results in Table 3 reveal that the fit statistics associated with the CFI in all three groups (cancer = .682, non-cancer = .715, and overall = .768) are significantly below the minimum cutoff score of .95. Even if one were to assume a certain leeway of say, .90 and above, the scores attained by the present model would still not come close to approaching what is defined by the CFI as a good model.

Finally, results from a relative fit index, the TLI, were reviewed in order to further assess the level of fitness of the SEM. Relative fit indices compare a chi-square for the model tested to one from a so-called null model (also called a “baseline” model or “independence” model). The null model is a model tested that specifies that all measured variables are uncorrelated. The TLI is computed by using ratios of the model chi-square and the null model chi-square, taking into account their degrees of freedom. (Kenny et al., 2014). TLI scores range between 0 and 1.0. A cut-off score of .95 or above has been utilized for good fitting models. The TLI results in Table 3 reveal that the fit statistics associated with the TLI in all three groups (cancer = .699, non-cancer = .704, and overall

= .759) are significantly below the minimum cut-off score of .95, indicating a poor fit. These results are consistent with the CFI, SRMR, and Chi-Square results, indicating a poor SEM fit.

In all the three samples, the *p*-values associated with the chi-square test of model fitness ($p < 0.001$) suggested that the null hypothesis (no difference between the patterns observed in the samples) and the CFA model specified should be rejected at an alpha value of 0.05. However, it is generally expected that a good CFA model should have fit statistics such as the CFI and TLI which are greater than 0.95 (Costello and Osborne, 2005; Fabrigar, Wegener, MacCallum, & Strahan, 1999; Lance, Butts, & Michels, 2006). Contrary to this expectation, the results from Table 3 described above show that the CFI and TLI associated with the overall sample (CFI = 0.768, TLI = 0.759), cancer group sample (CFI = 0.682, TLI = 0.669), and non-cancer group sample (CFI = 0.715, TLI = 0.704) are well below the acceptable value of greater than 0.95. Except for the overall sample, the CFA results in Table 3 also revealed that the fit statistics associated with the RMSEA in the cancer and non-cancer samples are generally indicative of a poorly fitting model as the RMSEA are above the criterion value of 0.05. Taken together, the CFA results provide substantial evidence to suggest that the six factor structure associated of the SIRI inventory cannot be validated in the current samples. The findings, thus, provide a justification for a further analysis aimed at uncovering unique factor structures that might be present in the current samples.

Against this backdrop, an EFA using an oblimin rotation was carried out to determine whether a different number of factors fitted the data better. The results of the EFA (See Tables 4 and 5) suggested that a two-factor solution fitted the

Table 4

Factor Item Loadings

Item	Factor 1	Factor 2
I find it very difficult to stand up for myself	.478	
I prefer to agree with others rather than assert my own views	.437	
I tend to give in and abandon my own aims to achieve harmony with other people	.413	
I am unable to express my feelings and needs openly to other people	.510	
I tend to accept conditions that work against my personal interests without being able to protest	.428	
I often feel inhibited when it comes to openly showing negative feelings such as hatred, aggression, or anger	.403	
When I feel emotionally let down I tend to be paralyzed and inhibited	.582	
When something terrible happens to me, such as the death of a loved one, I am quite unable to express my emotions and desires	.544	
I have been complaining for years about various unfavorable conditions but am not able to change them	.507	
Certain people are the most important causes of my personal misfortunes	.493	
Certain conditions or situations are the most important causes of my personal misfortunes	.515	
I feel helpless against people or conditions that cause great unhappiness for me because I cannot change them	.589	
I always seem to be confronted with the undesirable aspects of people and conditions	.617	
Certain people keep interfering with my personal developments	.588	
Certain conditions keep interfering with my personal developments	.622	
I cannot control excitement or stress in my life because this is dependent on the actions of other people	.512	
I cannot control excitement or stress in my life because this depends on conditions over which I have no control	.583	
I can express my aims and desires clearly but feel that it is quite impossible to achieve them	.540	
I alternate to a great degree between the positive and negative evaluation of people and conditions	.487	
With people I love, I keep changing from keeping them at a great distance to stifling dependence and from stifling dependence to excessive distancing	.616	
When someone who is emotionally important to me hurts me ever so slightly, I immediately dissociate myself from that person	.561	
I expect others to live up to the highest moral standards but do not feel that these are binding on myself	.444	
I seek satisfaction of my own needs and desires first, regardless of the needs and rights of others	.456	
When I make emotional demands on another person, I require immediate satisfaction	.490	
As soon as someone becomes emotionally important to me, I tend to place contradictory demands on them, such as "Don't ever leave me" or "Get away from me"	.469	
I cannot live happily and contentedly in the presence or the absence of certain states or conditions; for example, I need my work but am unhappy doing it	-.558	
I often have thoughts that terrify me and make me unhappy	-.599	
Relations with certain people are always pretty unsatisfactory, but there is nothing I can do about it	-.524	
Certain situations and states (e.g. at my place of work) tend to make me unhappy, but there is nothing I can do to alter things	-.512	
Certain bodily conditions (e.g. being overweight) make me unhappy, by I feel unable to do anything about it	-.484	
I can relax bodily and mentally only very rarely; most of the time I am very tense	-.537	
I have great difficulties in entering into happy and contented relations with people	-.578	
I am helpless when confronted with emotional shocks, depression, or anxiety	-.653	
I am seldom able to feel enthusiasm for anything	-.542	
I have difficulties in showing my emotions because for every positive emotion there is a negative one	.561	
My behavior toward other people alters from being very friendly and good-natured to being very hostile and aggressive	.570	
I often expect others to fulfill agreements very strictly but do not believe in doing so myself	.516	
I usually act in a spontaneous manner, following my immediate feelings without considering the actual consequences	.427	
I often feel like attacking other people and crushing them	.564	
When my partner demonstrates love toward me, I sometimes become particularly aggressive	.468	
When I feel like attacking someone physically, I have no inhibitions about doing this at all	.422	
I have no inhibition in hurting myself physically if I feel like doing so	.432	
I resent all moral obligations because they hamper and inhibit me	.485	
When it benefits me, I have no hesitation in lying and pretending	.411	

Table 4—*Continued*

Eigen value for Factor 1	13.063	
When I fail to achieve my objectives, I can easily change tack		.431
I can manage to live fairly contentedly with or without someone who is emotionally important to me		.435
I can usually change my behavior to suit conditions		.472
I am usually capable of finding new points of view and successful, sometimes surprising, solutions for problems		.556
I am independent in what I do, and do not depend on other people when it works to my disadvantage		.467
When things don't work out, this does not make me give up but rather makes me change my way of doing things		.501
When things lead to harmful results for me, I have no trouble in changing my behavior to make for success		.507
Reason, rather than emotion, guides my behavior		.479
My actions are never influenced by emotions to the degree that they might appear irrational		.402
I always try to do what is rational and logically correct		.405
I always try to express my needs and desires in a rational and reasonable manner		.456
I try to solve my problems in the light of relevant and rational consideration		.583
Eigen value for Factor 2	3.545	

Table 5

Summary of Rotation Through Oblimin^a

Factor	Variance	Difference	Proportion	Cumulative
Factor 1	13.044	9.481	0.516	0.519
Factor 2	3.563		0.141	0.657

Note: Method: Principal factors; Rotation: oblimin; Retained factors: 2

^a*n* = 648

data better for all three samples based on a 0.4 factor loading criterion. These items (56) and their factor loadings are presented in Table 4. While other possible factor solutions were explored, a careful assessment of a possible three, four, five, or six-factor solution based on the most commonly used criteria suggested that the reported two-factor solution provides the most appropriate and substantively or theoretically meaningful solution to the dimensions in the data. Such criteria include the use of Eigen values greater than one, scree plot, total percent of variance explained in the model, and most importantly, the use of meaningful factors which is designed to ensure that, regardless of any criterion used, the factor solution arrived at is meaningful. An exploration of the results in Table 4

suggested that the first factor could be described as an “Unhealthy” personality type while the second factor can be described as a “Healthy” personality type.

The determination that two new dimensions fitted the data in the current study better, therefore, rendered redundant the expectation that Type 1 personality could potentially differentiate between individuals with a current diagnosis of cancer and those who are cancer-free. In other words, Type 1, together with the other five personality types espoused by the proponents of the SIRI inventory, may not be sufficiently present in the current sample and, therefore, may not be used to differentiate between cancer and non-cancer groups. As a result, I will now move forward by examining the ability of the two new dimensions (Healthy and Unhealthy personality types) to differentiate between individuals who have cancer and those who do not have cancer.

