

WORRY AND HEALTH DECISION-MAKING:  
THE MODERATING ROLE OF SOCIAL SUPPORT

by

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The present set of studies examined whether social support strengthens the relationship between worry and health decision-making about prevention of skin and colorectal cancer in high risk individuals. Two cross-sectional (Studies 1a and 1b) and two longitudinal (Studies 2 and 3) designs were used to test the hypothesis that higher levels of social support would strengthen the positive relationship between worry and adaptive health decision-making. Although support for this hypothesis was not found, main effects of social support and worry were found in some of the studies. Structural and functional social support predicted intentions to use sunscreen in Study 1a, a nationally representative study. However, worry predicted reported use of sunscreen and intentions to use sunscreen at baseline and 30-day follow-up in Study 3, a longitudinal study. In regard to health decision-making about colorectal cancer prevention, Study 1b, a nationally representative study, revealed elevated levels of structural support in those who had been screened for colorectal cancer. Study 2 revealed a trend towards significance for the moderating role of social support in the relationship between worry and intentions to be screened for colorectal cancer at follow-up; however, it was not in the predicted direction. Theoretical and clinical implications of the findings are identified as well as directions for future research.

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## 1.0 INTRODUCTION

As medicine shifts from a paternalistic to a patient-centered focus (Frosch & Kaplan, 1999), patients are given greater responsibility for making health decisions than ever before. The patient's values and preferences are a more prominent focus of communications with healthcare professionals (Kassirer, 1994), which is reflected in applied research on the development of shared decision-making aids in healthcare (e.g., O'Connor et al., 1999). Other research has focused on understanding the factors that influence individuals' decisions about healthcare. The predominant focus of this work has been on understanding reasoning processes in the hopes of improving patients' ability to make rational choices, which some researchers have argued is synonymous with effective decision-making (e.g., Pauker & Kassirer, 1987). However, some research indicates that engaging in rigorous reasoning processes does not always lead to effective decisions and may under some circumstances lead to poorer decision-making (Ubel & Loewenstein, 1997), including decisions that are not health promoting.

It may be the case that the infusion of emotions into the predominantly reasoned-processing approach to health decision-making may provide critical insight into the understanding of how effective health decisions are made. The role of emotions and other psychosocial factors in health decision-making processes have received little attention even though emotions have been a focus of researchers in other fields of decision-making (Damasio,

1994), and given that individuals can experience psychological distress about health decisions (Hay, Buckley, & Ostroff, 2005).

## **1.1 WORRY**

Worry can be considered one type of emotional experience that can influence decision-making. Indeed, those at high risk for cancer as well as the general population can experience worry and anxiety related to health decision-making (O'Connor et al., 2003). Although the study of the relationship between worry and health decision-making is relatively new, it has been influenced by earlier clinical research. This research has generally taken a maladaptive view of worry, focusing on the association between worry and psychopathology (Davey, 1994). Worry is conceptualized as the uncontrollable and unwanted experience of negative emotions, such as anxiety (Borkovec, Ray, & Stober, 1998; Sutton, 1998), as well as repetitious thoughts focused on future threats (Borkovec, Robinson, Pruzinsky, & Dupree, 1983). Worry is also often associated with problem-solving difficulties (Dugas, Letarte, Rheaume, Freeston, & Ladouceur, 1995; Szabo & Lovibond, 2002; Tallis & Eysenck, 1994).

In contrast to the clinical literature, health decision-making research indicates that worry may not always be maladaptive. Worry may alert an individual to the presence of a problem or serve as a reminder to solve a problem (McCaul & Mullens, 2003). It may prompt individuals to appraise resources and initiate coping processes in an effort to reduce the threat (Myers, 2003; Peters, Lipkus, & Diefenbach, 2006) and manage negative affect (Aspinwall & Taylor, 1997; Davey, 1994; Mathews, 1990). Health decision-making research has also distinguished worry as

a related but separate construct from other health cognitions (e.g., risk perception) that influence health decision-making (Lipkus et al., 2000).

In the health decision-making literature, worry is typically conceptualized as future-oriented thoughts about a perceived threat or vulnerability to a disease, accompanied by negative affect (McCaul & Mullens, 2003). It can range from low intensity thoughts and emotions (i.e., occasional thought, mild negative affect) to high intensity thoughts and emotions (i.e., uncontrollable thoughts, extreme negative affect). Although anxiety and fear have been assessed most frequently (Lerman et al., 1991; McCaul, Branstetter, Schroeder, & Glasgow, 1996), given their relationship to worry in the clinical literature (Borkovec et al., 1983), measures of trait worry and disease-specific worry have also been included in the health decision-making literature.

The Penn State Worry Questionnaire (PSWQ; Meyer, Miller, Metzger, & Borkovec, 1990) is an assessment of trait worry targeted at pathological or clinically significant levels of worry, including items such as, “Once I start worrying, I cannot stop” and “I worry all the time.” The Worry Domains Questionnaire (WDQ; Tallis, Davey, & Bond, 1994 Tallis, Eysenck, & Mathews, 1992) is a domain-specific measure focused primarily on assessing the content of non-pathological worry. Participants are asked to report how much they worry on a 5-point scale, which ranges from no worry at all to extreme worrying. Worry questions are divided into five domains: interpersonal relationships, lack of confidence, aimless future, work incompetence, and financial. An item such as, “I worry that I will lose close friends” is in the interpersonal domain, whereas the item, “I worry that I will run out of money” falls within the financial domain.

In contrast to the global measures of worry used in the clinical literature, assessments of worry in the health decision-making literature are more disease-specific. Worry related to health

decision-making is typically measured via content-valid items intended to measure the intensity or frequency of the worry about a given disease. Participants may be asked a frequency question such as, “How often do you worry about getting colon cancer?” (NCI, HINTS, 2005; McCaul, Schroeder, & Reid, 1996). The Breast Cancer Worry Scale (Lerman et al., 1991) is the only measure that is used fairly consistently to measure worry about a specific disease state. This brief measure assesses frequency of worry as well as its impact on daily functioning. The Revised Impact of Events Scale (RIES; Horowitz, Wilner, & Alvarez; 1979) is a widely used measure in the study of psychological stress that is not typically used in the assessment of worry in health decision-making or clinical research. However, some health decision-making researchers use this assessment to assess intrusive and avoidant thoughts in relation to health as a proxy for worry.

Perhaps because of the wide variation in the measurement of worry, research findings about the relationship between worry and health decision-making do not create a clear picture of the direction of the relationship between these variables. Researchers have reported adaptive, maladaptive, and null associations between worry and health decision-making. Even a small minority of studies has provided support for the possibility of a curvilinear relationship in which low and high worry is unrelated to health decision-making but moderate levels of worry predict cancer screening (e.g., Sutton, Bickler, Sancho-Aldridge, & Saidi, 1994). However, researchers have struggled with how to operationalize high, moderate, and low worry in these studies. For example, excessive worry has not necessarily been defined by a cut-off score but by not being positively related to adaptive health decision-making.

Instead, a greater proportion of research suggests that worry has a positive linear association with more effective health decision-making (Hay, Buckley, & Ostroff, 2005). Health decisions about breast cancer prevention have received copious attention in the literature

examining the relationship between worry and health decision-making. However, much of this work has been cross-sectional and a recent meta-analysis revealed only 12 prospective studies examining breast cancer worry and intentions to engage in screening for breast cancer (Hay, McCaul, & Magnan, 2006). The review of these studies indicates that breast cancer worry is generally adaptive and motivates women to screen for breast cancer, confirming findings from cross-sectional research in which high levels of worry were related to intentions to get a mammography and conduct breast self-exams (Lerman et al., 1991; McCaul, Reid, Rathge, & Martinson, 1996). Similar findings have also been found in women who have an elevated risk of breast cancer. High levels of worry in these women have been linked with more frequent breast self-exams (Brain, Norman, Gray, & Mansel, 1999) and a greater likelihood to engage in genetic testing for breast cancer (Cameron & Diefenbach, 2001). Researchers have also demonstrated a link between elevated levels of worry and colorectal cancer screening (Glanz, Grove, Lerman, Gotay, & Le Marchand, 1999; Wardle et al., 2000), and skin cancer prevention behaviors have been linked with increased levels of worry (De Rooij, Rampen, Schouten, & Neumann, 1997; Mermelstein, Weeks, Turner, & Cobb, 1999).

Whereas decisions to engage in a greater number of cancer prevention behaviors have been related to higher levels of worry, this relationship has not always been found. Some individuals may worry about receiving a feared diagnosis and thus avoid screening (Cameron, 1997; Considine et al., 2004). Cross-sectional and prospective studies have found some support for this notion. Elevated levels of worry have been related to fewer intentions to engage in cancer screening behaviors. A decreased likelihood to get screened for breast cancer has been linked to increased breast cancer worry or anxiety in high risk populations (Kash, Holland, Halper, &



Miller, 1992). High cancer worry has also been related to low intentions to obtain a colorectal cancer screening test (Watts, Vernon, Myers, & Tilley, 2003).

Some studies, however, indicate that no relationship exists between worry and health decision-making. A cross-sectional, community study in African-American and Native-American women found no relationship between worry about cervical cancer and intention to obtain a Papanicolaou (Pap) smear (Wilcox, Ainsworth, LaMonte, & DuBose, 2002). Orbell (1996) also found that worry about cervical cancer was not related to intentions to get a Pap smear in a community sample of adult women. However, worry was measured by one item that was originally intended to be part of a two-item measure of perceived threat. Worry about prostate cancer has been shown to be unrelated to intentions to get screened in African-American men (Myers et al., 1996).

Although these discrepant findings may be related to inconsistent measurement strategies across studies, it is not clear that this difference is the primary reason for incongruities. Important moderating factors that have yet to be explored in this literature may account for some of these inconsistencies, including cognitive, emotional, and interpersonal factors. Some of these include coping skills, information processing (e.g., Lazarus & Folkman, 1984), and social support (e.g., Cohen, Gottlieb, & Underwood, 2000).

Social support is particularly intriguing, as health decision-making research has primarily focused on *intrapersonal* processes and paid little attention to *interpersonal* processes. The role of social support as a potential moderating influence on the relationship between worry health decisions has yet to be explored. Epidemiological evidence indicates that individuals rely on social support when making health decisions, including ones about which they are worried (O'Connor et al., 2003). Some community study findings indicate that social support is related to

intentions to be screened for cancer. In African-American men, receptivity to advice from health care professionals was related to greater intentions to be screened for prostate cancer (Myers et al., 1996). In another study, family support predicted increased intentions to be screened for colorectal cancer (Watts et al., 2003). Even though worry was also assessed in these studies, any findings regarding the relationship between worry and social support or their collective influence on intentions were not reported.

It is possible that worry leads one to seek social support. The individuals who worry and have social support upon whom they feel they can rely may be able to make more effective health decisions than individuals who worry and do not have adequate social support. Thus, elevated worry may not necessarily facilitate effective decision making unless it is accompanied by social support.

## **1.2 SOCIAL SUPPORT**

Social support has been conceptualized in several distinct ways in the literature, with researchers finding it can have both positive and negative effects on an individual's well-being (Cohen, Gottlieb, & Underwood, 2000; Schwarzer & Leppin, 1991). Although the majority of research has focused on positive effects, some research identifies social processes that have a negative effect on health, such as social conflict (House, Landis, & Umberson, 1988; Thoits, 1995). For example, there is evidence that early family environments that are conflictual and aggressive are related to an increased risk for disease in adulthood (Repetti, Taylor, & Seeman, 2002).

Whereas it is not the intent to minimize the influence of negative social processes on health decision-making, the focus in this paper is on the positive, health-promoting effects of

social support. Such effects have been found consistently in the literature even after controlling for the relationship between negative effects of social relationship and health (Cohen, Gottlieb, & Underwood, 2000). Social support is defined here to be any relationship that provides (or is perceived to provide) a general sense of well-being or a buffer for negative affect (Thoits, 1995). It can include relationships with varying levels of intimacy, from ties to others in the community to marital relationships and friendships.

Individuals may rely on these social supports during times of worry and threat, depending on others to cope with the negative affect (Cohen, Gottlieb, & Underwood, 2000; Myers, 2003). In turn, social supports can affect physical and psychological well-being in positive and negative ways (Billings & Moos, 1982; Cohen & Wills, 1985; DuPertuis, Aldwin, & Bosse, 2001; House, Landis, & Umberson, 1988). Structural and functional types of social support have been associated with physical health and mortality (Cohen, 2004). Structural support refers to individual ties within the community, including the number of social roles one occupies, and is believed to have a direct influence on physical health (Thoits, 1995).

Of note, the measure of structural support in the following studies is restricted to assessments of social ties within the participant's community. Although marital status has been used previously as a measure of structural support, it will not be included in this set of studies. The relationship of marital status to physical health not only varies based on gender but each partner's relative satisfaction with the relationship can affect the influence of social support on health (Kiecolt-Glaser & Newton, 2001). Because partner satisfaction was not measured in two of the key studies included in this collection of studies, thus preventing an accurate assessment of the influence of marital status on health decision-making, marital status was not included as a measure of social support. If social support is found to strengthen the relationship between worry

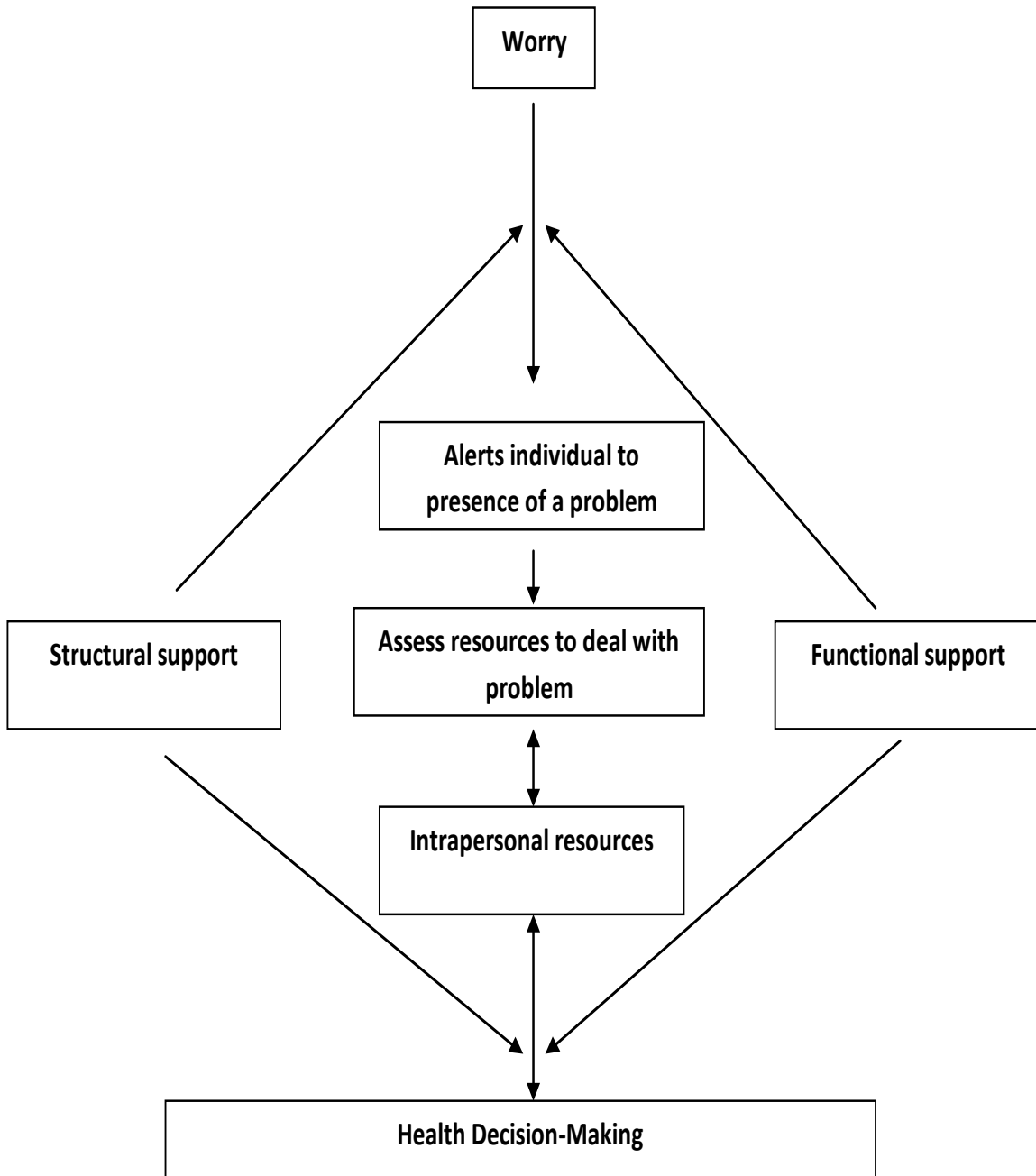
and health decision-making in this set of studies, then future studies can expand measurement of structural support to include measures of relationship satisfaction as well as role conflict (Cohen & Syme, 1985).

In contrast, functional support tends to affect physical health by altering the level of stress or threat an individual is experiencing. Three commonly accepted types of functional social support (emotional, informational, and instrumental) are related to the management of negative affect (Cohen, 2004; Dunkel-Schetter, 1984; House, 1981). Emotional support refers to attempts to regulate negative affect. Supportive individuals in this role may function as empathic listeners, allowing individuals to express their feelings. Informational support involves problem-solving or offering advice to assist with the current difficulties. Instrumental support refers to tangible assistance, including money or transportation, provided to address the problem. Some studies of physiological indicators of stress provide further support for the buffering effects of social support. Laboratory studies reveal that individuals who are in the presence of a supportive person while experiencing stress have lowered cardiovascular reactivity, relative to individuals who are alone or are with non-supportive people (e.g., Gerin, Milner, Chawla, & Pickering, 1995; Gerin, Pieper, Levy, & Pickering, 1992; Kamarck, Manuck, & Jennings, 1990; Uchino & Garvey, 1997).

The effects of social support on health can occur regardless of whether the person actually received social support. In fact, perceived support is usually more strongly correlated with health than received support (e.g., Cohen & Wills, 1985). Nevertheless, the receipt and perception of support during times of threat have been shown to positively affect physical health (e.g., Rosengren, Orth-Gomer, Wedel, & Wilhelmsen, 1993).

In sum, the experience of worry about a disease can alert individuals to the presence of a problem to be solved, which can lead them to assess their resources for dealing with the problem, including intra- and interpersonal resources. In turn, an individual's perception and receipt of support can have an influence on the ability to make decisions related to this disease. Figure 1 provides a model of the hypothesized relationships among variables; the focus of this set of studies is not on the relationship between intrapersonal processes and health decision-making, yet it is nevertheless included in the model for clarity. Individuals who worry about health decisions may benefit from either structural or functional social support. However, they might experience more benefit from functional types of support given that it is intended to address negative feelings. Several potential pathways exist to explain the relationship between social support and health decision-making.

Figure 1. Model of the role of social support in the relationship between worry and health decision-making



### **1.3 POTENTIAL PATHWAYS LINKING SOCIAL SUPPORT AND HEALTH DECISION-MAKING**

#### **1.3.1 Types of social support and health decision-making.**

As mentioned previously, worry alerts individuals to the presence of a problem, which signals them to assess their resources. One of those resources is structural support, which can provide individuals with a sense of belonging that can lead them to feel greater self-worth, which may motivate them to take care of themselves (Cohen & Syme, 1985). This motivation can lead them to make more effective health decisions. For example, feeling a strong connection with the surrounding community can lead them to have greater intentions to behave in a healthy manner, such as the intention to get screened for diseases or wear sunscreen to prevent skin cancer. Having a large amount of structural support may also mean they have greater access to sources of information, which increases the likelihood that they will be able to access accurate and relevant information sources when needed (Cohen, Gottlieb, Underwood, 2000). Moreover, the greater their structural support the more likely it is that they will be able to rely on someone for tangible assistance (e.g., money or transportation). This perception can lead to greater intentions to engage in health behaviors (i.e., effective health decision-making). Additionally, social pressures to exercise or eat right can influence health decisions and engagement in health promotion activities (House, Landis, & Umberson, 1988). In short, structural support may not necessarily decrease the worry but is still effective in helping individuals make more effective health decisions.

Conversely, the lack of social support may lead them to make less adaptive health decisions when worried. Researchers have found negative effects of social isolation on physical health. For example, social isolation has been related to higher mortality rates in cardiovascular disease patients (e.g., Berkman et al., 1995; Brummet et al., 2001). It is possible that isolated individuals do not feel a sense of belonging, worry less about taking better care of their health, and thus are less motivated to make beneficial choices about their health. Because of this isolation, they likely have fewer people upon whom they can rely for informational or instrumental support. As such, they can have lowered intentions to engage in health behaviors and make less adaptive decisions.

The positive influence of functional support on health decision-making may come into play when individuals feel it is difficult to manage their worry. Functional support directly targets these elevated levels of distress. If an individual feels worried and appraises that he or she has high levels of social support, then he or she may feel better able to cope with the worry and thus reappraises the event as less worrisome and more capable to deal with decisions related to the disease (Lazarus & Folkman, 1984). At times, the perceived availability of individuals to turn to can reduce the presence of persistent unwanted thoughts (Lepore, Silver, Wortman, & Wayment, 1996). Actually receiving support may also lead to a decrease in worry, which may lead to more effective decision-making. If others offer advice, tangible assistance, or even a distraction from worrisome thoughts, then the person may feel more capable to make decisions related to the disease (Cohen, Gottlieb, & Underwood, 2000).



### **1.3.2 Social support providers and health decision-making**

Not only do different types of support have a differential impact, but the types of supportive individuals may also influence the effects of social support (e.g., family, friends, co-workers). Some research has focused on how the roles of others are related to the effectiveness of different types of functional social support. During times of increased negative emotion, emotional support received from individuals with less intimate roles (e.g., co-workers) is generally less effective than emotional support received from people with more intimate roles (e.g., family, friends; Dunkel-Schetter, 1984; Neuling & Winefield, 1988; Thoits, 1995). In terms of informational support, cancer patients have indicated that talking with individuals going through a similar experience about problem-solving strategies or a topic unrelated to the stressor is beneficial in reducing negative affect (Costanza, Derlega, & Winstead, 1988). In general, individuals find instrumental support the least helpful when coping with a chronic illness. However, cancer patients have indicated that, if they receive this type of support, they prefer it comes from family instead of friends or healthcare professionals (Rose, 1990).

These findings appear to indicate that more effective health decisions will be made when emotional support is provided by people to whom the patients feel closer, whereas informational support is most beneficial from people to whom patients feel less close. However, these studies have been conducted in patients undergoing treatment for a chronic illness and generalizations are limited to community samples making preventive health decisions. Research in preventive health decision-making not only has yet to focus on the effect of social support in general but also on these differences between types of support and role of supporter. The content and intensity of negative cognition and affect experienced over time is likely distinct from that experienced by patients, who are not currently managing a chronic illness, making preventive

health decisions. Nevertheless, these findings are an important starting point for understanding the role of social support processes in preventive health decision-making and indicate that social support may be differentially effective.

### **1.3.3 Social support, adherence, and health decision-making**

Further support for this notion that social support may have disparate effects can be found in the social support and treatment adherence literature, which is also somewhat limited in its generalizability given its predominant focus on chronic illness. A recent meta-analysis of 122 studies from 1948 to 2001, in which social support and patient adherence were examined, illustrates this focus. Seventy-eight percent ( $n = 95$ ) of the studies included were related to chronic illness (e.g., hypertension, diabetes), 5% ( $n = 6$ ) involved decisions about discrete illnesses (e.g., athletic injury), 16% ( $n = 19$ ) were multi-dimensional (e.g., chronic and discrete illnesses, primary care visits), and 1% ( $n = 2$ ) was related to preventive decisions (DiMatteo, 2004). These latter two studies included a study examining mammography (Beaulieu, Beland, Roy, Falardeau, & Hebert, 1996) and a pilot study of sigmoidoscopy screening for colorectal cancer (Kremers, Mesters, Pladdet, van den Borne, & Stockbrugger, 2000). The former study was included in the meta-analysis for its measurement of marital status, which was not a significant predictor of mammography screening (Beaulieu et al., 1996). In Kremers et al.'s (2000) pilot study, non-participants and participants in screening were compared on types of social support, including structural, emotional, informational, and instrumental. Odds ratios revealed that, in comparison to non-participants, screened participants were eight times more likely to have informational support and five times more likely to have instrumental support. Neither emotional support nor membership in a social network predicted screening. This finding,

however, is only partially consistent with the overall findings of the meta-analysis (DiMatteo, 2004). The authors found that functional support, specifically instrumental and emotional, were more strongly related to treatment adherence than structural support or informational support.

A cross-sectional survey was conducted to examine potential mediating pathways between social support and colorectal cancer screening (Honda & Kagawa-Singer, 2006). These researchers surveyed Japanese Americans and found that emotional support from family and friends was related to increased screening adherence but support from healthcare professionals was not related to adherence. Even though the authors examined several mediators, the only mediator of the relationship between emotional support from family and friends and screening adherence was perception of subjective norms. Thus, perceptions of the preferences of people with whom individuals had more intimate relationships were more predictive of adherence than perceived norms of healthcare professionals. However, as the authors point out, they examined this sub-population because they were interested in assessing individuals from a collectivistic culture. Although they did not assess cultural perceptions, it is possible that these findings have limited generalizability to the more predominant, individualistic culture in the United States.

Although there is an abundance of research demonstrating that social support is related to health, there is a dearth of research on social support and preventive health decisions. The limited research makes it difficult to not only predict the specific facets of social support that might influence preventive health decision-making, but determine if social support moderates the relationship between worry and health decision-making. In general, though, it appears that functional support has a more consistent relationship with health, but structural support cannot be ruled out as a possible contributor to effective health decision-making.

In sum, worry is one of the few emotion-related variables studied in relation to health decision-making and can alert an individual to the presence of a problem. However, research findings do not provide a clear understanding of the relationship between worry and health decision-making. Factors that moderate the relationship should be examined. Because researchers have focused primarily on intrapersonal processes and paid minimal attention to interpersonal processes, an examination of social influences on health decision-making is extremely valuable. Moreover, an abundance of research has shown a relationship between social support and health but minimal attention has been paid to social support and preventive health decisions, which is particularly interesting in worried individuals given that worry is characterized, in part, by future-oriented thoughts (e.g., “I’m worried about getting cancer.”). Thus, the following studies focused on examining the moderating role of social support in the relationship between worry and health decision-making. It is believed that worried individuals would feel more capable if they have supportive people upon whom they can rely to manage worry associated with the health decision, which in turn would lead to more health promotion behaviors. It is important to note that although it is likely that social support influences worry, this relationship is not the focus of this investigation. The purpose of this set of studies is to conduct a relatively novel examination of interpersonal factors, specifically social support, in the relationship between worry and health decision-making. It is not believed that the moderating influence of social support on worry is the result of affecting worry and is not necessary for moderation to be present.

## 1.4 HYPOTHESES

The main hypothesis to be explored in the studies proposed herein is that social support strengthens the relationship between health-related worry and health decision-making. In other words, when individuals experience elevated levels of worry and have high levels of social support, they will make more effective health decisions (i.e., health promoting) than worried individuals who have low levels of social support. Although any type of social support is hypothesized to have a moderating effect on worry and health decision-making, differences between functional and structural social supports are predicted. It is hypothesized that functional support will have a more positive effect on health decision-making than structural support when worry is elevated.

Some literature suggests that the level of intimacy in the supportive relationships may influence the effects of social support on health. However, the research to date has focused primarily on individuals living with chronic or terminal illnesses, which can have a significant impact on the amount and complexity of negative affect experienced. The demands of the situation may lead to more specific needs of the patient than when managing worry related to future illnesses. Moreover, because of the likely difference in emotional intensity of the situation, worried individuals may be able to meet their needs with the first available supportive person upon whom they can rely. In turn, there may not be a large amount of variability in types of social support relationships reported as helpful, thus limiting the ability to conduct meaningful analyses. Therefore, the type of intimate relationship will be assessed, including the following categories: family, friend, co-worker, acquaintance, and healthcare professional. Comparisons of different types of supportive individuals will serve as an exploratory portion of the proposed studies.

## 1.5 TEST OF HYPOTHESES

As a first test of the main hypothesis, analyses were conducted on a nationally representative, community sample of adults within the United States who completed the Health Information and National Trends Survey (HINTS, 2005), a survey study conducted by the National Cancer Institute (NCI). In this survey, participants were asked (along with a large number of other measures) about social support as well as their cancer-related worry and intentions to engage in preventive behaviors to reduce their likelihood for two types of cancer (skin cancer and colon cancer). Structural measures of social support were the main types of support assessed. The strengths of this study include a large sample and the ability to test the main hypothesis across different cancer types. However, the cross-sectional design does not allow for a temporal examination of factors. Moreover, even though measures of worry, social support, and health decision-making included in the HINTS (2005) study are informative, more comprehensive measures of these constructs would allow for a more in-depth understanding of the moderating role of social support in the relationship between worry and health decision-making.

Consequently, Study 2 was a prospective study in which both functional and structural social support were examined, with the intention to begin to identify the facets of worry and social support that interact to influence health decision-making. Participants were a community sample of adults who were in the recommended age range for receiving a colorectal cancer screening test but had never been screened. In addition to asking participants the same worry and social support questions as in HINTS (NCI, 2005), participants were asked about emotional, informational, and instrumental forms of functional social support as well as providers of this support. Participants were asked questions about worry and social support at the first time-point and then followed up at a later time-point to determine if intentions to get screened were affected

by the interaction of worry and social support at baseline. Structural and functional types of social support were compared to determine if the latter strengthens the positive relationship between worry and health decision-making more than structural support.

Although these two studies have several strengths, they possess some key limitations. It is likely that worry about a disease waxes and wanes over time and participants may be unable to give an accurate assessment of their worry for various reasons, including memory problems and limitations of the worry measure. Similar difficulties may lead to inaccurate assessment of social support. Another limitation in the previous studies is that neither worry nor social support is experimentally manipulated, thereby obfuscating causal inferences.

Study 3 was intended to address these concerns by randomly assigning participants to groups in which participants level of worry and social support are experimentally manipulated. A controlled laboratory experiment was conducted with undergraduates, targeting skin cancer prevention. Skin cancer was selected for several reasons. Individuals who are college-age often use tanning beds and engage in few protective behaviors, and the majority of exposure to the sun occurs during this period of time (Banks, Silverman, Schwartz, & Tunnessen, 1992). Intervention studies have shown that certain types of interventions can result in greater intentions and health protective behaviors related to skin cancer (e.g., wearing sunscreen; Rothman et al., 1993) and can lead to the seeking of social support post-intervention (Mahler et al., 2005).

In this experiment, participants were assessed at Time 1 and completed a follow-up phone interview. They were randomly assigned to a worry or no-worry condition in which they were given worry-eliciting information or neutral information, using a paradigm that has already been used successfully in our laboratory and was tested in a pilot study previous to the main study. After participating in one of the two worry conditions, participants were randomly

assigned to a condition in which they either received or did not receive social support. A second pilot study was conducted to examine whether the social support manipulation had its anticipated effects.

The inclusion of all three sets of studies represents a unique opportunity to elucidate the moderating influence of social support on the relationship between worry and health decision-making in cancer prevention. Study 1 provides an important baseline for comparison of the results from Studies 2 and 3. The questions asked are similar to the questions asked in the worry and health decision-making literature and include general yet fundamental types of social support. The goals of this investigation are the following: (1) assess whether social support is an important moderating variable in the relationship between worry and health decision-making in cancer prevention, (2) examine the roles of multiple dimensions of worry -- such as perceived vulnerability and anxiety – and social support in health decision-making about cancer prevention, (3) assess the relative benefit of a multi-dimensional measurement approach to worry (e.g., if null findings are present in Study 1, but not in Study 2 or 3, then one conclusion could be that future worry studies need to utilize a multi-dimensional measurement approach).



## 2.0 STUDY 1

Three public access databases for the Health Information National Trends Survey (NCI, HINTS, 2005) can be obtained through the National Cancer Institute's (NCI's) website. HINTS 2005 includes questions related to skin and colon cancers. The intention of the HINTS survey is to increase the understanding of individual and social factors that influence health behavior and health communication related to cancer. This database includes measures of worry, behavior, and social support, providing an initial opportunity to examine the main hypothesis. The worry and behavior measures of interest here were specific to either colon or skin cancers. A nationally representative sample of adults, age 18 years and older, was recruited through random digit dialing. Demographic measures included gender, race, age, education, marital status, and income. For some of the questions of interest in this study (e.g., social support), data were collected from all of the participants ( $n = 5586$ ). However, participants who received cancer-related worry questions were a select subgroup of a larger sample. Study 1 examined the hypotheses using HINTS data on both skin cancer (Study 1a) and colorectal cancer (Study 1b).