Research Question 2: Ability of Type 1, Healthy, and Unhealthy Personality Types to Discriminate Between the Groups

To assess whether the new Unhealthy and Healthy personality types can significantly discriminate between individuals with a current diagnosis of cancer and those that do not have cancer, a descriptive discriminant functional analysis was performed. The results are shown in Table 6. Table 6 also presents a comparative analysis of the discriminant abilities of the new personality types (Healthy and Unhealthy). Results from both descriptive and predictive discriminant analysis are presented and examined (See Tables 6, 7, and 8).

Results from the descriptive discriminant analysis (Table 6) show that the Unhealthy personality type significantly ($F = 17.86, p < 0.001$) discriminates between the cancer and non-cancer groups with a predictive discriminant ability of 69% (see Table 8).

Table 6

Discriminant Analysis of Healthy and Unhealthy Types of Cancer Status

	Non Cancer Group		Cancer Group		Overall Group	
	Mean	SD	Mean	SD	Mean	SD
Healthy Personality Type	8.60	2.87	8.71	2.60	8.64	2.78
Unhealthy Personality Type	14.01	4.90	16.93	6.62	14.98	5.70
Test of Equality Functions						
	Wilks' Lambda	F	df (1)	df (2)	Sig.	
Healthy Personality Type	1.000	0.239	1	646	0.625	
Unhealthy Personality Type	0.973	17.859	1	646	0.000	
	Wilks' Lambda	Chi-Square	df	Sig.		
Test of Function(s)+	0.938	40.918	3	0.000		

Table 7

Discriminant Analysis (Canonical) Examining the Predictive Ability of the Healthy Personality Type

	Cancer Status	Predicted Group Membership ^{a, c}		Total
		Non-Cancer Group	Cancer Group	
Original Sample	Non-Cancer Group	235	197	432
	Cancer Group	92	124	216
	Non-Cancer Group	54.40%	45.60%	100%
	Cancer Group	42.60%	57.40%	100%
Cross-Validated ^b	Non-Cancer Group	226	206	432
	Cancer Group	107	109	216
	Non-Cancer Group	52.30%	47.70%	100%
	Cancer Group	49.50%	50.50%	100%

Note: Wilks' Lambda = .971; Chi-square = 18.920; *df* = 12; Sig. = .090

^a55.4% of original group cases correctly classified. ^bCross-validation is done only for those cases in the analysis. In cross-validation, each case is classified by the functions derived from all cases other than that case. ^c51.7% of cross-validated grouped cases correctly classified.

Table 8

Discriminant Analysis (Canonical) Examining the Predictive Ability of the Unhealthy Personality Type

	Cancer Status	Predicted Group Membership ^{a, c}		Total
		Non-Cancer Group	Cancer Group	
Original Sample	Non-Cancer Group	322	110	432
	Cancer Group	90	126	216
	Non-Cancer Group	74.50%	25.50%	100%
	Cancer Group	41.70%	58.30%	100%
Cross-Validated ^b	Non-Cancer Group	299	133	432
	Cancer Group	112	104	216
	Non-Cancer Group	69.20%	30.80%	100%
	Cancer Group	51.90%	48.10%	100%

Note: Wilks' Lambda = .849; Chi-square = 102.589; df = 43; Sig. = .000

^a69.1% of original group cases correctly classified. ^bCross-validation is done only for those cases in the analysis. In cross-validation, each case is classified by the functions derived from all cases other than that case. ^c62.2% of cross-validated grouped cases correctly classified.

The Wilk's Lambda test indicates that the discriminant ability of the Unhealthy personality type is highly significant at the 99.99% confidence level. Expectedly, Table 6 shows that the Healthy personality type has no significant discriminant ability to differentiate between the two groups ($F = 0.625$, $p = 0.625$).

Thus, without controlling for demographic factors, the results from descriptive and predictive discriminant analyses suggest that the Unhealthy personality type significantly discriminates between the cancer and the non-cancer groups. As shown in Table 8, the Unhealthy personality type has the ability to correctly and significantly predict about 69% of cancer diagnosis cases.

Research Question 3: Demographic Factors

Originally, this research question sought to assess whether the Type 1 category of the SIRI could reliably differentiate individuals who have a current diagnosis of cancer

from those who are cancer-free, given relevant covariates and/or specific demographic variables. However, as CFA results suggested a borderline to poor fit for the presence of six constructs in the SIRS in the current sample and EFA results led to the determination that two new constructs (Healthy and Unhealthy) better fit the data, it is now of interest to determine whether the new two-factor solution (Healthy and Unhealthy) of the SIRS can reliably differentiate between the two groups after controlling for demographic factors. To examine the effects of the Healthy and Unhealthy personality types on cancer status, three binary logistic regression models were estimated and presented in Table 9. Overall results from Table 9 suggests that after controlling for demographic factors, the analysis examining the effect of the Unhealthy personality type significantly predicted higher odds ($OR = 1.813, p < 0.001$) of being diagnosed with cancer.

Effects of Healthy and Unhealthy Personality After Controlling for Demographic Factors

Three binary logistic regression models examining the effects of the Healthy and Unhealthy personality types are presented in Table 9. In Model 1, where the Healthy personality type is the only covariate being assessed, results indicate that the Healthy personality type is not significantly associated with having a diagnosis of cancer ($OR = 1.169$). The effect of the Unhealthy personality type is, however, significantly associated ($1.81, p < 0.000$) with having a current diagnosis of cancer (see Model 2). Consistent with the bivariate analysis in Table 8, Model 2 suggests that individuals with the Unhealthy personality type are about 81% more likely to develop cancer. The deleterious effect of the Unhealthy personality type remained robust, even after controlling for the effects of other covariates in Model 3. The results in Model 3 suggest

Table 9

Logistic Regression Models Examining the Effects of Healthy and Unhealthy Personality Types on Cancer Status

Variables	Model 1				Model 2				Model 3			
	Coef.	OR ^a	SE(OR)	Confidence interval (OR)	Coef.	OR ^a	SE(OR)	Confidence interval (OR)	Coef.	OR ^a	SE(OR)	Confidence interval (OR)
Personality Type												
Healthy	0.156	1.169	0.110	0.972-1.405	----	----	----	----	0.152	1.165	0.117	0.956-1.418
Unhealthy					0.595	1.813	0.160	1.525-2.155	0.600	1.822	0.173	1.513-2.193
Age									0.048	1.051	0.016	0.018-1.082
Gender (Ref is Male)												
Female									-0.120	0.888	0.163	0.619-1.272
Ethnicity (Ref is Other)												
White									-0.521	0.594	0.147	0.366-0.965
Physical Activity (Ref is Sedentary)												
Occasional									0.212	1.236	0.291	0.779-1.959
Intermediate									0.079	1.082	0.269	0.665-1.763
Conditioning									0.055	1.057	0.302	0.604-1.849
Smoking Status (Ref is Never Smoked)												
Ever Smoked									0.219	1.245	0.226	0.872-1.778
Constant	-0.697				-0.737				-2.893			
Log likelihood		-411.049				-388.26				-412.46		
Nagelkerke R-squared		0.006				0.100				0.137		
Cox and Snell R-squared		0.004				0.072				0.099		

Note: Coef. = regression coefficient, OR = odds ratio, SE = standard error

^an=648; *p<0.05, **p<0.01, ***p<0.001.

that possessing an Unhealthy personality type significantly increases the odds of being diagnosed with cancer by approximately 82% ($OR = 1.822, p < 0.000$). Further, Model 3 revealed that while old age is a risk factor for developing cancer, being White (as compared with being Non-White) has a protective effect on the odds of developing cancer. Older individuals ($OR = 1.051, p < 0.01$) are significantly (5%) more likely to have a current diagnosis of cancer while Whites ($OR = 0.594, p < 0.05$) are about 41% less likely to have a cancer diagnosis. The effects of gender, physical activity level and smoking status are, however, not statistically significant.

Overall, the results in Table 9 reveal that, while the Healthy personality type is not a predictor of current cancer status, individuals who possess an Unhealthy personality type are significantly more likely to have a current diagnosis of cancer. This finding remains true even after accounting for the effects of social and demographic factors. The observed deleterious effect of having an Unhealthy personality type appears to have the largest effect among any of the variables utilized in the analysis. Similarly, being older emerged as a highly significant risk factor for developing cancer. The odds of developing cancer, is however, reduced by being White as opposed to being non-White.

Summarizing, this chapter has addressed the three research questions in the current study. The analyses presented in this chapter indicate that contrary to expectations, there are not six constructs present in the current sample as revealed by the borderline to poor fit of the CFA model. This led to the specification of an EFA model which suggested that a new two-factor solution fitted the data better. These two factors were, respectively described as Unhealthy and Healthy factors. At the bivariate level, the analyses in this chapter also revealed that the Unhealthy personality type significantly

discriminates individuals with cancer from those without cancer. At the multivariate level of the analyses, where demographic factors were controlled for, the results revealed that the Unhealthy personality type remained significantly associated with higher odds of being diagnosed with cancer.

Chapter 5 will include a more detailed discussion of the results from Chapter 4 and the implication of these results in the context of existing literature and future research.

CHAPTER 5

SUMMARY, DISCUSSION, AND CONCLUSIONS

Introduction

This chapter will summarize the information contained in the previous four chapters by reviewing the purpose of the study, providing a summary of the literature review, statistical methodology employed, and a presentation of the key findings of the study. The findings of this study will be discussed according to current literature. Finally, limitations will be identified and recommendations for future research will be explored.

Purpose of the Study

The purpose of this dissertation was threefold. Firstly, to assess the validity of the SIRI by assessing whether the six personality Types included on the SIRI were present in the current sample. Secondly, if found to be present in the sample, evaluate the validity of the Type 1 personality category by determining whether it could distinguish a group of subjects with a current diagnosis of cancer from a group who had no current/historical cancer diagnosis. Finally, to determine whether relevant covariates and/or specific demographic factors (age, gender, ethnicity, level of physical activity, and smoking behavior) affect the ability of the Type 1 personality category of the SIRI in discriminating between the cancer group and the current/historically cancer-free group. A group of subjects with a current diagnosis of cancer and a second group with no

current/historical cancer diagnosis completed an online version of the SIRI and a demographic questionnaire.

Summary of Literature Review

A review of the literature began by using PNI research to establish the existence of a link between the physical body and psychological state. Psychoneuroimmunology research has established evidence suggesting that communication between the brain and the immune system is bidirectional, leading to the distinct probability that each is affected by the other. Under this notion, an individual who represses his/her emotions and experiences depressive symptoms may well alter the efficacy of their immune system, thus leading to the initiation of physical disease.

Next, the Grossarth-Maticek personality theory was reviewed. This is the basis on which the SIRI was established. It includes the six personality Types, which now constitute the SIRI, and describes how each of the Types is preprogrammed for health, illness, or social deviance. Of particular interest for this study is the Type 1 personality category, whose members have a tendency to suppress their emotions and be unassertive; leading to feelings of depression and helplessness, immunosuppression, and the eventual development of cancer.

The development of the SIRI was then discussed. The SIRI, which was published in 1990, was developed using data mined from early research by Grossarth-Maticek in 1975 in (Heidelberg, West Germany). Outcomes from these early studies produced impressive results, with hit rates for identifying future cancer development of 97.3%. Unfortunately, there are concerns surrounding Grossarth-Maticek's early work. Chief among them is a failure to release the initial instruments used in these studies and a lack

of information surrounding the selection criteria established for choosing the 70 items (which were subsumed among 450 items) that were used to develop the SIRI. These concerns suggest the need for future research in the direction of establishing the validity of the SIRI as a whole and each of the Type categories individually. The current study has chosen to begin this process by assessing the SIRI in general and the Type 1 personality category specifically, as it is the only Type which has been the focus of past research.

The two established scoring methods for the SIRI were then reviewed. The first is the Grossarth-Maticek and Eysenck method, which was used in their 1990 study. According to this method, the allocation of a subject to a given personality Type was characterized by having a perfect score of 10 for that Type and no score higher than two on any other Type. This scoring method has been objected to by several authors as it often leaves most, if not all, of the subjects unclassified. The second scoring method was devised by Schmitz (1992). Under this scoring method, the assignment of a subject into a respective Type is based on whether his/her score falls in the highest quartile of only one Type. Unfortunately, research by Roberts et al. (1995), which utilized this scoring method to assign subjects to a specific Type, found that only 30% of subjects could be successfully classified. As a result of these challenges, the current study has opted to utilize the means, which are based on a summary measure of all the items associated with each personality Type, in order to establish the extent to which each of the 6 personality Types are present in the sample. In this way, scales with higher mean scores will be seen as more present in the sample than those with lower mean scores. The advantage is that every subject is represented in the data and the summary will therefore reflect all data.

Finally, the inconsistent results of studies utilizing the SIRI were discussed and possible explanations for the lack of consistent results were investigated. Those studies supporting Grossarth-Maticek and Eysenck (1990) have suggested that the Type 1 and Type 2 personality categories are capable of identifying whether an individual is at heightened risk of developing a specific illness. However, those studies (Quander-Blaznick, 1991; Rundmo et al., 1996) which do not support the findings of Grossarth-Maticek & Eysenck (1990), have found that the Type 1 and Type 2 personality scales are intercorrelated and, consequently, are not capable of identifying an individual at risk for a specific illness. The lack of agreement between these studies may be secondary to the absence of a single effective scoring method, differences in the age of subjects included across the different SIRI studies, the different versions of the SIRI utilized by researchers, differences in the mode of SIRI administration, and issues in the translation of the SIRI across several languages. Because authors who have utilized the SIRI in research have selected several components, which are in contrast to those chosen by Grossarth-Maticek in his early data collection, it has created a significant obstacle when attempting to assess the validity of the SIRI. There is a clear need for research which attempts to follow several of the methods utilized by Grossarth-Maticek when he initially collected his data in 1975. This includes; subjects with an age range between 40 and 60 years, administration of all items of the SIRI, and the SIRI presented to subjects in one of the two languages in which the SIRI has been offered by Grossarth-Maticek and Eysenck (German and English). The current study will do this by administering the complete SIRI, which was directly translated by the authors into English, to a sample of individuals who

are similar in age to those utilized by Grossarth-Maticek in his 1967 and 1975 research (between the ages of 40 and 60).

Psychoneuroimmunology research appears to suggest that personality/psychological state have a specific effect on the physical health of an individual. The SIRI has been designed to identify those individuals who are at a heightened risk of developing a specific illness. Unfortunately, while some studies have confirmed the early success of Grossarth-Maticek and Eysenck in utilizing the SIRI (Quander-Blaznick, 1991; Rundmo et al. 1996) for this purpose, other studies have found strikingly different results. This lack in consistency of results must be addressed in order to determine whether the SIRI is, in fact, able to accurately identify those at increased risk for developing a specific physical illness, as proposed by Grossarth-Maticek and Eysenck (1990). As the limited research utilizing the SIRI has focused on the Type 1 (cancer-prone) personality category, the focus of the current study will address the validity of this scale. As discussed earlier, there may be potential benefits to having the ability to identify individuals who are at a heightened risk for the future development of cancer. Namely, as demonstrated by Grossarth-Maticek et al. in 2000, a specific prophylactic treatment could be utilized to reduce the risk of an individual identified with a Type 1 personality for the future development of cancer.

Summary of Methodology

The present study employed an ex post facto research design. An ex post facto design is a non-experimental research technique in which preexisting groups are compared on some dependent variable. In this design, the assignment of participants to the levels of the independent variable is based on events that occurred in the past. This

non-experimental research is similar to an experiment because it compares two or more groups of individuals who were exposed to different conditions as a result of their natural histories.

The sample for this study consisted of 648 English speaking male ($n = 235$) and female ($n = 413$) adults who are between 40 and 60 years of age located across North America. The subjects belonged to one of two groups. The first group consisted of 216 individuals with a current diagnosis of cancer. The second group includes 432 individuals who are currently/historically cancer-free. Subjects were acquired using convenience sampling. Both groups of participants completed an online version of the SIRI and a Demographic Questionnaire via the SurveyMonkey website. Instructions from Grossarth-Maticek and Eysenck (1990) were followed during administration of the SIRI.