## 2.1 STUDY 1A: SKIN CANCER

### 2.1.1 Method

### 2.1.2 Participants

One-third of participants ( $n = 1637$ ) who did not have a history of skin cancer (but could have had a history of another type of cancer) were selected randomly to report how frequently they worried about getting skin cancer. A subset of participants at increased risk for developing skin cancer at some point in their life (i.e., Caucasian, young adult females) was then selected from this sample. “Young adult” was operationalized as 18 to 24 years. Participants matching these criteria represented 2.4% ( $n = 39$ ) of the sample asked about skin cancer. This sample was examined for the following reasons: (1) young adult, Caucasian females are at increased risk of sun damage that eventually leads to skin cancer, compared to the rest of the population and (2) to draw more accurate comparisons to Study 3 in which the sample was also young adult females.

The mean age of the sample was 21 ( $SD = 2.06$ ). Most participants had received some college education (54%,  $n = 21$ ), whereas 15% ( $n = 6$ ) did not complete high school, 18% ( $n = 7$ ) obtained a high school diploma but did not pursue further education, 10% ( $n = 4$ ) obtained a college degree, and 3% ( $n = 1$ ) obtained a post-baccalaureate degree. Fifteen percent ( $n = 6$ ) of participants had an income less than \$25,000, 18% ( $n = 7$ ) had an annual income between \$25,000 and \$35,000 15% ( $n = 6$ ) had an annual income between \$35,000 and \$50,000 15% ( $n = 6$ ) between \$50,000 and \$75,000 and 18% ( $n = 7$ ) greater than \$75,000. Eighteen percent ( $n = 7$ ) indicated that they did not know their annual income. Forty-one percent reported having a significant relationship (31% ( $n = 12$ ) married and 10% ( $n = 4$ ) living with a partner), whereas the remaining participants reported not being in a significant relationship (56% [ $n = 22$ ] never

married and one participant [3%] was divorced). One participant had a history of cervical cancer for which she received treatment approximately 5 years prior to the study.

### **2.1.3 Procedure**

Individuals who agreed to participate in the study were asked several cancer-related questions during a one-time phone interview that lasted approximately 30-45 minutes.

### **2.1.4 Measures**

#### **2.1.5 Worry**

Participants were asked to rate, “How often do you worry about getting skin cancer?” on a 4-point rating scale (1 = rarely or never, 2 = sometimes, 3 = often, 4 = always; NCI, HINTS, 2005;  $M = 1.69$ ,  $SD = .92$ ).

### **2.1.6 Social Support**

All participants were asked questions about structural and functional types of social support. As a structural measure of support, participants were asked, “How many community organizations are you currently a member of?” Fifty-one percent ( $n = 19$ ) indicated that they were not a member of a community organization. Of the remaining 49%, 31% ( $n = 12$ ) were members of 1 community organization, whereas 10% ( $n = 4$ ) were members of 2, 5% ( $n = 2$ ) were members of 3, and one participant (3%) was a member of 5. In terms of functional support, participants were asked, “Do you have friends or family members that you talk to about your health?” Most

participants (80%,  $n = 31$ ) had someone with whom they talked about their health. If a participant answered “yes,” then he/she was asked how frequently he/she spoke with them on a 3-point scale (1 = not very frequently, 2 = somewhat frequently, 3 = very frequently). Participants indicated that, on average, they spoke with them somewhat frequently ( $M = 1.94$ ,  $SD = .77$ ). All participants were asked, “How many people live near you who you can rely on in case you need a ride to visit your health care provider?” Participants’ responses ranged from 0 to 20 individuals. Almost all participants had at least one person upon whom they could rely ( $M = 10$ ,  $SD = 20.45$ ), as 5% of participants ( $n=2$ ) indicated that they had no one who could give them a ride. Each of these items was looked at separately in analyses.

### **2.1.7 Health decision-making**

Health decisions are operationalized as behaviors or intentions related to the prevention of skin cancer. All participants, including those with a history of cancer, were asked the following questions about skin cancer prevention: “When you go outside for more than 1 hour on a warm, sunny day, how often do you wear sunscreen?” and “When you go outside for more than 1 hour on a warm, sunny day, how often do you wear a hat that shades your face, ears and neck?”. These questions were answered on a 5-point rating scale (1 = never, 2 = rarely, 3 = sometimes, 4 = often, 5 = always). Although participants were asked about three other skin cancer prevention behaviors (i.e., wearing a long-sleeve shirt, wearing long pants, and staying in the shade) as part of the study, only two behaviors were included in the final analyses. The other behaviors were excluded for three primary reasons: (1) Cronbach’s alpha was below .60 for the average of 5 items, indicating that the items did not measure a unified construct, (2) reduced power as a result

of the small sample size, and (3) to focus on behaviors that have traditionally been examined in the skin cancer prevention literature.

### **2.1.8 Results**

### **2.1.9 Preliminary analyses**

Prior to beginning hypothesis-testing analyses, all assumptions were tested. The social support variable examining the number of community organizations to which the participant belonged was not normally distributed. This variable was converted to a dichotomous variable in which participants were categorized as ‘yes’ if they belonged to a community organization or ‘no’ if they did not belong to a community organization. Individuals who indicated belonging to 1 or more community organizations were categorized in the ‘yes’ category, whereas those participants who indicated belonging to no community organizations were categorized in the ‘no’ category. For all regression analyses, this variable was dummy-coded. The assumptions for the remaining variables were tested and met.

The relationship between participant’s relationship status and income to dependent and independent variables was examined through a series of one-way analyses of variance (ANOVAs) and chi-square analyses. Follow-up pairwise comparison tests were adjusted for multiple comparisons with a Bonferroni adjustment. None of these analyses were significant. Pearson-product-moment correlational analyses and one-way ANOVAs were used to assess the relationship between worry and social support. No significant relationships emerged.

### **2.1.10 Primary analyses**

In order to test the primary hypothesis, hierarchical multiple regression was used. The two skin cancer prevention behaviors were the dependent variables. In step 1, worry was entered, in step 2 the single measure of social support was entered, and in step 3, the interaction term for worry and social support was entered. Each of the two dependent variables as well as each of the three social support measures was examined in separate analyses, resulting in 6 regression analyses. Continuous variables were centered and a test of simple slopes was used to follow up any significant interactions. For the two regression analyses examining community organizations, this variable was dummy-coded (Aiken & West, 1991).

Regression analyses examining the use of sunscreen revealed that, contrary to hypotheses, no interaction effect was present. However, a main effect of structural support and functional support was present. Participants who belonged to at least one community organization were more likely to have greater intentions to use sunscreen than participants who did not belong to a community organization (Table 1). A main effect was found in the analysis examining the number of people who live near the participant upon whom she could rely for a ride to her provider, such that having a greater number of people was a significant predictor of increased sunscreen use (Table 2). Observed power for these analyses was .54, which indicates that power was insufficient to test the primary hypothesis (Cohen, 1988). No interaction or main effects emerged for the analysis examining whether frequency of talking to a friend or family member predicted sunscreen use.

Table 1: Summary of hierarchical regression analysis for worry and structural support predicting sunscreen use

Variable	Model 1			Model 2			Model 3		
	<i>B</i>	<i>SE</i>	$\beta$	<i>B</i>	<i>SE</i>	$\beta$	<i>B</i>	<i>SE</i>	$\beta$
Worry	.25	.22	.18	.20	.21	.14	-.11	.33	-.08
Community orgs				.93	.38	.38*	.94	.38	.38*
Worry X Community orgs							.51	.42	.29
$R^2$		.01			.13			.14	

*Note.* Community orgs is the number of community organizations to which the participant belonged.  $R^2$  refers to Adjusted  $R^2$ . Analyses for dummy code of no community organization = 0 and 1 or more community organizations = 1.  $n = 39$ .  
\*  $p < .05$ .

Table 2: Summary of hierarchical regression analysis for worry and functional support predicting sunscreen use

Variable	Model 1			Model 2			Model 3		
	<i>B</i>	<i>SE</i>	$\beta$	<i>B</i>	<i>SE</i>	$\beta$	<i>B</i>	<i>SE</i>	$\beta$
Worry	.25	.22	.18	.26	.20	.19	.28	.21	.20
Ride to provider				.13	.05	.41**	.13	.05	.44*
Worry X Ride to provider							.03	.08	.07
$R^2$		.01			.16			.14	

*Note.* Ride to provider is the number of people upon whom the participant can rely for a ride to her provider.  $R^2$  refers to Adjusted  $R^2$ .  $n = 39$ .  
\*\*  $p < .01$ . \*  $p < .05$ .

No significant interaction was revealed in the regression analyses examining whether the interaction of worry and social support predicted the frequency of wearing a hat that shades the face, ears, and neck for any of the three variables measuring social support.

Although findings were contrary to hypotheses, two noteworthy main effects of structural and functional support emerged. Because these findings were part of a nationally representative database, they have greater generalizability to the population as a whole. Study 3 is a longitudinal experiment examining the potential causal influence of worry and social support on decisions about skin cancer prevention in a high risk sample of young females, age 18 to 24 years. This study is included to address some of the key limitations present in Study 1a.

The next study, Study 1b, used the same cross-sectional, nationally representative sample to examine whether social support strengthened the relationship between worry and colorectal cancer screening. Participants who were 51 to 75 years old (the recommended age range for colorectal cancer screening) were included in the final analyses.

## **2.2 STUDY 1B: COLORECTAL CANCER**

### **2.2.1 Method**

### **2.2.2 Participants**

Participants who answered questions about colorectal cancer had no history of colorectal cancer but could have had another type of cancer. Approximately one-third of participants ( $n = 1929$ ) who met this criterion were randomly selected to answer the question pertaining to their frequency of colon cancer worry. Of this sample, 1217 participants (63%) provided a response to whether they had ever been screened for colorectal cancer. Although data were collected for participants who were 45 years and older, only data for participants who were 51 years and older were included in the analyses for colon cancer given that the recommended age range for colon



cancer screening is age 51 to 75 years (Rex et al., 2009). Overall, 639 participants (53% of the original sample selected to answer questions about colon cancer worry) were between the ages of 51 and 75 years ( $M = 62.11$ ,  $SD = 7.12$ ) and had valid data on all the primary variables of interest.

The majority of participants were female (66%,  $n = 420$ ). Thirteen percent ( $n = 85$ ) of participants had received less than a high school education, whereas 29% ( $n = 188$ ) graduated from high school. Of the remaining participants, 28% ( $n = 176$ ) received some college education, 15% ( $n = 97$ ) had a college degree, and 15% ( $n = 93$ ) had a post-baccalaureate degree. Thirty percent ( $n = 189$ ) of participants had an income less than \$25,000, 13% ( $n = 80$ ) had an annual income between \$25,000 and \$35,000, 16% ( $n = 102$ ) had an annual income between \$35,000 and \$50,000, 21% ( $n = 131$ ) between \$50,000 and \$75,000, and 21% ( $n = 137$ ) greater than \$75,000. Fifty-eight percent reported having a significant relationship (55% [ $n = 348$ ] married and 3% [ $n = 17$ ] living with a partner), whereas the remaining participants reported being divorced (17%,  $n = 109$ ), widowed (17%,  $n = 106$ ), separated (3%,  $n = 16$ ), or never marrying (7%,  $n = 43$ ). The majority of participants were Caucasian (85%,  $n = 524$ ) and 5% ( $n = 28$ ) were Hispanic, 8% ( $n = 50$ ) were African American, 2% ( $n = 12$ ) were American Indian, 1% ( $n = 4$ ) were Asian American, and .3% ( $n = 2$ ) were Native Hawaiian or other Pacific Islander. One percent ( $n = 5$ ) did not provide a response to this item, whereas 2% ( $n = 14$ ) reported being multiple races.

Twenty-two percent of participants ( $n = 138$ ) reported having a prior history of cancer. Of this group, the majority of participants (40%) had a history of melanoma ( $n = 18$ ) or another type of skin cancer ( $n = 37$ ), 23% ( $n = 32$ ) had breast cancer, 9% ( $n = 13$ ) had prostate cancer, 4% ( $n = 6$ ) had cervical cancer, 4% ( $n = 5$ ) had endometrial cancer, 3% ( $n = 4$ ) had bladder

cancer, 2% ( $n = 3$ ) had renal cancer, 3% ( $n = 4$ ) had lung cancer, 2% ( $n = 3$ ) had stomach cancer, 1% ( $n = 2$ ) had ovarian cancer, 1% ( $n = 2$ ) had pharyngeal cancer, 1% ( $n = 1$ ) had non-Hodgkins lymphoma, and 4% ( $n = 5$ ) reported having another, unspecified type of cancer.

Of these participants, 16 individuals reported that they had had another type of cancer as well. The majority (38%,  $n = 6$ ) had previously had skin cancer (other than melanoma), whereas 25% ( $n = 4$ ) had prostate cancer, 13% ( $n = 2$ ) had endometrial cancer, 13% ( $n = 2$ ) had renal cancer, 6% ( $n = 1$ ) had ovarian cancer, and 6% ( $n = 1$ ) had another, unspecified type of cancer. Finally, of these individuals, one participant indicated having a third type of cancer, which was a skin cancer other than melanoma. No other participants reported having had three types of cancer in their lifetime.

### **2.2.3 Measures**

#### **2.2.4 Worry**

Similar to the item about skin cancer worry in Study 1a, participants were asked to rate, “How often do you worry about getting colorectal cancer?” on a 4-point rating scale (1 = rarely or never, 2 = sometimes, 3 = often, 4 = always; NCI, HINTS, 2003;  $M = 1.26$ ,  $SD = .54$ ).

#### **2.2.5 Social support**

Participants were asked the same questions outlined previously in the skin cancer study. When asked, “How many community organizations are you currently a member of?” participants indicated that, on average, they belonged to at least one community organization ( $M = 1.38$ ,  $SD = 1.44$ ). Thirty-two percent ( $n = 207$ ) indicated that they were not a member of a community

organization. Of the remaining participants, 31% ( $n = 198$ ) were members of 1 community organization, whereas 21% ( $n = 134$ ) were members of 2, 10% ( $n = 65$ ) were members of 3, 3% ( $n = 15$ ) were members of 4, 2% ( $n = 11$ ) were members of 5, 1% were members of 6 ( $n = 6$ ), with two participants belonging to 7 ( $n = 2$ ), and one participant belonging to 15 community organizations. This final participant was an outlier and was excluded from analyses examining community organizations.

All participants were asked, “Do you have friends or family members that you talk to about your health?” Most participants (83%,  $n = 529$ ) had someone with whom they talked about their health. If a participant answered “yes,” then he/she was asked how frequently he/she spoke with them on a 3-point scale (1 = not very frequently, 2 = somewhat frequently, 3 = very frequently). Participants indicated that, on average, they spoke with them somewhat frequently ( $M = 1.81$ ,  $SD = .73$ ). All participants were asked, “How many people live near you who you can rely on in case you need a ride to visit your health care provider?” Participants’ responses ranged from 0 to 90 individuals. On average, participants had at least 4 people ( $SD = 5.21$ ) upon whom they could rely for a ride. Each of these items was looked at separately in analyses.

### **2.2.6 Health decision-making**

Only participants who were 45 years or older and did not have a history of colon cancer were asked about whether they had been screened. They were asked the following questions: “Have you ever done a stool blood test using a home kit?” and “Have you ever had either a colonoscopy or a sigmoidoscopy?” (CDC, NHIS, 2000). If they responded “yes” to either of these questions, they were asked when they most recently performed these screening tests. Fifty-two percent ( $n = 401$ ) of participants reported that they had done a stool blood test, and 62% ( $n = 472$ ) of

participants reported that they had a colonoscopy or sigmoidoscopy. Overall, 76% ( $n = 579$ ) indicated that they had been screened for colorectal cancer, having received one of the three screening tests.

### **2.2.7 Preliminary analyses**

Prior to beginning hypothesis-testing analyses, a test of assumptions was conducted. The measure of people upon whom participant could rely for a ride to a provider was positively skewed. It was log transformed and appeared to be normally distributed. The measure of the number of community organizations to which the participant belonged was positively skewed; however, attempts to transform it were unsuccessful. Thus, this variable was converted to a dichotomous variable in which participants were categorized as ‘yes’ if they belonged to a community organization or ‘no’ if they did not belong to a community organization. Individuals who indicated belonging to 1 or more community organizations were categorized in the ‘yes’ category, whereas those participants who indicated belonging to no community organizations were categorized in the ‘no’ category.