In order to avoid the confusion surrounding scoring methods and the significant weakness found in each, the current study utilized the means, which are based on a summary measure of all the items associated with each personality Type, in order to establish the extent to which each of the six personality Types are present in the sample. In this way, scales with higher mean scores were seen as more present in the sample than those with lower mean scores. Consequently, this allowed the researcher to avoid the current confusion in the literature surrounding the different scoring methods. Preliminary analysis confirmed previous research (Roberts et al., 1995), as the existing scoring methods would have led to a large number of subjects being removed from analysis, as they did not meet the criteria for being placed in a single personality Type. The advantage of using the current classification method is that it allowed for the representation of every subject on the continuum, from those individuals with low scores across all of the Types

to those who have scores equal on more than one Type. In a review of the mean scores for each of the personality Types of the SIRI (Table 2), the current study found that, in contrast to expectations, the Type 1 personality category had the third highest mean (Type 4a = 5.87; Type 5 = 5.48; Type 1 = 3.39). As approximately 33% of the sample consisted of individuals with a current diagnosis of cancer, it was expected that the cancer-prone personality would be more present in the current sample (as seen by a higher Type 1 mean score). Additionally, the mean scores for scales 4a (mean = 5.87) and 4b (mean = 3.00) were quite different. As Grossarth-Maticek and Eysenck's theory suggests that both scales measure a healthy personality, it would be expected that the means for the two scales would more similar. It is possible that this is the result of a difference in the presentation of the items in scale 4a (positively worded items) and scale 4b (negatively worded items).

Summary of Major Findings

An examination of the demographic variables revealed that more than half (63.7%) of the sample was female with a total subject mean age of 50 years. The sample consisted of mostly Caucasian individuals (85.5%) with over half (53.2%) reporting at least some current/historical smoking behavior (current every day smoker, current some day smoker, or former smoker). The level of current physical activity for all subjects was fairly evenly distributed with 25% leading a sedentary lifestyle (less than 30 minutes of exercise per week), 31.6% leading an occasional physically active lifestyle (between 30 and 60 minutes of exercise per week), 26.9% leading an intermediate physically active lifestyle (between one and three hours of exercise per week), and 16.5% leading a conditioned physically active lifestyle (three or more hours of exercise per week).

While Table 2 revealed that all six of the personality Types were present in the current sample to some extent, analyses indicated that, contrary to expectations, the existence of six constructs underlying the 70 items in the SIRI is not present, as revealed by the borderline to poor fit of the CFA model. Interestingly, while Table 2 revealed that Type 4a (mean of 5.87) appeared to be fairly strongly present in the sample, Type 4b was found to be weakly present (mean of 3.00). This was unexpected as Grossarth-Maticek and Eysenck reported that both Type 4a and 4b are measuring a healthy personality. In fact, when scoring the SIRI, these two scales are combined to create a single Type 4 scale. Consequently, it would be expected that the means of Type 4a and 4b should be similar. On further inspection of the items making up each of these two categories, it is clear that the positively worded items of Type 4a are much easier to comprehend than the negatively worded items that make up Type 4b (in fact three of the 10 items in Type 4b are double negatives). This could explain the discrepancy between the two sets of items in the current sample.

The lack of the six constructs being found in the present sample resulted in a specification of an EFA model that suggested that two new factors fitted the data better. These two factors were described as Unhealthy and Healthy. At the bivariate level, analysis revealed that the Unhealthy personality type significantly discriminated individuals with cancer from those without cancer. At the multivariate level where demographic factors were accounted for, the findings revealed that the Unhealthy personality type remained significantly associated with higher odds of being diagnosed with cancer. The Healthy type was unsuccessful at differentiating between the two groups at both the bivariate and multivariate level.

Discussion

Contrary to expectations, CFA results suggest that, in the current sample, six constructs are not present in the SIRI. Overall CFA model fitness can be, at best, described as a borderline to poor fit. Additionally, a review of the mean scores for each of the personality Types of the SIRI (Table 2), revealed that the Type 1 personality category had the third highest mean (Type 4a = 5.87; Type 5 = 5.48; Type 1 = 3.39). As approximately 33% of the sample consisted of individuals with a current diagnosis of cancer, it was expected that the cancer-prone personality would be more present in the current sample (as seen by a higher Type 1 mean score).

Prior research (e.g., Amelang & Schmidt-Rathjens, 1995; Roberts et al., 1995; Smedslund, 1995) on the validity and reliability of the SIRI has consistently suggested a hypothesis for why studies on the subject have produced inconsistent results (which, as in the case of the current dissertation, is often in contrast to those produced by the original authors of the SIRI). This explanation surrounds the wording of SIRI items. Researchers have noted the inherent difficulties involved in the translation of the SIRI from German to other languages. As pointed out by Roberts et al. (1995, p. 319), there are numerous awkwardly and negatively worded items contained in the English version of the SIRI and “many of the items are complex and rather clumsily expressed (e.g. double negatives)...and may make its application to low or average IQ subjects very limited.” These translation difficulties may have contributed to the unexpected results found in the current study, as the awkwardness of the wording of items may have been confusing to the respondents. For example, in my findings, the mean scores for scales 4a (mean = 5.87) and 4b (mean = 3.00) were quite different. As Grossarth-Maticek and Eysenck’s

theory suggests that both scales measure a healthy personality, it would be expected that the means for the two scales would be quite similar. However, while this difference was unexpected, it was not a unique finding. In 1995, Roberts et al. made a similar observation. They found a very low correlation between Type 4a and Type 4b (.17). The authors stated, “This was a disturbing finding. These two scales (4a and 4b) are supposed to be measuring the same construct, but analysis reveals that this may not be the case” (Roberts et al., 1995, p. 316). Roberts et al. attributed this to the fact that scales 4a and 4b are not simply composed of the same items worded in different ways (positively and negatively). The items from Type 4a are completely different from the items in 4b. Consequently, the authors concluded that the item content of each of the two scales might be measuring two different constructs. Additionally, Roberts et al. believed that the difficulty of the wording of the items in the negatively worded Type 4b scale is likely contributing to low observed correlation. After reviewing the items from the two scales, the writer was compelled to agree with the conclusions of Roberts et al. The items from each of the two Type 4 scales are completely different and the items from scale 4a (positively worded items) appear to be much easier to understand than the negatively worded items on scale 4b. These observations may well explain the stark differences in the means between scale 4a and 4b that were found in the current study. Additionally, a close look at the items that make up the new Healthy personality type, add further evidence to this hypothesis. Of the 12 items that make up the Healthy type, seven are from the Type 4a personality scale and the remaining five are from the Type 5 scale. This result was unanticipated. Based on the work of Grossarth-Maticek and Eysenk, it would

have been expected that at least some of the items from Type 4b would have been included in the Healthy type.

Following the CFA results, an EFA model was specified which led to the extraction of new two-factors which were respectively described as Unhealthy and Healthy factors. The description of the CFA model as a borderline to poor fit was justified on the basis that most of the commonly known and used model fit statistics did not provide sufficient support to validate the presence of six constructs in the SIRI in the current sample. The CFI values range from 0-1, with larger values indicating better fit. Values greater than 0.95 is considered an acceptable fit. Scores for the cancer group (0.682), non-cancer group (0.715) and the overall sample (0.768) were significantly below the cutoff of 0.95 suggesting a poorly fitting model. In terms of the TLI, scores range from 0-1 with a cutoff score of 0.95 and above considered a good fitting model. Scores for the cancer group (0.699), non-cancer group (0.704) and the overall sample (0.759) were significantly below the cutoff of 0.95 suggesting a poorly fitting model. Similarly, except for the overall sample (.79), the RMSEA fit statistic revealed a generally poorly fitted model with regard to the cancer (.83) and non-cancer samples (.81). Despite its limitations, Chi-square based model fitness statistics also provided statistically significant evidence to reject a well-fitted CFA model.

In taking a closer look at the make-up of the Unhealthy personality type (Table 6) it is noteworthy that eight of the 10 items from the Type 1 category are included in the new Unhealthy personality type. This appears to indicate that the items identified by Grossarth-Maticek to define a cancer-prone personality do have a part to play in

successfully differentiating between those individuals with a current diagnosis of cancer from those who are currently and historically cancer-free.

Following the results of the CFA, which did not reveal the presence of six constructs in the current sample, it was determined that it was no longer theoretically appropriate to continue forward with analysis of any of the six personality Types (including the Type 1 personality). Based on the CFA results, an EFA was necessary to explore possible dimensions in the data. The results of the EFA indicated that a two-factor model was sufficient to describe the data using best practices (total variance, scree plot, eigenvalues, and rational explanation). Accordingly, it was deemed appropriate to assess the relative effects of the newly defined Unhealthy and Healthy personality types on respondents' cancer status. The Healthy personality type showed no ability to differentiate between the two groups. It may be that the Healthy personality type is not a protective factor against the future development of cancer, thus it is not able to differentiate between those with a current diagnosis of cancer and those who are cancer-free. In examining the results from the Unhealthy type, it was determined that it discriminates between the cancer and non-cancer groups with a predictive discriminant ability of 69%. Thus, without controlling for demographic factors, both discriminant analyses and bivariate logistic regression models showed that the Unhealthy personality type had a significant effect on predicting cancer status.

Following the results from the EFA and descriptive discriminant functional analysis, a multivariate analysis, where the effects of the demographic factors were controlled for, was performed. Overall results revealed that the Unhealthy personality type continued to show a strong ability to differentiate between those individuals with a

current diagnosis of cancer from those who are cancer-free ($OR = 1.822$). The Healthy personality type remained unable to differentiate between the two groups.

In terms of demographic factors, age predicted cancer status in the expected direction (as age increased so did the likelihood of having a current diagnosis of cancer) while being Caucasian emerged as a significant protective factor of cancer development. Regarding age, a great deal of research has suggested that as individuals age, their odds of developing cancer increase (e.g., Colditz & Rosner, 2000; Pike et. al., 1993). These authors have pointed out that, in their belief, the most important risk factor for cancer is growing older. These studies suggest that age is a risk factor for developing cancer because, compared to their younger counterparts, older individuals consistently suffer from lower levels of nutrition and exercise, higher levels of stress, and the presence of several co-morbid conditions (i.e. diabetes, kidney disease, heart disease, high blood pressure, and arthritis). These results therefore corroborate the current finding that age has a positive independent effect on the likelihood of developing cancer.

The observed protective effect of being Caucasian is also supported by previous research. Greenlee, Murray, Bolden, and Wingo (2000), for instance, reported that overall rates of cancer incidence vary considerably among racial and ethnic groups. According to the authors, American Caucasians have the lowest rate of cancer incidence. Overall, Greenlee et al. reported that African Americans, American Indians, and Americans of Hispanic and Asian descent are between 40 and 60% more likely to develop cancer than Caucasians. These trends in cancer rate by ethnic background are therefore consistent with findings from the current study.

Other demographic factors included in the analyses were not found to be significantly associated with the likelihood of being diagnosed with cancer. Overall, the Unhealthy personality type emerged as having significant predictive ability in determining whether an individual has a current diagnosis of cancer.

Conclusion

In reviewing the previous research surrounding the SIRI, the current study is the only one to have included subjects in the same age range (40 to 60 years) as those utilized by Grossarth-Maticek when collecting his data in 1975, administered all 70 items of the SIRI and administered them on their own (without being subsumed among items from other inventories), and included a group of subjects with a current diagnosis of cancer.

In terms of test administration, this was the first study to administer all 70 items of the SIRI to subjects. Past research utilizing the SIRI has administered items from a select number of Types. As most studies have attempted to isolate the ability of the SIRI to predict whether an individual currently has cancer or may develop cancer in the future, they have most often only administered a truncated form of the SIRI (i.e., the 10 items from the Type 1 personality Type). Several researchers (Quander-Blaznik, 1991; Rundmo et al., 1996; Sandin et al., 1993) produced research that confirmed the original findings of Grossarth-Maticek and Eysenck (1990), namely; that the Type 1 personality category of the SIRI correlated highly with the presence of cancer. However, none of these studies administered the complete SIRI to subjects. Both Quander-Blaznik (1991) and Sandin et al. (1993) only utilized the 10 items from the Type 1 category, while Rundmo et al. (1996) chose to administer items from Types 1, 2, and 4. Both Amelang and Schmidt-Rathjens (1992) and Smedslund (1995) produced results that did not support those of

Grossarth-Maticek and Eysenck (1990). However, as in the case with the studies that found support for the work of Grossarth-Maticek and Eysenck, Amelang and Schmidt-Rathjens (20 items from Type 1 and Type 2 scales) and Smedslund (40 items from Type 1, 2, and 4 scales) failed to administer the complete SIRI. The current study administered all of the SIRI items (across all six Types) to individuals. This may have played a role in the finding that two factors fit the data better than the 6 proposed by Grossarth-Maticek and Eysenck (1990). .

An examination of the Unhealthy personality type revealed that it included items from all six personality Types included in the SIRI, although it did not include any of the items from Type 4a (the positively worded healthy personality Type). As Types 2 through 6 were not designed by Grossarth-Maticek and Eysenck to identify cancer-prone individuals, how is it possible that they find themselves included in a category capable of predicting membership in a cancer or cancer-free group? The Unhealthy type includes eight of the 10 items present in the Type 1 (cancer-prone) personality. As the Type 1 personality category was initially constructed as a cancer-prone personality Type by Grossarth-Maticek and Eysenck, it is not unexpected that some of the items would be part of a personality type that demonstrates the ability to differentiate a group of individuals with a current diagnosis of cancer from a group of individuals who are cancer-free. As for the inclusion of items from the other personality Types, it is possible that the Unhealthy type is able to identify those who are at risk for several different diseases. That would certainly explain the presence of items from all of the different SIRI personality scales in making up the Unhealthy type. While this study has linked the newly developed

Unhealthy type to the presence of cancer, further research will have to be undertaken to determine if it is possible to link this personality type to other physical diseases.

In terms of age, the current study is the first to attempt to replicate the age range utilized by Grossarth-Maticek when he initially collected data (Heidelberg, West Germany in 1975), which would later be used in the development of the SIRI. Studies attempting to validate the SIRI have, for unknown reasons, consistently chosen to ignore the age parameters chosen by Grossarth-Maticek. Studies attempting to validate the results of Grossarth-Maticek and Eysenck's work have utilized a wide range of subject ages. In supporting the results of Grossarth-Maticek and Eysenck (1990), Sandin et al. (1993) chose to include subjects between the ages of 18 and 27 and Rundmo et al. (1996) retained individuals 18 years of age and up. In studies that did not confer support for the work of Grossarth-Maticek and Eysenck (1990), Amelang and Schmidt-Rathjens (1992) and Roberts et al. (1995) included subjects between the ages of 19 and 72, while Smedlund (1995) included individuals 18 years of age and older. While these studies do not share the reason/purpose for selecting the type of samples they did, one strong possibility could surround the issue of sampling. The authors may have chosen the samples they did due to restrictions in their ability to access a specific type of sample or it may have been too expensive to gain access to a preferred sample. Increasing the difficulty of limiting the age of their subjects, some of the replication research utilized quota sampling (designed to include a specific segment of the population). For example, both Quander-Blaznik (1991) and Amelang and Schmidt-Rathjens (1992) included some subjects with cancer.

In terms of language, the SIRI was originally published in German and later translated into English by the authors. However, studies have administered the SIRI in Norwegian, Swedish, Spanish, and Danish (i.e., Larsson et. al., 1995; Sandin et al., 1993; Smedslund, 1995). None of these versions were translated by the developers of the SIRI (Grossarth-Maticek & Eysenck, 1990). In reviewing previous research utilizing alternate language versions of the SIRI not sanctioned by the original authors (Grossarth-Maticek & Eysenck), it was found that the researchers did not provide details surrounding the process associated with translation. As discussed previously in this study, research is fairly clear on the necessity of utilizing a clear, concise, and organized process when translating a validated instrument into a new language. If this process is not followed it could lead to results that are influenced by unseen factors. For example, specific meanings of the SIRI test items might be difficult to translate. Careful translation procedures must be assured to capture the intended meaning of the items in the original version of an instrument in order to ensure that they are comparable. Additionally, it is important to determine that the relevant components of the trait and the meanings of the items in each language are equivalent. While this procedure was likely undertaken by Grossarth-Maticek and Eysenck in their translation of the SIRI from German to English, it is not possible to confirm that it was completed when authors utilizing the SIRI in research translated it into their language of choice.

In conclusion, findings from the current study has shown that, contrary to some of the studies that have replicated and confirmed the six-personality factor structure of the SIRI, CFA evidence from the current study suggests that the presence of six constructs in the SIRI cannot be sufficiently validated. This observation may be attributed to the

uniqueness of the current sample and/or differences in the operationalization of the SIRI across studies. The literature on the subject shows that the SIRI has been administered in different languages that were not translated into those languages by the authors of the SIRI, with subjects falling outside of the age range in which the SIRI was validated, using small sample sizes, and utilizing a truncated version of the SIRI (i.e., only the items from Type 1 and 2). Accordingly, the present study attempted to replicate the 1990 work of Grossarth-Maticek and Eysenck as closely as possible. This resulted in the extraction of two new factors that better fitted the current data. These factors were consequently described as Unhealthy and Healthy personality types. Findings revealed that the Unhealthy personality type demonstrated significant descriptive and predictive discriminant ability and significantly differentiated individuals with a current diagnosis of cancer from their counterparts who do not have cancer. Indeed, further analysis also revealed that the ability of the Unhealthy personality type to predict cancer status is quite robust even after controlling for demographic factors.