Pearson-product-moment correlational analyses were used to assess the relationships among worry, social support, and whether participant had been screened for colorectal cancer (dummy coded, 0 = no, 1 = yes) with one exception. Chi square analyses were used to assess the relationship between the number of community organizations to which the participant belonged and whether the participant had been screened for colorectal cancer. Pearson-product-moment correlational analyses were used to examine the relationship between community organizations (dummy coded, 0 = no, 1 = yes) and worry and other measures of social support. No significant relationships between worry and any of the types of social support or the dependent variable

emerged. The number of community organizations participants belonged to was positively correlated with the number of people upon whom they could rely for a ride to their provider ( $r = .16, p < .001$ ). Chi square analyses revealed that participants who had been screened for colorectal cancer were more likely to have belonged to a community organization ( $\chi^2 = 15.11, p < .001$ ) and whether the participant had been screened for colorectal cancer ( $r = .15, p < .001$ ). No other significant correlations emerged.

The association of gender, income, education, and relationship status to dependent and independent variables was examined through chi square analyses and one-way analyses of variance (ANOVAs). Follow-up tests were adjusted for multiple comparisons with a Bonferroni adjustment.

Male participants ( $M = 4.82, SD = 7.07$ ) had more people upon whom they could rely for a ride to their provider than female participants ( $M = 3.57, SD = 3.51; F[1, 638] = 8.71, p < .01$ ). Participants who had a larger income talked more frequently with friends and family ( $F[4, 638] = 6.98, p < .001$ ) and were more likely to belong to a community organization ( $\chi^2 = 20.80, p < .001$ ) than those with a lower income.

Table 3: Descriptive statistics for income and talking with friends and family

Income	Talking with friends and family
Less than \$25,000	3.58 (7.36)
\$25,000 to \$35,000	3.75 (3.21)
\$35,000 to \$50,000	3.72 (3.83)
\$50,000 to \$75,000	4.34 (3.83)
Greater than \$75,000	4.61 (4.05)

*Note.* Untransformed  $M$  ( $SD$ ).  $n = 529$  for analyses examining talking with friends and family.

Whether participants had been screened for colorectal cancer was related to level of education ( $\chi^2 = 10.14, p < .05$ ). Participants with more education were more likely to have been screened. Education was related to the number of people upon whom the participant could rely for a ride to the provider ( $F[4, 638] = 3.32, p < .05$ ). Participants with more education tended to belong to more community organizations than those with less education ( $\chi^2 = 37.07, p < .001$ ). For the most part, participants who had a greater education had more people upon whom they could rely for a ride to their provider (see Table 4 for descriptive data).

Table 4: Descriptive statistics for education and ride to provider

Education	Ride to provider
Less than high school	5.01 (10.10)
High school graduate	3.49 (3.58)
Some college	3.85 (4.40)
Bachelor's degree	3.97 (3.26)
Post-baccalaureate degree	4.41 (2.84)

*Note.* Untransformed  $M$  ( $SD$ ).  $n = 639$ .

Married participants ( $M = 4.28, SD = 3.79$ ) had more people upon whom they could rely for a ride to their provider than never married participants ( $M = 2.74, SD = 2.55; F[5, 638] = 4.70, p < .001$ ). Chi-square analyses revealed that a greater proportion of participants who were married were more likely to have been screened for colorectal cancer than participants who had been divorced, never married, separated, widowed or lived with a partner were more likely to have been screened for colorectal cancer than not screened ( $\chi^2 = 15.58, p < .05$ ). Moreover, participants who were married were more likely to belong to a community organization than participants who were not married ( $\chi^2 = 27.01, p < .001$ )

### **2.2.8 Primary analyses**

In order to test the primary hypothesis, logistic regression was used with covariates (education and dummy code of marital status into significant other and no significant other) entered in step 1, worry in step 2, social support in step 3, and the interaction of worry and social support in step 4. Participant's relationship status was dummy coded and entered as covariates in step 1, as they were related to both independent and dependent variables. The dependent variable was whether participants had ever obtained a colorectal cancer screening test.

Contrary to the primary hypotheses, no significant interactions of worry and social support emerged. A significant main effect of social support emerged, as the number of community organizations to which the participant belonged was related to whether the participant had been screened for colorectal cancer. Participants who belonged to a community organization were approximately 2 times more likely to have been screened for colorectal cancer than participants who did not belong to at least one community organization (Table 5). Another significant main effect was approaching significance for frequency participants talked with friends or family about their health (Table 5). The observed power for these analyses is greater than .95 (Cohen, 1988).

Table 5: Summary of logistic regression predicting colorectal cancer screening

Independent Variables	<i>B</i>	<i>SE</i>	Wald	OR
Marital Status	.22	.19	1.40	1.25
Education	.17	.08	4.58	1.19
Worry	-.17	.26	.41	.85
Community Orgs	.59	.20	8.96 <sup>**†</sup>	1.81
Worry X Community Orgs	.27	.36	.59	1.31
Marital Status	.20	.21	.90	1.22
Education	.23	.09	7.16 <sup>**</sup>	1.26
Worry	-.08	.19	.18	.67
Freq of Talking	.29	.15	3.73 <sup>††</sup>	1.34
Worry X Freq of Talking	-.14	.22	.38	.87

*Note.* Community orgs = the number of community organizations to which the participant belonged, Freq of Talking = the frequency with which participants talk with friends or family.  $n = 638$ . <sup>†</sup>This main effect was present when the interaction effect was not included in the model ( $p < .01$ ).

<sup>\*\*</sup> $p < .01$ . <sup>††</sup> = .05.

### 2.2.9 Summary

Studies 1a and 1b both indicate the importance of social support in cancer prevention behaviors; however, they do not provide support for the primary hypothesis that social support moderates the relationship between worry and health decision-making. Although each study has certain strengths, the cross-sectional design has some key limitations that necessitate further exploration of the primary hypotheses in additional studies.

In Study 1b, one major drawback is that participants were screened for colorectal cancer at varying times, which may mean that some participants were no longer worrying about being screened, as they had already been screened recently. In Study 1a, the influence of worry and social support over time could not be examined. Conclusions about causal relationships cannot be made and the long-term influence of worry and social support on health decision-making is



unclear. The HINTS (2005) survey was not intended to provide an in-depth examination of the relationship between worry and social support and measures of these key constructs was limited to the brief assessments chosen by NCI researchers. These measures do not provide a comprehensive assessment of worry and social support, which may explain some of the null findings.

The following two studies are meant to address these concerns. Study 2 is a longitudinal examination of the influence of worry and social support on intentions to get screened for colorectal cancer across time. In Study 3, worry and social support are experimentally manipulated to determine their influence on skin cancer prevention over time. Both of these studies include additional measures of cancer-related worry and social support as well as health decision-making about cancer prevention.

## 3.0 STUDY 2

This prospective study examined adults who had not been screened for colorectal cancer and expanded on the cross-sectional findings in Study 1b. The intention of the study was to show that social support moderates the temporal relationship between worry and subsequent screening for colorectal cancer.

### 3.1.1 Method

### 3.1.2 Participants

Participants were 25 men and women between the ages of 51 and 75 years in the mid-Atlantic region of the country, who had not had a fecal occult blood test (FOBT), colonoscopy, or sigmoidoscopy, and who had not had cancer. The number of participants at T2 follow-up was 17. Of note, the number of participants in the original study was 36, but 19 participants were enrolled prior to the variables of interest in this study were added for times 1 and 2 or were lost to follow-up.

The majority of participants were Caucasian (88%) and the remaining participants were African American ( $n = 2$ ). Mean age of participants was 55.94 ( $SD = 4.84$ ). Gender of participants was roughly evenly split (53% male). Most participants had graduated from college (41%,  $n = 7$ ), whereas 24% ( $n = 4$ ) had obtained some college education and 6% ( $n = 1$ ) had a

doctoral degree. Eighteen percent of the sample ( $n = 3$ ) graduated from high school or got their GED, and 12% ( $n = 2$ ) attended a trade/technical/vocational school.

Twenty-nine percent ( $n = 5$ ) of the participants were married, 29% ( $n = 5$ ) were single and had never married, 6% ( $n = 1$ ) were widowed, and 35% ( $n = 6$ ) were divorced. Twelve percent ( $n = 2$ ) of participants had a household income of less than \$10,000 per year, 12% ( $n = 2$ ) \$10,000 to \$20,000, 24% ( $n = 4$ ) \$20,000 to \$35,000, 12% ( $n = 2$ ) \$35,000 to \$50,000, 29% ( $n = 5$ ) \$50,000 to \$75,000, and 12% ( $n = 2$ ) \$75,000 or more per year.

### **3.1.3 Procedure**

Data included in this study were part of a larger study wherein participants were randomly assigned into one of four groups as part of the original study (with unrelated hypotheses). Participants were asked to reflect positively on their values (i.e., self-affirmation) or complete an equivalent but neutral task. Additionally, participants were randomly assigned to a condition in which they received either absolute risk feedback or comparative risk feedback. Six participants were in the self-affirmation + comparative and absolute risk feedback condition, 3 participants were in the neutral + comparative and absolute risk feedback, 1 participant was in the self-affirmation + absolute risk feedback condition, and 7 participants were in the neutral + absolute risk feedback condition.

Because the assignment into groups was not the focus of this study, participants within all four groups were combined to make up the final sample. Although it was believed that merging data for the groups would not affect the outcome of results, groups were compared on the independent and dependent variables within the study to determine if differences across groups existed. Because one of the groups had inadequate sample size ( $n = 1$ ), two sets of analyses were

conducted in which participants within the affirmation and risk feedback groups were compared to one another on key independent variables. No significant differences emerged.

Participants were recruited through random digit-dialing and advertisements. Interested individuals were asked to complete a brief phone interview to determine their eligibility. They were asked to report their age and if they had ever had cancer or an FOBT, colonoscopy, or sigmoidoscopy. If the participant was within the recommended age range for receipt of a colorectal cancer screening test and had not been screened using one of the three accepted methods, then he or she was eligible for the study. After determining the participant's eligibility, the data were destroyed to maintain anonymity. Eligible participants were sent an informed consent form with a self-addressed stamped envelope for return of the signed consent form. Upon receiving the signed consent form, the researchers scheduled the first assessment with the participant.

The first assessment was a phone interview, which lasted approximately 45 minutes to one hour. Participants were asked a series of questions, including several that were not pertinent to the hypotheses in this study. Information obtained from this phone interview included demographic information, colorectal cancer screening history, worry and anxiety about colorectal cancer, and functional and structural social support measures (described below).

The second assessment took approximately 1 hour and occurred in the laboratory. Upon entering the lab, participants completed the experimental manipulations and then the main dependent measures on a computer using a program called MediaLab. Participants were then debriefed, reimbursed for travel expenses, and compensated \$30 for their participation in the study.

### **3.1.4 Measures**

### **3.1.5 Worry**

Questions assessing worry were asked at times 1 and 2. Participants were asked, “In general, how *worried* are you about getting colorectal cancer in your lifetime?”, “How *fearful* are you about getting colorectal cancer in your lifetime?”, and “How *anxious* are you about getting colorectal cancer in your lifetime?” (Lipkus, Klein, Skinner, & Rimer, 2005). These three questions were rated on a 5-point scale (1 = not at all *worried/fearful/anxious*, 2 = slightly *worried/fearful/anxious*, 3 = somewhat *worried/fearful/anxious*, 4 = very *worried/fearful/anxious*, 5 = extremely *worried/fearful/anxious*) and Cronbach’s alpha was .81 for the three items. Thus, an average of the three scores was used as the measure of colorectal cancer worry.

### **3.1.6 Social support**

The social support questions asked at Time 1 were focused on participants’ perception of social support. The same questions asked in HINTS (NCI, 2005) were asked in this study. At Time 1, participants were members of an average of 2.88 ( $SD = 1.93$ ) community organizations. Of these participants, 18% ( $n = 3$ ) indicated that they were not a member of a community organization. Of the remaining participants, 35% ( $n = 6$ ) were a member of one, 24% ( $n = 4$ ) were a member of two, 12% ( $n = 2$ ) were a member of three, one participant (6%) was a member of four, and one participant (6%) was a member of eight community organizations. Eighty-two percent of participants reported that they have friends or family with whom they talk about their health. In turn, these participants reported talking to them somewhat frequently, on average ( $M = 1.93$ ,  $SD$

= .73). Participant indicated having an average of 2.59 ( $SD = 2.50$ ) individuals upon whom they could rely in case they needed a ride to visit their health care provider.

However, to provide a more comprehensive assessment of social support than in HINTS, additional measures of structural and functional support were included. These questions were taken from an existing social support measure that has demonstrated validity and reliability in older adults (Hanson & Östergren, 1987). Participants were asked, “During a month, how often, on average, do you meet any of these persons (family, neighbors, close friends, acquaintances, co-workers) at your or at their homes?” to further assess structural support. Participants provided a response on a 4-point rating scale (1 = never or less than once per month, 2 = one to two times per month, 3 = 2 to 5 times per month, 4 = more than 5 times per month). Cronbach’s alpha for these items was .85. An average of the five items served as a measure of structural support ( $M = 2.24$ ,  $SD = 1.00$ ).

As a measure of functional support, participants rated three statements on a 4-point scale (1 = definitely false, 2 = probably false, 3 = probably true, 4 = definitely true). Emotional support was assessed with the statement, “When I need to discuss a personal problem, I have a close friend or relative I can turn to.” Informational support was assessed with the statement, “There is someone who I trust and could turn to if I needed advice about making career plans or retirement decisions.” Instrumental support was assessed with the statement, “If I needed a place to stay for a week because of an emergency (for example, water or electricity out in my apartment or house), I could easily find someone who would put me up.” Because of a limited range of responses (see Table 6), resulting in some cells having zero participants, these three measures of functional support were not included in final analyses.

Table 6: Perceptions of available functional support

	Emotional support		Instrumental support		Informational support	
	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>
Definitely false	6%	1	-	-	-	-
Probably false	12%	2	-	-	18%	3
Probably true	18%	3	35%	6	18%	3
Definitely true	65%	11	65%	11	65%	11

*Note.* Emotional support refers to having a close friend with whom they can talk. Instrumental support refers to having a place to stay in case of emergency. Informational support refers to have someone with whom they could talk about career or retirement decisions.

### 3.1.7 Health decision-making

As part of the phone interview (T1) and the lab assessment (T2), participants were asked about their intentions to get screened for colorectal cancer in various ways at different time-points in the assessment. At T1, participants were asked three questions about colorectal cancer screening – “How likely are you to get an FOBT/sigmoidoscopy/colonoscopy in the next 6 months?” They rated this question on a 7-point scale (1 = not at all likely to 7 = extremely likely). Cronbach’s alpha for the three items was .85; thus, an average of the items was used as a measure of intention to be screened for colorectal cancer at T1 ( $M = 2.67$ ,  $SD = 1.73$ ). At T2, participants were asked their level of agreement with the statement, “I intend to get a colorectal cancer screening test sometime in the next 6 months” (1 = strongly disagree, 4 = neither disagree nor agree, and 7 = strongly agree;  $M = 5.24$ ,  $SD = 1.68$ ). Pearson product moment correlational analyses revealed that T1 and T2 intentions were not related.

### **3.1.8 Results**

#### **3.1.9 Preliminary analyses**

Prior to beginning hypothesis-testing analyses, all assumptions were tested and met. Demographic variables were examined through a series of analyses of variance, with follow-up tests corrected for multiple comparisons with a Bonferroni adjustment, and Pearson-product-moment-correlational analyses to determine if they were related to the dependent and independent variables. A MANOVA revealed that married participants ( $M = 3.40$ ,  $SD = .89$ ) had reduced intentions to get screened for colorectal cancer in the 6 months following the lab assessment than the single/never married ( $M = 5.80$ ,  $SD = 1.64$ ) or divorced/widowed participants ( $M = 6.14$ ,  $SD = 1.07$ ;  $F[2, 16] = 8.12$ ,  $p = .005$ ). A MANOVA revealed that participants with an income of less than \$20,000 ( $M = 7.00$ ,  $SD = .00$ ,  $n = 4$ ) had greater intentions to get screened for colorectal cancer in the 6 months following the lab assessment than participants with an income of \$50,000 or more ( $M = 4.29$ ,  $SD = 1.60$ ,  $n = 7$ ;  $F[2, 16] = 5.01$ ,  $p = .02$ ). Pearson product-moment-correlational analyses and one-way ANOVAs revealed no significant relationship between worry and measures of different types of social support.