Consistent with extant research, the current study also found evidence that shows that increasing age is a risk factor for having a current diagnosis of cancer and being Caucasian (as compared with being Non-White) has a protective effect on the odds of being diagnosed with cancer. On the other hand, no significant association was found between factors such as gender, physical activity level, and smoking status.

While the findings of the current study are the first to suggest that two constructs fit the current data better than the six identified by Grossarth-Maticek and Eysenck, it is worth noting that they are unique within the context of the current sample.

Limitations and Direction for Future Research

In spite of the care taken in the design of the present investigation, there are some methodological limitations. As with many studies, the cross sectional nature of this study makes causal inferences from the findings problematic. Specifically, what is the predictive power of the Unhealthy personality type? Do the types of interpersonal reactions covered in the SIRI items making up the Unhealthy personality type directly predispose individuals for disease, or do they influence the people to live unhealthy lifestyles, exposing them to unhealthy or toxic substances? Consequently, a cautionary interpretation of the current findings is recommended. As pointed out in other studies (Eysenck, 1985; Garssen & Goodkin, 1999), results from research addressing a psychosocial issue as a potential cause of cancer are tenuous when they are of a retrospective design, and they are difficult to interpret; the observed difference in characteristics between cancer patients and controls may be due to the impact of the cancer diagnosis. This concern may be especially relevant in the present study. All of the subjects in the cancer group were aware of their current diagnosis of cancer. Future research could utilize a longitudinal design in which individuals would be followed over an extended period of time. This would ensure that the personality factors contained in the Unhealthy personality type could be measured across the course of cancer development, specifically, when cancer-free, developing cancer, and, finally, in receipt of a cancer diagnosis. This could prevent prior knowledge of a diagnosis from affecting a subject's responses to the Unhealthy personality type items and provide more detailed information for researchers. This approach may ultimately help the researcher to clearly

establish the direction of causality as opposed to establishing a mere association between the dependent and the independent variables.

While the current study administered the SIRI in a language which was officially translated by the authors, the wording of the items in English have been found by other researchers to be difficult to decipher and hard to understand (Amelang, 1997; Kirk & Martin, 1998; Roberts et al., 1995). This observation was shared by the author of this dissertation.

It has been suggested that the mode of administration of the SIRI can affect the validity of the questionnaire. Grossarth-Maticek used interviewers to administer the SIRI. These interviewers tried to establish trust and explain and inform the subjects about the idea behind the personality-disease relationship. Using this approach, the assessment of the SIRI may well be more valid when utilizing an interview process rather than self-report (Grossarth-Maticek et al., 1993). A self-report method (questionnaire) could, for instance, enhance the possibility of misunderstanding items that could lead to the under-reporting or over-reporting of certain personality characteristics. It may be that the act of interviewing, which entails some form of social interaction, may encourage the respondent to give more truthful or revealing answers (Eysenck, 1990). A trained interviewer can explain the purpose of the questionnaire in detail, assure the subjects of confidentiality, answer both general and specific questions, and build trust and confidence with the subject. Future research could attempt to establish the validity of the SIRI by administering the inventory via interview as opposed to paper-and-pencil administration.

Notwithstanding these limitations, the present study has contributed to the extant research on this subject in very unique ways. First, this study adds to our knowledge by establishing that, in the current sample, it was not possible to confirm the presence of six separate constructs. Instead, two new constructs were found (Unhealthy and Healthy). The Unhealthy type was found to effectively predict the presence of cancer, even after controlling for demographic variables.

Most of the previous research has utilized small sample sizes, age ranges which do not replicate those used by Grossarth-Maticek in his initial data collection, contained a version of the SIRI in a language which was not translated by the authors of the SIRI, and administered either a truncated version of the SIRI or subsumed the items of the SIRI among those of other measures (i.e. Roberts et al., 1995). The current study did not suffer from these limitations. This may help to explain why some of the previous work on validating the SIRI generated results that were inconsistent with the findings of the current study. After all, it's not possible to know how the subjects in previous studies would have been dispersed among all the SIRI Types if they had been administered all 70 items of the SIRI, instead of just the items from one, two, or three of the Types. Additionally, differences in age are also important. For example, a University student sample might not yet display the characteristics of a cancer-prone personality as they may not have much experience with adult types of stress nor have they experienced stress over a long enough period of time. Given the stark differences between the methodologies utilized in the current study versus that of previous validation studies, it would be interesting to know whether the results of the current study will hold up in future research.

Future research may want to categorize subjects by cancer diagnosis. There are over 110 kinds of cancer, with studies suggesting that some cancers have a much larger genetic component than others (Baylin & Jones, 2011). In fact, as Holland showed in the case of breast cancer, there seems to be great differences in heritability even within a single type of cancer. This certainly suggests the possibility that various cancers may, theoretically, have entirely different psychosocial factors associated with them.

Future research may want to attempt to confirm the link between the new Unhealthy personality type and cancer and to look to establish whether the Unhealthy type can predict the presence of other physical diseases. There were items from all 6 of the SIRI personality Types included in the Unhealthy type. While there is now evidence that this new type can predict the presence of Cancer, it is logical to attempt to discover how far reaching the predictive powers of the Unhealthy type are.

Finally, future research may wish to explore the effects that culture has on the expression of emotions. As emotional expression is seen as the most significant factor in personality induced cancer development, it is important to determine how this is mediated by culture. For example, if emotional repression is more accepted in one culture as opposed to another, would we expect to see the latter culture experience a lower rate of cancer development?

Summary

The present study has found that six constructs do not underlie the SIRI in the current sample and that the data better fitted two hitherto unexplored factor structures (Unhealthy and Healthy personality), which may underlie the patterns in SIRI based data. As eight of the 10 items from the Type 1 scale of the SIRI make up the Unhealthy type, it

follows that, while Grossarth-Maticek and Eysenck may well have been on their way in the development of their cancer-prone personality (Type 1), their six Type method may not have been the best way of accomplishing their goal of identifying individuals who are at a higher risk of developing specific diseases. It may well be that a group of items from the SIRI (for example, the items making up the Unhealthy type in the current study) is capable of identifying those individuals who are at a higher risk of developing disease in general. In this situation, a person who scores high on the Unhealthy type would then be seen as “disease-prone” and could be more closely monitored for the future development of illness.

The promise of identifying individuals with a disease-prone personality capable of identifying cancer-prone persons could hold great importance. If research could definitively link a particular set of personality variables to the future onset of cancer, then a prophylactic treatment could be utilized to lower the level of cancer risk in the population. In fact, as discussed earlier, there has already been work done in this area. Autonomy training was designed by Grossarth-Maticek et al. (2000) to alter behavior in an individual away from Type 1 behavior and closer to Type 4 behavior. In individuals who have been identified as possessing a cancer-prone personality, autonomy training has shown (over follow-up periods of 13 to 23 years) that these individuals have significantly less mortality from cancer than the control group (Grossarth-Maticek & Eysenck, 1991). Possibly, this autonomy training can display similar positive effects with the new Unhealthy type. It is hopeful that the possibility of one day having the ability to identify someone with a cancer-prone personality type could lead to a reduction in cancer development and/or a delay in the onset of cancer.

APPENDIX A
QUESTIONNAIRES

Short Interpersonal Reactions Inventory

Instructions

Here are a number of questions covering your attitudes and emotions in relation to people and situations which have great significance for you. Try to answer Yes or No to each question according to your first impression. Do not think too long about the precise meaning of the question. Leave the answer blank only if you find it impossible to answer Yes or No.