#### **3.1.10 Primary analyses**

In order to test the primary hypotheses, hierarchical multiple regression, with T2 intentions as the dependent variable, was used. Step 1 included covariates identified in the preliminary analyses. Step 2 included T1 worry and step 3 was T1 social support. Step 4 was the interaction term for T1 worry and T1 social support. Continuous variables were centered (Aiken & West, 1991).



Analyses examining the role of structural support included two measures: (1) the 5-item structural support measure, (2) and the number of community organizations to which they belonged, which is the same measure examined in Study 1b. Analyses examining the role of functional support included two measures, which were also examined in Study 1b: (1) instrumental support - the number of people upon whom the participant could rely for a ride to their provider, (2) emotional support - how frequently they talked about their health with their friends and family. Contrary to the primary hypotheses, neither functional (frequency of talking to friends and family) nor structural (number of community organizations or combined measure of structural support) social support moderated the relationship between worry and intention to be screened for colorectal cancer at time 2, as the regression analyses were not significant. However, analyses examining the moderating role of the influence of the number of people upon whom the participant could rely for a ride to a provider on the relationship between worry and intentions approached significance (Table 7). No significant main effects emerged.

Figure 2 reveals a disordinal interaction between worry and the number of people upon whom participants could rely for a ride to their provider. A test of simple slopes indicates that participants who were low in worry with more people upon whom they could rely for a ride to their provider, had decreased intentions to be screened for colorectal cancer at follow-up ( $t = -3.46, p < .01, \beta = -.66$ ). However, contrary to hypotheses, participants who were high in worry with fewer people upon whom they could rely for a ride to their provider did not have increased intentions to be screened for colorectal cancer ( $t = .47, p > .05, \beta = .15$ ). The observed power for the interaction is .96 (Cohen, 1988).

Table 7: Intentions to be screened for colorectal cancer in the next 6 months at time 2

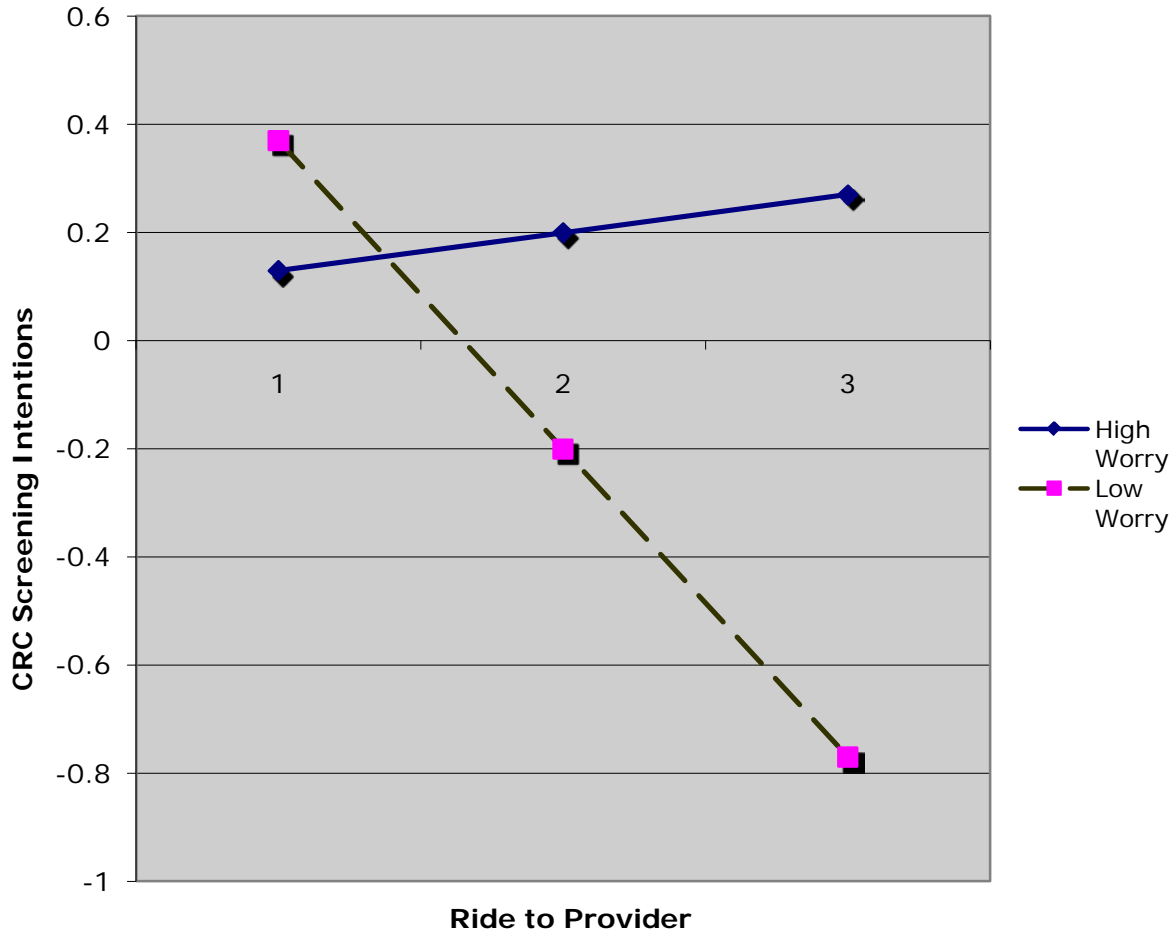
Variable	Model 1			Model 2			Model 3			Model 4		
	<i>B</i>	<i>SE</i>	$\beta$	<i>B</i>	<i>SE</i>	$\beta$	<i>B</i>	<i>SE</i>	$\beta$	<i>B</i>	<i>SE</i>	$\beta$
Income	-.73	.40	-.35	-.62	.42	-.30	-.64	.35	-.31	-.63	.31	-.31
Marital	-1.96	.69	-.55*	-2.04	.69	-.57*	-2.27	.58	-.64**	-2.07	.53	-.58**
Worry				.34	.35	.17	-.03	.32	-.01	.41	.37	.20
Ride to provider							-.27	.10	-.41*	-.17	.11	-.25
Worry X Ride to provider										.33	.17	.32 <sup>†</sup>
<i>R</i> <sup>2</sup>		.62			.65			.77			.83	

*Note.* Marital refers to participant's marital status. Ride to provider is the number of people upon whom the participant can rely for a ride to her provider. *R*<sup>2</sup> refers to Adjusted *R*<sup>2</sup>. *n* = 17.

\*\* *p* < .01. \* *p* < .05.

<sup>†</sup> *p* = .08

Figure 2: Interaction effect of worry and ride to provider on colorectal cancer screening intentions



Because colorectal cancer was also addressed in Study 1b, a comparison of effect sizes was performed. Guidelines set forth by Menard (2002) were used to compare the effect sizes from Study 1b, in which logistic regression was used, and Study 2, wherein hierarchical multiple regression was used. An equivalent to  $R^2$ ,  $\eta^2$ , was calculated for Study 1b. A comparison of these effect sizes revealed that the models in Study 2 revealed a stronger relationship between the

predictor variables and colorectal cancer screening than the models in Study 1b, as  $R^2$  is .52 for the former study and  $\eta^2$  is .03 for the latter study.

### **3.1.11 Summary**

The results of Study 2 are inconsistent with the findings from Study 1b. The trend towards significance found for the influence of functional (instrumental) support on the relationship between worry and intentions to be screened for colorectal cancer is noteworthy given the small sample size; however, it is not in the predicted direction. The comparison of effect sizes revealed that the model for Study 2 described the relationship between predictor and outcome variables better than the one in Study 1b.

Some key reasons that differences may have been found between the two studies are the following: (1) the dependent variable of Study 1b was behavior, whereas intentions were examined in Study 2, (2) the worry measure included in this study was more comprehensive than in Study 1b, and (3) participants were screened for colorectal cancer at varying times in Study 1b, which may have had implications for participant's level of colorectal cancer worry. Similar to Study 2, the next study is a longitudinal examination of the hypothesis tested in Study 1a's cross-sectional database. However, one key difference between Studies 2 and 3 is that the latter involves the experimental manipulation of worry and social support, thus allowing for potential causal inferences to be made.

## 4.0 STUDY 3

Study 3 was intended to expand on findings from Study 1a by examining skin cancer prevention behaviors in an at-risk sample of college-aged females within a prospective experimental design. Worry about skin cancer and social support were experimentally manipulated to assess their influence on intentions to engage in behaviors intended to prevent skin cancer. Doing so allowed for the possibility of determining whether the interaction of worry and social support would have a causal effect on health behavior.

Two pilot studies were first conducted to determine whether the worry and social support manipulations would have the anticipated effects. Pilot Study 1 examined the worry manipulation, whereas Pilot Study 2 examined the effects of the social support manipulation.

The information to develop the manipulations came from existing studies. For the worry manipulation, materials that have increased negative emotions and influenced preventive skin cancer behaviors were used to develop the worry manipulation in this study (Mahler et al., 2005; Rothman et al., 1993). Participants were provided with information that included epidemiological information about skin cancer, risk factors for skin cancer, effects of skin cancer on appearance, and prevention of skin cancer. However, because none of the previous studies specifically examined the effect of this information on worry, a pilot study was conducted to examine whether the worry manipulation would have the anticipated effects.

#### **4.1.1 Pilot study 1**

#### **4.1.2 Method**

#### **4.1.3 Participants**

Thirty-one females between the ages of 18 and 24 years were recruited during the months of May, June, and July. Most participants (71%,  $n = 22$ ) were recruited through community advertisements and received monetary compensation for their participation. The remaining participants were recruited from an introductory psychology class at a medium-sized public university in an urban, mid-Atlantic setting. They received course credit for their participation. Of the original sample, 27 participants had valid data. Although females of any ethnic background were recruited, only Caucasian females were included in this analysis because of their increased risk for skin cancer. One participant did not follow essay instructions, two were excluded because of experimenter error in administering study materials, and one participant was excluded because she was not Caucasian.

Participants were assigned to one of two groups through the use of blocked random assignment. Twelve participants were assigned to the neutral condition, whereas 15 participants were assigned to the worry condition. As part of the worry condition, participants were provided with written information about the dangers of the ultraviolet rays from the sun, which can cause skin cancer. They were also given two sets photos of two young adult, Caucasian women. One photo was an image of a female's face taken by a camera without an ultraviolet (UV) lens, whereas the second photo of the same female showed the image of the female's face when her picture was taken by a camera with a UV lens, which revealed damage not seen by the naked eye. After participants read the information and were presented with the photographs, they wrote an essay about what it would be like to develop skin cancer and included details about the cost,

treatment, and what they imagine it would be like to have skin cancer. Participants in the neutral condition were not presented with the pictures and were provided with information about the sun. Participants were then asked to write an essay about the relevance of the sun in everyday life. The experimenter read essays at the end of the experiment to verify the participant's understanding and followed the directions for each respective condition. Mean age of participants was 20.43 ( $SD = 1.40$ ,  $n = 7$ ), ranging in age from 19 to 23 years.

#### **4.1.4 Procedure**

The study took approximately 30 minutes to complete. Two undergraduate research students were trained by the primary investigator to administer the questionnaires. Upon obtaining participant's informed consent, participants were asked questions to obtain baseline data about skin cancer prevention behaviors, including the same ones asked in Study 1a, as well as worry about skin cancer. Participants then received information about skin cancer so that all participants were aware of the key factors that can lead to skin cancer and how to prevent it. Participants were then asked to complete the worry or neutral manipulation.

As part of the worry condition, participants were asked to do the following: "Please write an essay about what you imagine it would be like for you to find out that you had skin cancer. Please include as many details as possible. How you would feel? What doctor would you see? What medical treatment would you receive? How much money would it cost?" Participants in the neutral condition were asked to do the following: "Please write an essay about your beliefs about the relevance of the sun for everyday life. Include as many details as possible." They were given 5 minutes to complete the essay. Their essays were read by the head researcher to

determine whether the participant followed the instructions and the essay was valid. All essays were determined to be valid.

Immediately following the essay, participants were asked questions about worry, which was then followed by questions about intent to engage in skin cancer prevention behaviors. Demographic information was collected at the end of the experiment. The measures included were an abbreviated version of the main study's measures.

#### **4.1.5 Measures**

#### **4.1.6 Worry**

Prior to the worry manipulation, participants were asked, "In general, how *worried* are you about getting skin cancer?" and "In general, how *vulnerable* do you feel to skin cancer?" They marked a line that was anchored by "not at all *worried/vulnerable*" and "extremely *worried/vulnerable*". Initially, participants were not asked about baseline worry, but the measure was added approximately halfway through the pilot study to rule out the possibility that pre-existing group differences were contributing to initial null findings when comparing the experimental groups.

Participants were asked the same two questions asked prior to the manipulation as well one additional question – "How *concerned* are you about getting skin cancer?" For all of these items, a ruler was used to determine the participant's score (e.g., 1 inch = 1, 2 inches = 2, etc.). Scores were measured to two decimal places.



#### **4.1.7 Health decision-making**

Participants were asked the same questions after the experimental manipulation as asked in Study 1a – “Over the next month, when you go outside for more than 1 hour on a warm, sunny day, to what extent do you plan to wear sunscreen, stay in the shade, wear a hat that shades your face ears and neck wear a long-sleeve shirt, and wear long pants,” which participants rated on a 7-point scale (1 = not at all to 7 = definitely plan to do so).

#### **4.1.8 Results**

A test of assumptions revealed that data were normally distributed. An Analysis of Covariance (ANCOVA), in which baseline worry was included as a covariate, revealed a significant difference between the two groups in perceived worry post-manipulation ( $F[2, 6] = 30.57, p < .01, \text{partial } \eta^2 = .94$ ). Participants in the worry group indicated they were more worried about getting skin cancer ( $M = 4.20, SD = 1.43$ ) than participants in the neutral group ( $M = 3.77, SD = 2.75$ ). Thus, it was concluded that the worry manipulation was successful.

#### **4.1.9 Pilot study 2**

In order to examine whether the social support experimental manipulation had its intended effects, a pilot study was conducted in the target population prior to the beginning of the main experiment.

#### **4.1.10 Method**

#### **4.1.11 Participants**

Nineteen females between the ages of 18 and 24 years were recruited from community advertisements during the months of June and July in an urban mid-Atlantic setting. Participants were assigned to one of two groups through the use of blocked random assignment. They either received a social support intervention or were in the neutral condition and received no social support intervention. Two of the participants had invalid data, as one participant knew the undergraduate experimenter and the other participant's responses indicate that she did not follow instructions. Nine participants were in the neutral group, whereas 8 participants were in the social support intervention group. However, because new questions were introduced after seven participants had already enrolled in the study, the final sample was seven participants in the social support condition and four participants in the neutral condition. Participants were provided monetary compensation for their time. Mean age of participants was 20.55 ( $SD = .93$ ,  $n = 11$ ), ranging in age from 18 to 21 years.

#### **4.1.12 Procedure**

Blocked random assignment was used to assign participants to conditions. The study took approximately 30 minutes to complete. Two undergraduate research students were trained by the primary investigator to administer the questionnaires. The measures included were an abbreviated list of the main study's measures. Three questions were added after seven participants had enrolled in the study, as the initial social support measures were not affected by the manipulation, perhaps because they were not assessing participant's more immediate

perception of social support. These questions were intended to measure the more proximal effects of the social support manipulation.

After completing questionnaires, participants were told that the experimenter had to set up another part of the experiment and would be with them shortly. Upon the return of the experimenter, the participants in the social support condition were told of the different support options available to them. The intent of the script was to normalize the experience for the participant, thus minimizing any perception of barriers to perceiving or utilizing the support and is modeled after a script previously used in experimental social support research (Uchino & Garvey, 1997). Participants were given access to online websites wherein they could learn more about skin cancer prevention behaviors. These websites were pre-existing ones that were run by national cancer organizations and contain information about skin cancer intended for the public. After each participant, the sites that they visited were recorded to determine the number of times they accessed these websites and whether they were accessing websites not pertaining to the study. None of the participants spent times on other websites and, if the participant accessed one of the websites, it was at least 2 visits. This manipulation was intended to provide them with the perception of functional support and provide two measures of received support – asking the undergraduate experimenter any additional questions and visiting the website for more information. Although most participants did not ask the undergraduate experimenter any follow-up questions, some participants did and the experimenters reported no difficulties answering their questions. The experimenters had been trained by the principal investigator prior to the experiment in how to address participant's questions and working with the participant to examine the website for the answers whenever possible.

The experimenter read the following script to participants in the social support condition:

I'd now like to let you know about a couple of websites that have information about skin cancer, including skin cancer prevention. Please feel free to look at them on the computer for the next few minutes while I prepare the next part of the study. If after reviewing the information provided, you would like more information, I can provide you with the contact information of someone who can answer your questions.

Experimenters were also instructed to return to the room in 5 minutes, ask the participant if she would like more information and provided a written phone number for more information, which was the primary experimenter's contact information. Participants in the no support condition were not offered this support. They were simply asked if they had finished filling out the questionnaires and told that they needed to wait for the experimenter to prepare the next part of the experiment.

#### **4.1.13 Measures**

#### **4.1.14 Social Support**

Participants were asked to indicate their level of agreement with the following statements by marking an X on the designated line, immediately following the experimental manipulation: "I feel satisfied with the amount of information given to me today about skin cancer.", "I was provided with adequate opportunities to obtain information about skin cancer.", "I would have liked more information about skin cancer.", "There is someone I can talk to if I have any other questions about skin cancer.", "There are supportive people who I can rely on if I want to talk more about my thoughts or feelings associated with skin cancer.". The line was anchored with "strongly disagree" and "strongly agree". A ruler was used to determine the participant's score (e.g., 1 inch = 1, 2 inches = 2, etc.). Scores were measured to two decimal places. These

questions were intended to capture participant's perception of social support subsequent to the experimental manipulation, with the expectation that participants who were in the social support manipulation would indicate feeling more supported.

#### **4.1.15 Results**

A test of assumptions was conducted and none were violated. Three one-way ANOVAs were conducted in which condition was the independent variable and one of the three proximal social support questions was the dependent variable. In two of the three ANOVAs, the relationship was in the expected direction, indicating that the manipulation had the desired effect. However, adequate power was not present to detect significant differences. One ANOVA revealed a trend towards significance ( $F[1,10] = 13.17, p = .07, \text{partial } \eta^2 = .33$ ), as participants in the neutral condition reported that they would have liked to receive more information about skin cancer ( $M = 6.18, SD = .60$ ) than participants in the social support condition ( $M = 3.90, SD = 2.08$ ), indicating participants in the social support condition were more likely to feel that they received adequate informational support. A second ANOVA revealed a trend towards significance ( $F[1,10] = 3.41, p = .10, \text{partial } \eta^2 = .28$ ), as participants who were in the social support condition reported that they had perceived more opportunities to obtain information about skin cancer ( $M = 6.16, SD = 1.18$ ) than participants in the neutral condition ( $M = 4.90, SD = .87$ ). The final ANOVA, in which participant's level of satisfaction was examined, did not trend towards significance and indicated that no group differences were present.

The timing of the second pilot study was towards the end of the summer months and data collection had to be terminated earlier than anticipated because the main study needed to be conducted before the warm and sunnier months ended. Given the large effect sizes and analyses

approaching significance, it was concluded that the tested experimental manipulations could be included in the main study. (Of note, the manipulation had the intended effect in the actual experiment.)

#### **4.1.16 Main study**

Subsequent to the completion of the two pilot studies, the main study was conducted. The two experimental manipulations, which were based on the findings of the pilot studies, were incorporated into the main study.

#### **4.1.17 Method**

#### **4.1.18 Participants**

Seventy-seven females between the ages of 18 and 24 years were recruited. Eighty-three percent ( $n = 47$ ) were undergraduates taking an introductory psychology class at a public university in an urban mid-Atlantic setting. These participants received course credit in exchange for their participation. The remaining 17% ( $n = 10$ ) were recruited through the use of community advertisements and provided monetary compensation in return for their participation. Although females of any ethnic background were recruited, only Caucasian females were included in this analysis because of their increased risk for skin cancer. Seven participants who identified themselves as African American, four participants who identified themselves as Asian American, two participants who identified themselves as multi-racial, and one participant who identified herself as 'Other' were excluded from analyses. Four Caucasian participants were excluded from the sample for leaving several items blank.

The final sample total of 59 participants is sufficient power to balance Type I and Type II error, based on power analyses calculated from the pilot studies. The effect sizes (partial eta squared) ranged from .28 (Pilot Study 2) to .94 (Pilot Study 1). Mean age of participants was 18.85 ( $SD = 1.3$ ), ranging in age from 18 to 23 years. Most participants were single (53%,  $n = 31$ ), whereas 44% ( $n = 26$ ) identified themselves as being in a committed relationship. One participant indicated that 'Other' was her relationship status, and one participant left this item blank. None of the participants indicated that they had skin cancer before and one indicated that she had another type of cancer but information about the type of cancer was not collected.

#### **4.1.19 Procedure**

Participants were recruited during August and September, as these are the warmer and sunnier months in the mid-Atlantic city, and participants would have a greater necessity to engage in skin cancer prevention behaviors. Blocked random assignment was used to assign participants to one of four conditions in this 2X2 factorial design. Participants were randomly assigned to either a worry-induction or a neutral (no worry-induction) condition and a social support intervention or neutral (no social support intervention) condition. These experimental manipulations were the same ones examined in the two pilot studies. The four experimental groups were worry + social support ( $n = 16$ ), worry + no social support ( $n = 13$ ), no worry + social support ( $n = 14$ ), and no worry + no social support ( $n = 16$ ). Two undergraduate research students were trained by the author to administer the questionnaires.

Before beginning the experiment, participants were told that the purpose of the study was to find out more about psychological factors, such as health knowledge and attitudes that

influence an individual's decisions to prevent skin cancer. Participants were not given all of the information about the intention of the experiment to reduce demand characteristics.

Participants in the worry-induction condition received written information about skin cancer and were asked to read this information and imagine the experience of having skin cancer, including the impact it would have on their emotions, daily activities, and their health. They were also given two sets of pictures of young females who had their photo taken with a normal lens and another photo taken with an ultraviolet lens (see Appendix A). The experimenter read the following script:

Now I'd like for you to read some information related to skin cancer. Please take your time and read it carefully because you will be asked questions about this material later in the study. I'd also like to show you pictures that illustrate the damaging effects of ultraviolet radiation (UV) on the skin that can lead to skin cancer. This one is a photo of a young woman taken with a normal camera lens. The second photo is taken with a UV lens, which reveals damage caused by UV radiation to the skin that you cannot see with the naked eye. The second set of photos is similar. The first one shows a photo of a woman taken with a normal camera lens. The second photo is taken with a UV lens, which reveals damage to the skin not seen by the naked eye.

The participants were then provided with the following reading material:

If you don't always protect your skin from the damaging effects of the sun as much as you should, there are negative consequences for your appearance and health. Being careless now means that you may age more quickly than your peers. You may develop wrinkles and age spots on your face and hands before your peers.

Aside from the damaging effects of the sun on your appearance, you are increasing your



risk of skin cancer each time you choose to not protect yourself from the sun. It can be difficult to notice if you have skin cancer if you do not go to the doctor or check yourself for skin abnormalities on a regular basis. If you do develop skin cancer then you would require treatment, which involves costly medical care and procedures to remove the cancer.

The experimenter returned to the room and read the following script:

Please write an essay about what you imagine it would be like for you to find out that you had skin cancer. Please include as many details as possible. How you would feel? What doctor would you see? What medical treatment would you receive? How much money would it cost?

Participants in the neutral condition received information about the sun and were not asked to imagine having skin cancer. They were read the following script: “Now I’d like for you to read some information related to skin cancer. Please read it carefully because you will be asked questions about this material later in the study.”

They were then provided with the following reading material:

Throughout history, Western and non-Western cultures have identified the importance of the Sun by incorporating it in mythological and religious writings. The idea that the Sun is the center around which the planets move, however, did not begin to gain wide acceptance until the 16th century. Now, it is widely accepted as fact that the Sun is the star at the center of the solar system and is the nearest star to earth.

Further scientific research has revealed that it comprises approximately 99% of the mass of the solar system, and its surface composition consists of hydrogen and trace quantities

of other elements. The Sun, in the form of heat and sunlight, provides the Earth's primary source of energy and most living things are supported by the Sun through photosynthesis.

They were then given the following instructions: "Please write an essay about your beliefs about the relevance of the sun for everyday life. Include as many details as possible."

The principal investigator reviewed essays at the end of the experiment to determine whether participants followed instructions for both the neutral and worry conditions. All of the participants in the final sample of 59 had valid essays.

Participants in the social support condition were read the following script by the experimenter:

I'd now like to let you know about a couple of websites that have information about skin cancer, including skin cancer prevention. Please feel free to look at them on the computer for the next few minutes while I prepare the next part of the study.

If after reviewing the information provided, you would like more information, I can provide you with the contact information of someone who can answer your questions.

The experimenter was instructed to return to the room in five minutes and ask the participant, "Now that you've had a chance to obtain additional information about skin cancer, what questions can I answer for you?" Participants were then provided with a card with the principal researcher's contact information and told, "This individual can answer any additional questions you have about your risk of skin cancer or prevention of skin cancer." None of the participants contacted the principal investigator for additional information.

Participants in the neutral condition were read the following script by the experimenter: "Please wait in this room for a few minutes while I prepare for the next part of this study. Do you have any questions before I leave for the next few minutes?" None of the participants had any

questions at that point in time. These participants were not provided with the principal researcher's contact information.

Immediately following each experimental manipulation, participants completed measures of key variables. At the end of the experiment, participants were debriefed and asked if they were willing to be contacted by one of the experimenters for a brief phone interview in approximately 1 month. All participants indicated that they would be willing to be contacted. Their contact information was provided to the experimenters, who asked for the identification number the participant generated when they called, so that the data could be matched to their original data. At that time, participants were asked follow-up skin cancer prevention behavior questions they had engaged in since the end of the experiment as well as intentions to engage in these behaviors over the next month. Of the original sample, 86% ( $n = 49$ ) were included in the 30-day follow-up. Attrition in each of the groups was as follows: worry + social support condition lost two participants ( $n = 13$ ); worry + neutral lost no participants ( $n = 13$ ); neutral + social support condition lost four participants ( $n = 10$ ), and neutral + neutral condition lost two participants ( $n = 13$ ). Chi square analysis revealed that there were no differences in attrition across conditions.

#### **4.1.20 Measures**

#### **4.1.21 Worry**

Participants were asked questions about worry at the beginning of the experiment, after the worry or neutral manipulation, and at the 30-day follow-up. Baseline worry questions were two questions, which were used in Pilot Study 1: "In general, how *worried* are you about getting skin cancer?" and "In general, how *vulnerable* do you feel to skin cancer?" These questions were marked on a 7-inch line with the anchors of "not at all" and "extremely *worried/vulnerable*". A

ruler was used to determine the participant's score (e.g., 1 inch = 1, 2 inches = 2, etc.). Scores were measured to two decimal places. Cronbach's alpha was .83 and thus the items were averaged and served as the baseline worry measure.

The participants were asked the following questions immediately after the worry or neutral manipulation: "How *worried* are you about getting skin cancer?", "How *concerned* are you about getting skin cancer?", "How *vulnerable* do you feel to skin cancer?", "How *anxious* are you about getting skin cancer?", and "How *fearful* are you about getting skin cancer?", which were similar to ones used in a previous examination of worry (Lipkus et al., 2005). These questions were rated on a 7-point scale and scored the same way as the baseline worry items. The Cronbach's alpha was .88 and thus the items were averaged and served as the post-manipulation worry measure.

#### **4.1.22 Social support**

In order to determine if participants possessed stylistic differences in their use of coping, which could affect group differences, they were asked to complete the Brief COPE at time 1. This 28-item measure includes several two-item subscales (i.e., self-distraction, active coping, denial, substance use, behavioral disengagement, venting, positive reframing, planning, humor, acceptance, religion, and self-blame), including two dimensions of functional social support (use of emotional and instrumental support; Carver, 1997). Items are rated on a 4-point Likert-type scale (ranging from 1 = I don't do this at all to 4 = I do this a lot). If individual differences in seeking of coping exist across the experimental groups, then this measure may be used as a covariate. The Emotional Support subscale is measured with the items, "I get emotional support from others," and "I get comfort and understanding from someone," whereas the Instrumental

Support is measured with the items “I get help and advice from other people,” and “I try to get advice or help from other people about what to do.”

Immediately following the social support manipulation, participants were asked to indicate their level of agreement with the following four statements by marking an X on the designated line: “I was provided with adequate opportunities to obtain information about skin cancer.”, “I would have liked more information about skin cancer.”, “There is someone I can talk to if I have any other questions about skin cancer.”, and “There are supportive people who I can rely on if I want to talk more about my thoughts or feelings associated with skin cancer.”. The line was anchored with “strongly disagree” and “strongly agree”. A ruler was used to determine the participant’s score (e.g., 1 inch = 1, 2 inches = 2, etc.). Scores were measured to two decimal places. The Cronbach’s alpha for the four items was .77.

#### **4.1.23 Health decision-making**

Participants were asked questions about their previous skin cancer prevention behavior at the beginning of the experiment, immediately following the final experimental manipulation, and during the 30-day follow-up phone contact. Similar to Study 1a, two skin cancer prevention behaviors were examined: “When you go outside for more than 1 hour on a warm, sunny day, how often do you wear sunscreen?” and “When you go outside for more than 1 hour on a warm, sunny day, how often do you wear a hat that shades your face, ears and neck?” Participants were asked to rate these questions on a 5-point scale (1 = never to 5 = always) at baseline and 30-day follow-up. As part of the latter, participants were asked whether they had engaged in these behaviors as well as their intentions to engage in these behaviors over the next 30 days. Items were examined separately in analyses, as the Cronbach’s alpha was less than .60.

#### **4.1.24 Results**

Prior to beginning hypothesis-testing analyses, tests of assumptions of all variables included in preliminary and primary analyses were conducted. All assumptions were met.

#### **4.1.25 Preliminary analyses**

#### **4.1.26 Worry and experimental group**

In order to ensure that randomization was effective and no pre-existing group differences in worry existed, an ANOVA was done to examine group differences on baseline worry. The ANOVA revealed a trend towards significance ( $F[1,56] = 3.84, p = .06, \text{partial } \eta^2 = .07$ ) and thus baseline worry was included as a covariate in the primary analyses. However, because its inclusion as a covariate did not change the significance of the findings, it was excluded in the reporting of the final analyses. Participants in the neutral condition ( $M = 4.65, SD = 1.40$ ) were more worried than participants in the worry manipulation condition ( $M = 4.01, SD = 1.06$ ).

In order to determine if the worry induction procedure had its intended effects, a one-way ANOVA was done in which post-manipulation worry was compared in the two groups (i.e., worry induction or neutral conditions). The hypothesis was that the worry-induction group would be more worried than the neutral group. Because baseline differences in skin cancer worry existed, a 2X2 mixed-design ANOVA was used to compare the two groups on pre-post worry, wherein condition had the levels worry or neutral and the other variable had the levels of baseline and post-manipulation worry. Although this analysis was not significant ( $F[1,55] = 2.08, p = .16, \text{partial } \eta^2 = .04$ ), it revealed that the means changed in the predicted direction, as the worry group's mean score moved in a positive direction ( $M = 4.01, SD = 1.06$  to  $M = 4.22,$

$SD = 1.00$ ), whereas the neutral group's mean score moved in the negative direction ( $M = 4.65$ ,  $SD = 1.40$  to  $M = 4.49$ ,  $SD = 1.05$ ).

#### **4.1.27 Social support and experimental group**

The two social support groups were compared on the perceived social support measure. It was hypothesized that group differences in perceived social support would exist, which was supported by the ANOVA results ( $F[1,56] = 11.65$ ,  $p < .01$ , partial  $\eta^2 = .18$ ). Participants in the social support group ( $M = 6.28$ ,  $SD = .67$ ) experienced a greater perception of social support than participants in the neutral group ( $M = 5.48$ ,  $SD = 1.07$ ), confirming the strength of the experimental manipulation.

#### **4.1.28 Baseline skin cancer prevention and experimental group**

A MANOVA was used to examine baseline differences in skin cancer prevention behaviors among the four experimental groups. No significant results emerged, indicating that participants in the four groups were exhibiting equivalent skin cancer prevention behaviors at baseline.

#### **4.1.29 Baseline sun exposure and dependent variables**

Pearson-product-moment-correlations were used to examine the relationship between baseline sun exposure frequency and dependent measures immediately following the social support manipulation. Sun exposure frequency was measured by four items, which included the frequency of indoor tanning as well as the number of hours spent outside sunbathing or doing

other activities for the past week. Although no significant relationship emerged between the number of hours spent in the sun and dependent measures, the use of indoor tanning was negatively correlated with intentions to use sunscreen ( $r=-.53, p<.01$ ) and stay in the shade ( $r=-.33, p=.01$ ). Thus, participant's frequency of indoor tanning was used as a covariate in the primary analyses.