1. I find it very difficult to stand up for myself:

☐ Yes

☐ No

2. I have been complaining for years about various unfavorable conditions but am not able to change them:

☐ Yes

☐ No

3. I am mainly concerned with my own well-being:

☐ Yes

☐ No

4. I am usually content and happy with my daily activities:

☐ Yes

☐ No

5. I can express my feelings only when there are good reasons for them:

☐ Yes

☐ No

6. I don't believe in social rules and don't pay much attention to other people's expectations or the obligations I may have towards them:

☐ Yes

☐ No

7. I cannot live happily and contentedly with nor without a particular person:

☐ Yes

☐ No

8. I prefer to agree with others rather than assert my own views:

☐ Yes

☐ No

9. Certain people are the most important causes of my personal misfortunes:

☐ Yes

☐ No

10. I alternate to a great degree between the positive and negative evaluation of people and conditions:

☐ Yes

☐ No

11. When I cannot achieve closeness with someone who is emotionally important to me, I have no difficulties in letting them go:

☐ Yes

☐ No

12. I have difficulties in showing my emotions because for every positive emotion there is a negative one:

☐ Yes

☐ No

13. My behavior toward other people alters from being very friendly and good-natured to being very hostile and aggressive:

☐ Yes

☐ No

14. I cannot live happily and contentedly in the presence or the absence of certain states or conditions; for example, I need my work but am unhappy doing it:

☐ Yes

☐ No

15. I tend to act more to fulfill the expectations of people close to me, rather than look after my own needs:

☐ Yes

☐ No

16. Certain conditions or situations are the most important causes of my personal misfortunes:

☐ Yes

☐ No

17. With people I love, I keep changing from keeping them at a great distance to stifling dependence and from stifling dependence to excessive distancing:

☐ Yes

☐ No

18. I can usually arrange things so that people who are emotionally important to me are as close to or as distant from me as I wish:

☐ Yes

☐ No

19. Reason, rather than emotion, guides my behavior:

☐ Yes

☐ No

20. I often expect others to fulfill agreements very strictly but do not believe in doing so myself:

☐ Yes

☐ No

21. I often have thoughts that terrify me and make me unhappy:

☐ Yes

☐ No

22. I tend to give in and abandon my own aims to achieve harmony with other people:

☐ Yes

☐ No

23. I feel helpless against people or conditions that cause great unhappiness for me because I cannot change them:

☐ Yes

☐ No

24. When I am in a situation that I experience as threatening, I immediately try to get other people to help and support me:

☐ Yes

☐ No

25. When I fail to achieve my objectives, I can easily change tack:

☐ Yes

☐ No

26. When people make emotional demands on me I usually react only rationally, never emotionally:

☐ Yes

☐ No

27. I usually act in a spontaneous manner, following my immediate feelings without considering the actual consequences:

☐ Yes

☐ No

28. Relations with certain people are always pretty unsatisfactory, but there is nothing I can do about it:

☐ Yes

☐ No

29. I am unable to express my feelings and needs openly to other people:

☐ Yes

☐ No

30. I always seem to be confronted with the undesirable aspects of people and conditions:

☐ Yes

☐ No

31. When someone who is emotionally important to me hurts me ever so slightly, I immediately dissociate myself from that person:

☐ Yes

☐ No

32. I can manage to live fairly contentedly with or without someone who is emotionally important to me:

☐ Yes

☐ No

33. I am quite unable to allow myself to be guided by emotional considerations:

☐ Yes

☐ No

34. I often feel like attacking other people and crushing them:

☐ Yes

☐ No

35. Certain situations and states (e.g. at my place of work) tend to make me unhappy, but there is nothing I can do to alter things:

☐ Yes

☐ No

36. I tend to accept conditions that work against my personal interests without being able to protest:

☐ Yes

☐ No

37. Certain people keep interfering with my personal developments:

☐ Yes

☐ No

38. I expect others to live up to the highest moral standards but do not feel that these are binding on myself:

☐ Yes

☐ No

39. I can usually change my behavior to suit conditions:

☐ Yes

☐ No

40. My actions are never influenced by emotions to the degree that they might appear irrational:

☐ Yes

☐ No

41. When my partner demonstrates love toward me, I sometimes become particularly aggressive:

☐ Yes

☐ No

42. Certain bodily conditions (e.g. being overweight) make me unhappy, but I feel unable to do anything about it:

☐ Yes

☐ No

43. I often feel inhibited when it comes to openly showing negative feelings such as hatred, aggression, or anger:

☐ Yes

☐ No

44. Certain conditions keep interfering with my personal developments:

☐ Yes

☐ No

45. I seek satisfaction of my own needs and desires first, regardless of the needs and rights of others:

☐ Yes

☐ No

46. I am usually capable of finding new points of view and successful, sometimes surprising, solutions for problems:

☐ Yes

☐ No

47. I always try to do what is rational and logically correct:

☐ Yes

☐ No

48. When I feel like attacking someone physically, I have no inhibitions about doing this at all:

☐ Yes

☐ No

49. I can relax bodily and mentally only very rarely; most of the time I am very tense:

☐ Yes

☐ No

50. I am inclined not to be demonstrative when emotional shocks upset me:

☐ Yes

☐ No

51. I cannot control excitement or stress in my life because this is dependent on the actions of other people:

☐ Yes

☐ No

52. When I make emotional demands on another person, I require immediate satisfaction:

☐ Yes

☐ No

53. I am independent in what I do, and do not depend on other people when it works to my disadvantage:

☐ Yes

☐ No

54. I always try to express my needs and desires in a rational and reasonable manner:

☐ Yes

☐ No

55. I have no inhibition in hurting myself physically if I feel like doing so:

☐ Yes

☐ No

56. I have great difficulties in entering into happy and contented relations with people:

☐ Yes

☐ No

57. When I feel emotionally let down I tend to be paralyzed and inhibited:

☐ Yes

☐ No

58. I cannot control excitement or stress in my life because this depends on conditions over which I have no control:

☐ Yes

☐ No

59. I usually find fulfillment in everyday situations that are not subject to ordinary rules, regulations, and expectations:

☐ Yes

☐ No

60. When things don't work out, this does not make me give up but rather makes me change my way of doing things:

☐ Yes

☐ No

61. I try to solve my problems in the light of relevant and rational consideration:

☐ Yes

☐ No

62. I resent all moral obligations because they hamper and inhibit me:

☐ Yes

☐ No

63. I am helpless when confronted with emotional shocks, depression, or anxiety:

☐ Yes

☐ No

64. When something terrible happens to me, such as the death of a loved one, I am quite unable to express my emotions and desires:

☐ Yes

☐ No

65. I can express my aims and desires clearly but feel that it is quite impossible to achieve them:

☐ Yes

☐ No

66. As soon as someone becomes emotionally important to me, I tend to place contradictory demands on them, such as "Don't ever leave me: or "Get away from me":

☐ Yes

☐ No

67. When things lead to harmful results for me, I have no trouble in changing my behavior to make for success:

☐ Yes

☐ No

68. I only believe in things that can be proved scientifically and logically:

☐ Yes

☐ No

69. When it benefits me, I have no hesitation in lying and pretending:

☐ Yes

☐ No

70. I am seldom able to feel enthusiasm for anything:

☐ Yes

☐ No

- Type 1:** Add “Yes” answers to questions: 1, 8, 15, 22, 29, 36, 43, 50, 57, 64.
- Type 2:** Add “Yes” answers to questions: 2, 9, 16, 23, 30, 37, 44, 51, 58, 65.
- Type 3:** Add “Yes” answers to questions: 3, 10, 17, 24, 31, 38, 45, 52, 59, 66.
- Type 4a:** Add “Yes” answers to questions: 4, 11, 18, 25, 32, 39, 46, 53, 60, 67.
- Type 4b:** Add “No” answers to questions: 7, 14, 21, 28, 35, 42, 49, 56, 63, 70.
- Type 5:** Add “Yes” answers to questions: 5, 12, 19, 26, 33, 40, 47, 54, 61, 68.
- Type 6:** Add “Yes” answers to questions: 6, 13, 20, 27, 34, 41, 48, 55, 62, 69.

DEMOGRAPHIC QUESTIONNAIRE

Demographic Questionnaire Statement

Please be informed that the researcher is conducting a study on “Assessing the Validity of the Type 1 personality of the Short Interpersonal Reactions Inventory.” In connection with this the author constructed a questionnaire to gather information for the study. Your completion of this survey is very important. All provided information will be kept in strict confidentiality. I recognize the value of your time and sincerely appreciate your efforts on my behalf. All responses will be anonymous and all data will be held in confidence. Your input is critical to the success of this research. Please take 5 minutes to complete this questionnaire.

Thanks for taking the time to participate in this research project.

Sincerely,

Jason Taller

Doctoral Candidate in Counseling Psychology

Andrews University

1. Ethnicity (Please select one)

- ☐ Caucasian/White
 - ☐ Hispanic/Latino
 - ☐ African American/Black
 - ☐ Native American
 - ☐ Asian American
 - ☐ Other (Please Specify)
-

2. How old were you on your last birthday?

3. Gender (Please select one)

- ☐ Female
- ☐ Male

4. Which of the following categories best describes your current level of physical activity?

- ☐ Sedentary (less than 30 minutes of exercise per week)
- ☐ Occasional (30-60 minutes of exercise per week)
- ☐ Intermediate (1-3 hours of exercise per week)
- ☐ Conditioning (3+ hours of exercise per week)

5. Which of the following statements best describes your smoking status?

- ☐ Current every day smoker
- ☐ Current some day smoker
- ☐ Former smoker
- ☐ Never Smoker

APPENDIX B

SURVEY MONKEY INFORMATION

SurveyMonkey Details

Who is the SurveyMonkey Audience?