#### **4.1.30 Individual differences and group assignment**

In order to verify that random assignment eliminated the influence of individual differences on the primary variables of interest, a series of analyses were conducted. A chi square analysis of the relationship between relationship status and condition was not significant. Each subscale of the Brief COPE was examined, including the subscales examining use of emotional and instrumental support. A MANOVA revealed no differences among the four conditions in stylistic preferences for coping. Pearson product moment correlation coefficients were used to examine the relationship between perceived social support after the social support manipulation and trait coping, as measured by the Brief COPE. No significant correlations emerged.

Individuals receiving the worry-elicitation were compared to those who received neutral information on retention of information with one-way ANOVAs. It was expected that the groups would be equivalent in their knowledge about the prevention of skin cancer, which was supported by the analyses.



#### **4.1.31 Relationships among primary variables**

In order to determine the relationship among the primary variables of interest across time, the continuous measures of baseline worry, post-manipulation worry, 30-day follow-up worry, post-manipulation and 30-day follow-up perceived social support, and baseline, post-manipulation, and 30-day follow-up measures of skin cancer prevention were examined through the use of Pearson-product-moment correlations. Baseline worry was positively correlated with worry at subsequent time-points. Although baseline worry was not consistently related to skin cancer prevention behaviors, it was positively correlated with intentions to wear a hat at baseline and intentions to wear sunscreen at follow-up (Table 8). Both baseline worry and worry immediately following the worry manipulation were positively correlated with perceived social support following the social support manipulation at baseline and frequency with which participant reported talking to her friend at follow-up. Participant's reported worry at follow-up was positively correlated with frequency with which they spoke with friends about skin cancer and accessed information about skin cancer at follow-up.

Table 8: Bivariate associations among worry and dependent variables

Variable	1	2	3	4	5	6	7
1. Baseline Worry	—	.64 <sup>***</sup>	.28 <sup>*</sup>	.45 <sup>***</sup>	.19	.20	.43 <sup>**</sup>
2. Post-Manip. Worry		—	.27 <sup>*</sup>	.32 <sup>*</sup>	.28 <sup>*</sup>	.49 <sup>***</sup>	.47 <sup>**</sup>
3. Post-Manip. SS			—	.12	.15	.10	.09
4. Baseline behaviors				—			
Sunscreen					.49 <sup>***</sup>	.16	.42 <sup>**</sup>
Hat					.53 <sup>***</sup>	.61 <sup>***</sup>	.59 <sup>***</sup>
5. Post-Manip. Intentions					—		
Sunscreen						.40 <sup>**</sup>	.61 <sup>***</sup>
Hat						.48 <sup>**</sup>	.59 <sup>***</sup>
6. 30-day Behaviors						—	
Sunscreen							.64 <sup>***</sup>
Hat							.70 <sup>***</sup>
7. 30-day Intentions							—
Sunscreen							
Hat							

*Note.* Post-Manip. Worry is the measurement of perceived worry immediately following the worry manipulation. Post-Manip. SS is the measurement of perceived social support immediately following the social support manipulation.  $n = 59$  for baseline and post-manipulation measures.  $n = 49$  for measures at 30 day follow-up.

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

#### 4.1.32 Primary analyses

Three MANCOVAs were used to test the hypothesis that the interaction of worry and social support would predict skin cancer prevention intentions and behavior. The four experimental groups were examined for their relationship to health decision-making about skin cancer prevention. The expectation was that an interaction would emerge such that there would be no difference or a small difference in intentions in the no-worry group yet greater intentions in the worry/support group than in the worry/no support group.

Continuous measures of intentions and willingness and commitment to engage in protective behaviors (i.e., using sunscreen and wearing a hat) at Time 1 as well as protective behaviors at Time 2 were analyzed. Frequency of indoor tanning was included as a covariate. Three sets of each of the two dependent variable measures were included: (1) post-manipulation intentions to engage in skin cancer prevention behaviors (Table 9), (2) 30-day follow-up intentions to engage in skin cancer prevention behaviors (Table 10), and (3) skin cancer prevention behaviors at 30-day follow-up (Table 11). No significant group differences were found for any of the three dependent measures: intentions to use sunscreen at baseline ( $F[3,56] = .53, p = .67, \text{partial } \eta^2 = .03$ ), intentions to wear a hat at baseline ( $F[3,56] = .122, p = .31, \text{partial } \eta^2 = .07$ ); intentions to use sunscreen at follow-up ( $F[3,44] = .21, p = .89, \text{partial } \eta^2 = .01$ ), intentions to wear a hat at follow-up ( $F[3,44] = .51, p = .68, \text{partial } \eta^2 = .03$ ), reported use of sunscreen at follow-up ( $F[3,44] = 1.47, p = .24, \text{partial } \eta^2 = .09$ ), and reported wearing a hat at follow-up ( $F[3,44] = .51, p = .68, \text{partial } \eta^2 = .03$ ).

Table 9: Estimated marginal means of intentions to engage in skin cancer prevention behaviors post-experimental manipulation at baseline

	Sunscreen	Hat	<i>n</i>
Worry + SS	4.76 (1.52)	2.31 (1.51)	15
Worry + Neutral	4.81 (1.53)	3.37 (1.53)	13
Neutral + SS	4.67 (1.54)	2.57 (1.54)	14
Neutral + Neutral	4.18 (1.53)	2.57 (1.52)	15

*Note.* Estimated marginal mean (*SD*).

Table 10: Estimated marginal means of intentions to engage in skin cancer prevention behaviors at 30-day follow-up

	Sunscreen	Hat	<i>n</i>
Worry + SS	3.58 (1.79)	1.67 (1.42)	13
Worry + Neutral	3.27 (1.79)	2.26 (1.42)	13
Neutral + SS	3.86 (1.80)	2.16 (1.43)	10
Neutral + Neutral	3.50 (1.79)	2.26 (1.42)	13

*Note.* Estimated marginal mean (*SD*).

Table 11: Estimated marginal means of intentions to engage in skin cancer prevention behaviors at 30-day follow-up

	Sunscreen	Hat	<i>n</i>
Worry + SS	2.37 (1.53)	1.22 (.92)	13
Worry + Neutral	1.87 (1.53)	1.39 (.92)	13
Neutral + SS	2.27 (1.53)	1.59 (.92)	10
Neutral + Neutral	3.10 (1.53)	1.62 (.92)	13

*Note.* Estimated marginal mean (*SD*).

Because of the null findings when examining experimental groups separately, and analyses indicating that the experimental manipulation for worry may not have had the desired effects, follow-up hierarchical regression analyses were conducted. The moderating role of perceived social support (measured just after the social support manipulation) on the relationship between perceived worry (measured just after the worry manipulation) and skin cancer prevention was examined across conditions for each of the three sets of measures of skin cancer

prevention behaviors. In step 1, indoor tanning was entered as a covariate; in step 2, worry was entered, followed by social support in step 3, and the interaction term for worry and social support. All continuous variables were centered (Aiken & West, 1991).

These analyses revealed no significant interactions but demonstrated significant main effects of worry on intentions to use sunscreen immediately following the manipulations, as well as sunscreen use and intentions to use sunscreen at 30-day follow-up (see Tables 12, 13, 14). High levels of worry predicted greater intentions and reported use of sunscreen at all time-points. Elevated levels of worry also predicted intentions to wear a hat at baseline but not at the follow-up time-points (Table 15). No significant main effect of social support was found.

The observed power for the analysis examining intentions to use sunscreen at baseline is .94. However, the observed power for the analysis examining intentions to wear a hat at baseline is .40 and is insufficient to test the hypothesis. The observed power for the analysis examining self-reported sunscreen use and intentions to use sunscreen at follow-up is .80 for both analyses (Cohen, 1988).

Table 12: Summary of hierarchical multiple regression of intentions to use sunscreen at baseline

Variable	Model 1			Model 2			Model 3			Model 4		
	<i>B</i>	<i>SE</i>	$\beta$	<i>B</i>	<i>SE</i>	$\beta$	<i>B</i>	<i>SE</i>	$\beta$	<i>B</i>	<i>SE</i>	$\beta$
Indoor Tanning	-.63	.14	-.53***	-.65	.13	-.55***	-.67	.13	-.56***	-.66	.13	-.56***
Worry				.54	.18	.32*	.48	.19	.28*	.48	.19	.28*
SS							.25	.20	.14	.27	.21	.15
Worry X SS										.09	.16	.06
<i>R</i> <sup>2</sup>	.27			.36			.37			.36		

*Note.* Indoor Tanning is a measure of the frequency with which the participant engaged in indoor tanning. SS refers to the social support measure. *R*<sup>2</sup> refers to Adjusted *R*<sup>2</sup>. *n* = 59.

\*\*\* *p* < .001. \* *p* < .05.

Table 13: Summary of hierarchical multiple regression of intentions to wear a hat at baseline

Variable	Model 1			Model 2			Model 3			Model 4		
	<i>B</i>	<i>SE</i>	$\beta$	<i>B</i>	<i>SE</i>	$\beta$	<i>B</i>	<i>SE</i>	$\beta$	<i>B</i>	<i>SE</i>	$\beta$
Indoor Tanning	-.10	.14	-.10	-.12	.13	-.11	-.12	.13	-.11	-.11	.14	-.11
Worry				.48	.19	.33*	.48	.20	.32*	.48	.20	.33*
SS							.01	.21	.01	.02	.22	.01
Worry X SS										.05	.17	.04
$R^2$		-.09			.08			.06			.05	

*Note.* Indoor Tanning is a measure of the frequency with which the participant engaged in indoor tanning. SS refers to the social support measure.  $R^2$  refers to Adjusted  $R^2$ .  $n = 59$ .

\*  $p < .05$ .

Table 14: Summary of hierarchical multiple regression of intentions to use sunscreen at follow-up

Variable	Model 1			Model 2			Model 3			Model 4		
	<i>B</i>	<i>SE</i>	$\beta$	<i>B</i>	<i>SE</i>	$\beta$	<i>B</i>	<i>SE</i>	$\beta$	<i>B</i>	<i>SE</i>	$\beta$
Indoor Tanning	-.38	.16	-.32*	-.41	.14	-.34**	-.41	.15	-.35**	-.42	.15	-.36*
Worry				.89	.22	.49***	.88	.23	.48***	.88	.23	.48***
SS							.09	.23	.05	.07	.23	.48
Worry X SS										-.11	.21	-.07
$R^2$		.09			.31			.30			.29	

*Note.* Indoor Tanning is a measure of the frequency with which the participant engaged in indoor tanning. SS refers to the social support measure.  $R^2$  refers to Adjusted  $R^2$ .  $n = 49$ .

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

Table 15: Summary of hierarchical regression of use of sunscreen at follow-up

Variable	Model 1			Model 2			Model 3			Model 4		
	<i>B</i>	<i>SE</i>	$\beta$	<i>B</i>	<i>SE</i>	$\beta$	<i>B</i>	<i>SE</i>	$\beta$	<i>B</i>	<i>SE</i>	$\beta$
Indoor Tanning	-.30	.15	-.29*	-.32	.13	-.31*	-.33	.13	-.32*	-.34	.13	-.33*
Worry				.82	.19	.50***	.80	.20	.49***	.81	.20	.50***
SS							.09	.20	.06	.08	.21	.05
Worry X SS										-.13	.18	-.09
$R^2$	.07			.31			.30			.29		

*Note.* Indoor Tanning is a measure of the frequency with which the participant engaged in indoor tanning. SS refers to the social support measure.  $R^2$  refers to Adjusted  $R^2$ .  $n = 49$ .

\*\*\*  $p < .001$ . \*  $p < .05$ .

#### 4.1.33 Summary

Contrary to hypotheses, social support did not moderate the influence of worry on decision-making about skin cancer prevention over time. Instead, a main effect of elevated levels of worry on intentions to use sunscreen and reported use of sunscreen over time was found. These results are not consistent with those of Study 1a in which main effects of structural and functional support were found to predict intentions to use sunscreen. They are also inconsistent with findings from Study 1b and Study 2. Possible explanations for these discrepancies as well as the implications of findings from Study 3 will be addressed in the next section; however, certain caveats about the experimental manipulations used in this study should be noted.

Although pilot studies were conducted to determine whether the experimental manipulations used in Study 3 were affecting worry and social support, it is important to note that these manipulations may have also affected other variables that had an effect on reporting of skin cancer prevention intentions and behaviors. The induction of worry and perceptions of

social support is a complicated process, and it is virtually impossible to segregate worry or social support processes from other perceptions, feelings, and thoughts that may be influenced by the experimental manipulations. Even though the anticipated effects were found immediately following the manipulation, other variables may have influenced outcome measures. For example, the worry manipulation may have led participants to feel a heightened sense of risk or fear about skin cancer, which led them to endorse greater intentions to engage in skin cancer prevention behavior. Participants may have also engaged in social comparison processes, given that the experimenter was of similar age and ethnic background to them. They had more interaction with the experimenter during the social support manipulation, which may have influenced their intentions about skin cancer prevention behaviors.



## 5.0 DISCUSSION

This collection of studies demonstrates the complex relationship among worry, social support, and health decision-making. In general, findings were contrary to hypotheses. Functional and structural social support was related to cancer prevention decisions in Studies 1a and 1b, whereas worry was related to such decisions in Study 3. In Study 2, a trend towards significance was found for the moderating role of social support in the relationship between worry and health decision-making; however, it was not in the predicted direction. The relationship between worry and health decision-making will be discussed initially, followed by findings that social support is related to health decision-making, and then the trend towards significance found for the relationship between the interaction of worry and social support

The findings in Study 3 are consistent with the literature (e.g., McCaul & Mullens, 2003). Elevated levels of worry were related to intentions to wear sunscreen at baseline and follow-up as well as intentions to wear a hat at baseline. One of the key strengths of this study is that a more comprehensive measure of cancer worry was used in this study than in any of the other studies. The measure was five items and based on theoretical and empirical literature. In contrast, a one-item measure of worry was used in Studies 1a and 1b, whereas a three-item measure of worry was included in Study 2. Although additional research would need to be conducted, it is possible that these differences in the measurement of cancer worry explain why it was not related to health decision-making in any of the other studies. Study 3 findings also provide support for

the temporal relationship between cancer worry and health decision-making, which has been a limitation of previous work in cancer worry (Hay, Buckley, & Ostroff, 2005).

The results of Studies 1a and 1b, although inconsistent with the main hypothesis, shed light on the importance of examining interpersonal factors in health decision-making research. In Study 1a, women who belonged to at least one community organization or had people upon whom they could rely for a ride to their providers had greater intentions to use sunscreen. In Study 1b, participants who had been screened for colorectal cancer were more likely to belong to at least one community organization than those who had not been screened. A trend towards significance was found for the role of functional support, wherein participants who had been screened for colorectal cancer were more likely to speak more frequently with family and friends about their health than those who had not been screened. Although findings from both of these studies potentially have implications for the population as a whole, the findings in Study 1a should be interpreted with caution given the small sample size.

Study 2 was the only one to show a potential relationship among worry, social support, and health decision-making. A trend towards significance was found for the moderating role of functional support in the relationship between colorectal cancer worry and intentions to be screened for colorectal cancer. However, the relationship was not in the predicted direction, as participants who had low levels of worry and had several people upon whom they could rely for a ride to their provider indicated that they had *lowered* intentions to be screened at follow-up. The expected relationship between social support and worry was not found in the high worry group, as high levels of colorectal cancer worry and functional support did not predict intentions to be screened for colorectal cancer. Because of the small sample size, additional planned analyses that could further explore the moderating role of different types of social support on

worry and colorectal cancer screening decisions, could not be conducted. Of note, though, a comparison of the effect sizes for Studies 1b and 2 revealed that the model of the relationship of worry and social support to colorectal cancer screening was stronger in latter than in the former.

### **5.1.1 Theoretical implications**

Several theoretical implications in the study of the relationship between worry and health decision-making emerge from this series of studies. Given the findings regarding social support in Studies 1a and 1b, it may be important for health decision-making research to focus more on the role of interpersonal processes in decisions. Both functional and structural social support may play a key role in decisions about cancer prevention. As such, other facets of social support may be influential, including social isolation, quality of relationships, and role conflicts (Cohen, Gottlieb, & Underwood, 2000). Individuals may also experience social pressures that are health-promoting, depending on the types of peers in their social network (House, Landis, & Umberson, 1988). Social support processes may also have an influence on certain intrapersonal processes. For example, social support may be leading worried individuals to experience greater self-worth and motivation and access health-promoting sources of information (Cohen, Gottlieb, & Underwood, 2000). Individuals may also experience an increase in self-efficacy over their health, which leads them to feel more capable to seek out additional resources that can help them to make better decisions.

Although one of the goals of this set of studies was to examine the influence of the relationship of the provider of social support to the individuals, the results of these studies do not provide clear evidence for whether the effectiveness of social support on preventive health decision-making is contingent upon whether these supports have more intimate roles (e.g.,

family friends), as opposed to less intimate ones (e.g., co-workers; Dunkel-Schetter, 1984; Neuling & Winefield, 1988; Thoits, 1995). Study 3 provided the best opportunity to assess these differences, given that participants were asked how often they accessed information from different sources, including health professionals and friends. However, because social support did not appear to moderate the relationship between worry and health decision-making, no conclusions about the role of the functional support provider could be made.

The disparity between the findings in Study 3 and the remaining studies is noteworthy, as worry was the sole factor predicting skin cancer prevention decisions. As mentioned previously, the measurement of worry was more comprehensive in Study 3 than in the other studies, incorporating perceptions of vulnerability, fear, concern, and anxiety, and should not be ruled out as a contributing factor to the dissimilar findings. The measurement of worry has been an issue concerning researchers in health decision-making and no consensus has been reached regarding the best way to assess health-related worry (Hay, Buckley, & Ostroff, 2005). Future research in health-related worry should continue to address this issue, using measures of worry that are influenced by theoretical and empirical evidence. More specifically, a one-item measure of frequency of worry may not capture the complex intrapersonal process of worry.

In addition to the measurement of worry, other factors may have also played a role in the divergent findings, including differences in type of cancer examined as well as the different age groups examined for colorectal and skin cancer. Decisions to use sunscreen may have fewer barriers than being screened for colorectal cancer. In turn, worry may not be as effective for health decisions with certain types of perceived barriers. The barriers to colorectal cancer prevention, in comparison to skin cancer prevention, are characteristically different. Perceived barriers to colorectal cancer screening include the cost of the procedure, lack of health insurance,

inability to get to the medical provider, and poor knowledge about screening tests (Guessous et al., 2010; O'Malley, Beaton, Yabroff, Abramson, & Mandelblatt, 2004). Conversely, decisions to engage in skin cancer prevention behaviors are not typically affected by such barriers, which commonly include lack of recommendations by a healthcare provider and negative social influence by parents or peers (Glanz, Lew, Song, & Cook, 1999; Kasparian, McLoone, & Meiser, 2009). It is possible that, although worry can alert individuals to the presence of a problem (McCaul & Mullens, 2003), certain barriers may inhibit potential positive effects of social support on the relationship between worry and health decision-making about cancer prevention. For example, the role of social support may be greatly diminished in the relationship between worry and intentions to be screened for colorectal cancer if the individual does not have health insurance, as they are unable to pay for screening. Decisions to prevent skin cancer are not usually as costly.

The potential influence of the age differences between the skin and colorectal cancer populations on the results should not be minimized. Adolescents and young adults are more likely to make riskier decisions than older adults (Steinberg, 2004). Moreover, their peers may play a greater role in such decisions (Reyna & Farley, 2006). These differences may indicate that the role of social support in health decision-making varies across age groups and should be taken into consideration in future research.

### **5.1.2 Limitations**

Although these studies provide valuable insight into the relationship of social support and worry with health decision-making in cancer prevention, some limitations exist that affect the generalizability of the findings. The reduced power in Studies 1a and for one of the behaviors

(i.e., wearing a hat) examined in Study 3 made it difficult to draw clear conclusions when comparing the disparate findings of the two studies. Although the target population examined in Study 1a is frequently examined by researchers because they are at increased risk for sun damage that eventually leads to cancer (Mahler et al., 2005), focusing on this age group reduced the sample size and consequently, the power to find group differences. Whereas the use of an existing database allowed for a unique opportunity to examine the relationship among worry, social support, and skin cancer prevention in a nationally representative population, additional data could not be collected to increase sample size.

The differing samples examined in Studies 1b and 2 may account for the disparate findings in these studies. Study 1b included participants who had been screened for colorectal cancer, whereas Study 2 only contained individuals who had never been screened. Participants in Study 1b may have been characteristically different in their worry about colorectal cancer and use of social support than those who had never been screened. This difference is further complicated by the fact that data in Study 1b did not include when participants had been screened, leaving it unclear how much time had passed since the last screening or whether they were due for a follow-up screening soon. This limitation highlights the value of using a more homogeneous population of individuals (i.e., people who have not been screened) to examine the influence of worry on health decision-making about cancer prevention, as in Study 2. Although the sample assessed in Study 2 was a strength of this study, the reduced power was a limitation. Because of recruitment difficulties, sample size was reduced, which meant that relationships between different types of social support, worry, and colorectal cancer screening intentions could not be adequately examined. In general, reduced power was an issue for this set of studies, which resulted in eliminating or constructing composite measures when appropriate. Although

empirical and theoretical literatures guided this process, the main hypothesis of this set of studies could not be fully explored.

### **5.1.3 Future directions**

Even though there is minimal evidence here for social support as a moderating factor in the relationship between worry and health decision-making, further research should be conducted examining the role of social support in other types of preventive health decisions. An abundance of research demonstrates that social support is related to health, yet there is a dearth of research examining the influence of social support on preventive health decisions. The limited research makes it difficult to not only predict the specific facets of social support that might influence preventive health decision-making, but determine if social support moderates the relationship between worry and health decision-making.

In order to further clarify the ways in which social support might be contributing, an examination of the different types of social support (i.e., structural and functional) would be valuable. Although functional support is hypothesized to play a more consistent role in decisions about worrisome health conditions, structural support cannot be ruled out as a possible contributor to effective health decision-making given the findings in Studies 1a and 1b. One key measure of structural support that would be beneficial to examine, but was not included in this set of studies, is marital status. The complexities of its relationship with health (Kiecolt-Glaser & Newton, 2001), as well as the relatively younger samples in the skin cancer studies wherein the variability in marital status was limited, precluded it from being included in this set of studies. However, given the relationship between social support and health decisions about cancer prevention found in Studies 1a and 1b, marital status may play a pivotal role in health decision-

making. Researchers should also examine whether functional support providers with more intimate roles are more influential than functional support providers with less intimate roles in health decision-making in worried individuals, as worried individuals generally prefer receiving functional support from those with whom they have closer relationships (Dunkel-Schetter, 1984; Neuling & Winefield, 1988; Thoits, 1995).

An important avenue for future research would be to focus on examining the role of worry and social support in additional types of health decision-making in high risk populations to determine if this relationship exists in other health problems or influences health behaviors that could have an impact on disease. For example, it would be interesting for future research to focus on whether health-related worry influences key lifestyle changes, including regular visits to the healthcare provider, exercise, and diet.

Future research should continue to focus on expanding measurement of key variables, including a commitment to using multi-dimensional measures of health-related worry. The incorporation of advanced measurement techniques that more accurately measure complex intrapersonal processes would also be valuable. As seen in Study 3, the use of experimental paradigms in which worry or perceptions of social support are induced may not always have the intended effects and care must be taken so they do not seem contrived. It would be valuable for any future studies that are adequately powered to examine the effectiveness of the worry manipulation by conducting an analysis examining whether perceived worry immediately following the manipulation mediates the relationship between worry condition and health decision-making.

In addition to enhancing the research literature on worry and health decision-making, these findings have several clinical implications. Results from Studies 1a and 1b indicate that



individuals who are in a high risk age group may benefit from public health intervention as well as assessments by healthcare providers. Treatment providers may want to assess an individual's social support system, particularly for those who exhibit poor treatment adherence. In the case of colorectal cancer prevention, these individuals may have several barriers to screening and could benefit from public assistance programs or a social work intervention.

The findings from the skin cancer prevention studies indicate that worry may prompt individuals to engage in skin cancer prevention behavior. One way to influence worry may be to conduct interventions that include feedback about social norms. Recent research suggests that providing this information can increase intentions to engage in skin cancer prevention behaviors as well as self-reported behaviors (Mahler, Kulik, Butler, Gerrard, & Gibbons, 2008; White et al., 2008).

In summary, this series of studies provides further evidence for the role of worry and social support on health decision-making. The measurement of cancer-related worry in Studies 2 and 3 goes beyond the previous literature by developing multi-dimensional measures based on the theoretical and empirical literature. The relatively unique examination of the role of different types of social support in the complex process of health decision-making is an important step in understanding complicated *intra-* and *interpersonal* processes in health decision-making.

## **APPENDIX**

### **STUDY 3 PHOTO MANIPULATION**

Figure A1. Photo of female #1 taken with regular lens

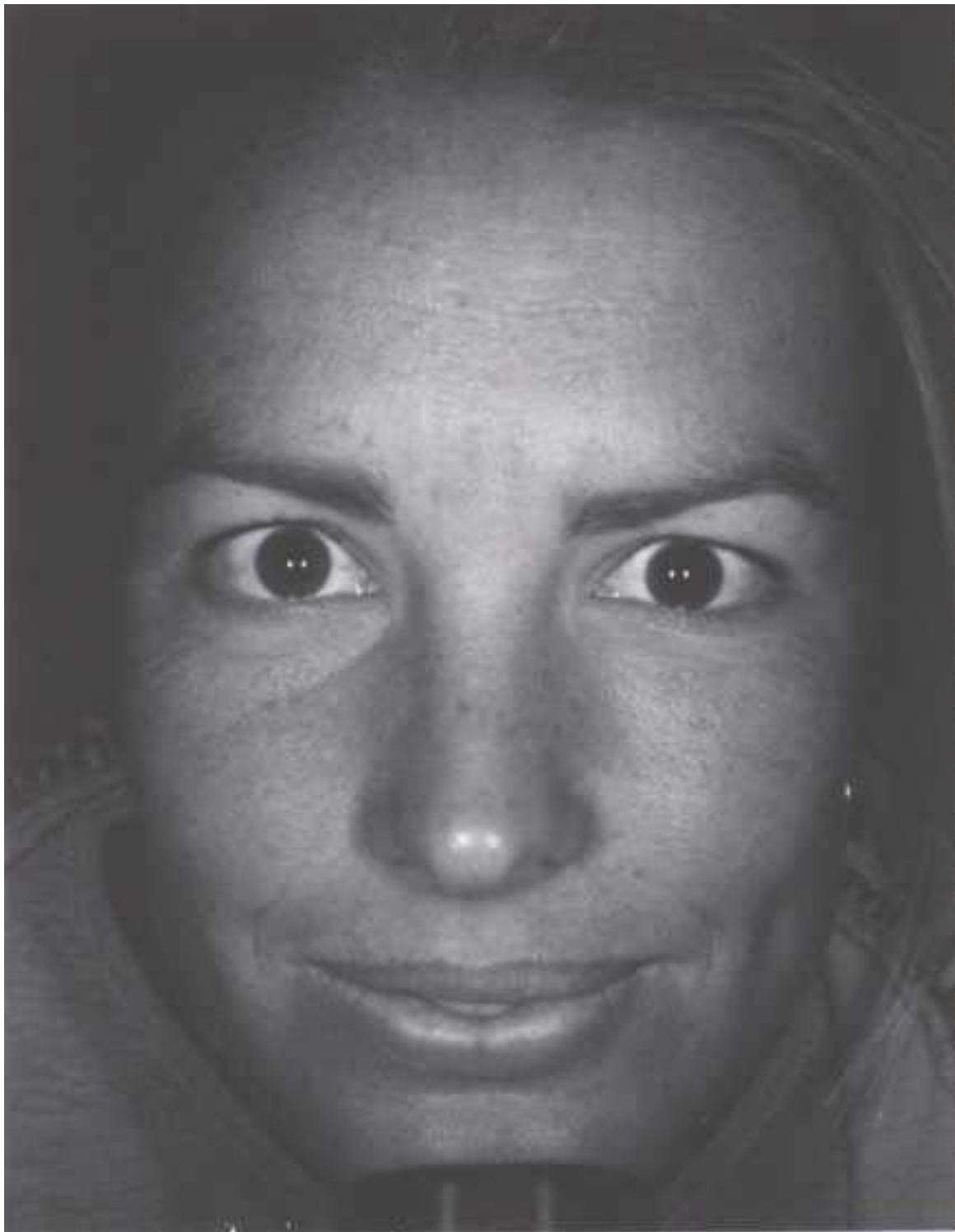


Figure A2. Photo of female #1 taken with ultraviolet lens

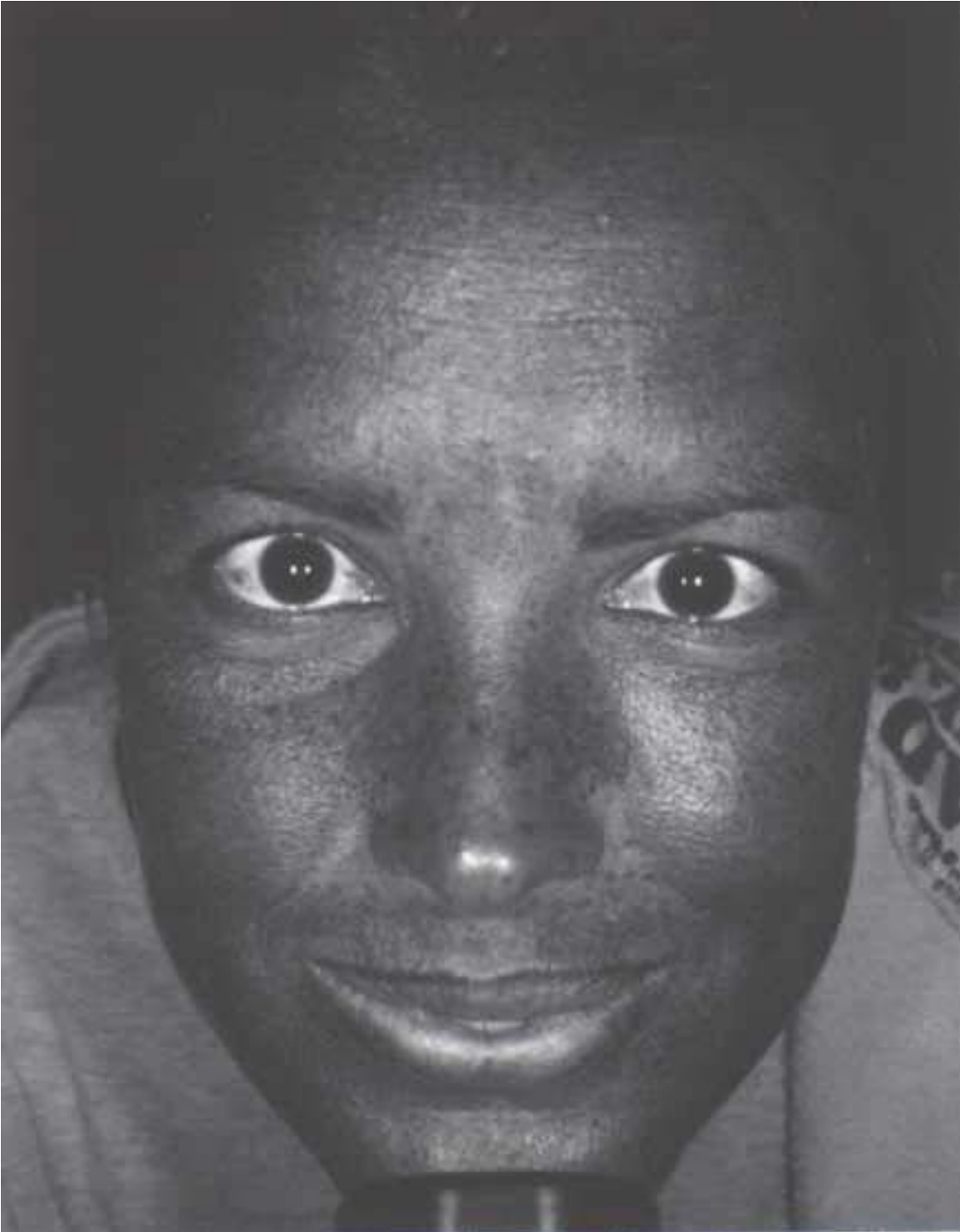


Figure A3. Photo of female #2 taken with regular lens



Figure A4. Photo of female #2 taken with ultraviolet lens



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