SurveyMonkey Audience is a large group of people SurveyMonkey has recruited to take surveys on behalf of SurveyMonkey customers who purchase our SurveyMonkey Audience product. There are nearly one million members who have signed up to take surveys and thousands of members join each day.

Our Members

We maintain a member site called [SurveyMonkey Contribute](#) to recruit members to take surveys on behalf of our customers. We also maintain a [Global Partner Network](#) for access to millions more respondents. We maintain these multiple sources because different member benefits and recruitment mechanisms attract different types of people. Certain types of surveys (e.g., longer surveys or surveys that only apply to a highly targeted or custom targeted group) may require different types of incentives. We seek to recruit a wide variety of members to ensure we can fill the needs of as many customer projects, as cost effectively as possible.

Please review our FAQ article about our [Global Partner Network](#) for more information about recruiting and incentivizing these respondents.

Recruitment

We recruit people to SurveyMonkey Contribute through a variety of means. The primary method of recruitment is SurveyMonkey surveys. Over 45 million unique respondents answer SurveyMonkey surveys sent out by our subscribers each month.

When designing a survey, our subscribers can decide what they want to do when respondents click the “Done” button. By default, we redirect respondents to a SurveyMonkey landing page that thanks them for completing the survey, and features an advertisement for SurveyMonkey products.

In many cases, we advertise SurveyMonkey on this closing page. We ask survey respondents if they would like to take additional surveys to benefit charities and have a chance to enter a sweepstakes. Up to tens of millions of people see this page each month and many of them join our SurveyMonkey Contribute member base.

When new members sign up, they fill out a profile which asks them key demographic, attitudinal and behavioral questions that allow us to send them relevant surveys. In addition, anyone who visits our website [SurveyMonkey Contribute](#) can sign up to receive surveys and in exchange for participation, donate money to charity and have a chance to enter a sweepstakes.

Member Rewards

In exchange for providing their time and opinions, we provide members of SurveyMonkey Contribute with two non-cash rewards. We believe that by offering these incentives, we limit problems such as satisficing and encourage respondents to provide honest, thoughtful opinions.

Additionally, with the SurveyMonkey Contribute non-cash awards, we believe we almost eliminate any incentive for providing false or inaccurate data or creating multiple member accounts. For more information about our member bases, please review the [SurveyMonkey Audience Data Quality Whitepaper](#).

Each survey respondent who finishes a survey receives:

- A donation to the charity of their choice (SurveyMonkey makes this donation on their behalf, and has a variety of charity partners which members can choose from)
- An entry into an instant win sweepstakes

SurveyMonkey Audience demographic composition

When we run a project for you, we ask you how many responses you need, and any specified targeting requirements (e.g. gender, age, income, location, etc.). In many cases, customers have no targeting requirements and just need a sample of the general population to take their survey.

Our Audience is a diverse group of people and is reflective of the general population. However, it is comprised of people who have Internet access and have joined a program to take surveys, this it does skew in some ways from that of the overall population.

Review this FAQ article for more information about [the Audience demographic composition](#).

Contact Us

We're here to help! If you have any questions or if you want to launch a project, please use the [SurveyMonkey Audience contact form](#).

For more information on SurveyMonkey Audience, please visit our [SurveyMonkey Audience website](#) and click the **Get Started Now** button in the top right corner of the page and complete the contact form. An Audience representative will be in touch with you as soon as possible, always within one business day.

APPENDIX C

PARTICIPANT MATERIALS

Re: Permission to Conduct Research Using SurveyMonkey

To whom it may concern:

This letter is being produced in response to a request by a student at your institution who wishes to conduct a survey using SurveyMonkey in order to support their research. The student has indicated that they require a letter from SurveyMonkey granting them permission to do this. Please accept this letter as evidence of such permission. Students are permitted to conduct research via the SurveyMonkey platform provided that they abide by our Terms of Use, a copy of which is available on our website.

SurveyMonkey is a self-serve survey platform on which our users can, by themselves, create, deploy and analyze surveys through an online interface. We have users in many different

industries who use surveys for many different purposes. One of our most common use cases is students and other types of researchers using our online tools to conduct academic research.

If you have any questions about this letter, please contact us through our Help Center at help.surveymonkey.com.

Sincerely,

SurveyMonkey Inc.

www.surveymonkey.com

For questions, visit our Help Center

help.surveymonkey.com

Andrews University

Department of Educational and Counseling Psychology

Informed Consent Form

TITLE OF STUDY

A psychometric investigation of the Short Interpersonal Reactions Inventory: Assessing the validity of the Type 1 (cancer-prone) personality category.

PURPOSE OF THE STUDY

You have the opportunity to participate in a research project being conducted by a faculty member and a graduate student at Andrews University. This study will be assessing the validity of the Type 1 personality category (cancer-prone) of the Short Interpersonal Reactions Inventory (SIRI). This will be accomplished by assessing the ability of the Type 1 category of the SIRI to distinguish between subjects with a current diagnosis of cancer from those who are currently/historically cancer-free. This study is being conducted by Jason Taller, B.A., Ph. D candidate and Rudi Bailey, Ed. D.

INCLUSION CRITERIA

I understand that in order for me to participate in this study I must be between the ages of 40 and 60 and must complete a demographic form and personality inventory in an honest and straightforward way.

PROCEDURE

I understand that I will be asked to complete a demographic questionnaire and the Short Interpersonal Reactions Inventory. The demographic questionnaire will be used to collect personal data but will not include any identifying information. Completion of this form will require approximately 5 minutes. The Short Interpersonal Reactions Inventory is a 70 item questionnaire designed to assess an individual's personality Type and classify the subject into one of 6 different personality categories. The inventory will take approximately 15–20 minutes to complete.

RISKS AND DISCOMFORTS

No risks or discomforts are anticipated from taking part in this study. If you feel uncomfortable at any point during this study, you may discontinue your participation. If you decide to quit at any time before you have finished the surveys, your answers will NOT be recorded. If you feel your rights have been violated in any way, you may contact the Andrews University Institutional Review Board (IRB) at the following address:

Institutional Review Board
Jerome Thayer, Ph.D.
Chair, IRB
4150 Administrative Drive, Room 322
Andrews University
Berrien Springs, MI 49104-0355

Telephone: (269) 471-6214
Facsimile: (269) 471-6543
Email: thayerj@andrews.edu

BENEFITS/RESULTS

I understand that I may not receive any direct benefits from participating in this study. I understand that the results may help researchers to more effectively identify individuals who possess a cancer-prone personality type. Consequently, this may allow clinicians to potentially treat those individuals whose personality places them at higher risk for the development of cancer. I understand that the information collected during this study will be included in a Doctoral Dissertation, and may be presented or published in professional meetings or journals.

VOLUNTARY PARTICIPATION

Your participation in this study is completely voluntary and you are free to withdraw your participation from this study at any time. If, at any point, you do not want to continue, you can simply leave the website and/or close your browser. If you do not click on the “submit” button at the end of survey your answers and participation will not be recorded. You also may choose to skip any questions that you do not wish to answer.

Your refusal to participate will involve no penalty or loss of benefits to which you are otherwise entitled.

CONFIDENTIALITY

I understand that all information and test results will be kept completely confidential. The researchers will NOT know your IP address when you respond to the survey. Records will be identified by numbers and be kept secure by the investigators. Only the investigators will have access to my individual data. At no time will I be identified individually in any type of publication or presentation.

REQUEST FOR MORE INFORMATION

If any questions should arise during this study I understand that I can contact either Jason Taller (jtaller@hotmail.com or (613) 697-5655) or research supervisor Dr. Rudolph Bailey (Department Chair, Graduate Psychology and Counseling, Andrews University, Bell Hall 157A, 8975 Old-US 31, Berrien Springs, MI 49104) at rbailey@andrews.edu or (269) 471-3346.

PARTICIPANT'S STATEMENT OF INFORMED CONSENT

If you agree with the following statement and wish to participate in the study, please click next to "I agree" below. If you do not agree with the statement below and/or do not wish

to participate in this study, simply click next to “I do not agree” below and you will be re-directed to an alternate page.

“I am at least 18 years of age, have read and understand the explanation provided to me and voluntarily agree to participate in this study.”

- ☐ I agree.
- ☐ I disagree

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