This is to certify that the
dissertation entitled

THE RELATIONSHIP BETWEEN BEHAVIORAL INTENTION, SELF-EFFICACY AND HEALTH BEHAVIOR: A META-ANALYSIS OF META-ANALYSES

presented by

DESIREE COLLEEN DUFF

has been accepted towards fulfillment
of the requirements for the

Ph. D. degree in Communication

Major Professor's Signature

August 16, 2010

Date

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By

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A DISSERTATION

Submitted to
Michigan State University
in partial fulfillment of the requirements
for the degree of

DOCTOR OF PHILOSOPHY

Communication

2010

ABSTRACT

THE RELATIONSHIP BETWEEN BEHAVIORAL INTENTION, SELF-EFFICACY AND HEALTH BEHAVIOR: A META-ANALYSIS OF META-ANALYSES

By

Desiree Colleen Duff

Many social-psychological theories and models applied to health communication research and practice posit two predictors, intention and self-efficacy, as proximal determinants of behavior. A number of meta-analyses have synthesized correlations as estimates of the relationships between behavior and the two predictors. However, these meta-analyses often have a focus that it is either broader than the health behavior domain—they do not limit their subject to just health behavior—or more narrow than the health behavior domain —they limit their subject to a single health behavior type, a theory, or an issue within health behavior research. This study contributed to health communication research by conducting a meta-analysis of meta-analyses limited to health behavior studies in order to assess the magnitude of the relationships between health behavior, intention and self-efficacy across health-related theories and behaviors.

For the intention-health behavior relationship, 174 tests with a combined sample of 36,168 participants derived from six meta-analyses produced a sample-weighted mean correlation of $r = 0.45$, a medium to large effect. For the self-efficacy-health behavior relationship, 173 tests with a combined sample of 33,836 participants from nine meta-analyses produced a sample-weighted mean correlation of $r = 0.28$, a moderate effect. For the intention-self-efficacy relationship, 180 tests with a combined sample of 54,348 participants from six meta-analyses produced a sample-weighted mean correlation of $r = 0.46$, a medium to large effect. When self-efficacy was distinguished from perceived

behavioral control, there was a statistically significant trend toward larger effects for the self-efficacy-health behavior relationship than for the perceived behavioral control-health behavior relationship. However, no significant difference was found between self-efficacy and perceived behavioral control in their relationship to intention.

The discussion highlights implications for health communication research and practice in light of the strength of the relationships between the variables, the interpretation of effect size, the relative homogeneity within results, the effects of meta-analytic techniques, and the need for future investigation using experimental rather than correlation-based designs.

ACKNOWLEDGMENTS

I would not have been able to complete this dissertation without the help and guidance of my dissertation advisor and members of my committee as well as the encouragement and support of my friends and family.

I would like to express my deepest gratitude to my dissertation advisor, Dr. Timothy Levine, whose intelligence, wit, creativity and insight have deeply influenced my approach to research and teaching. From the Solomon four-group design to meta-analysis, he expanded my research horizons and taught me that doing research can make a great story. His guidance and creative insight helped me traverse the uneven path of doctoral studies and bring it to a successful conclusion. Without his direction and persistent help this dissertation would not have been possible.

I am grateful to those who have served on my doctoral guidance committee, both past and present. Dr. Kami Silk's enthusiasm for health communication, her careful scrutiny of my writing and her positive spirit enhanced my program from prelim to final. Dr. Kim Witte, my research team advisor, stimulated my interest in health communication, exposed me to its application in international contexts, and taught me that one can juggle many aspects of life and career while having a global impact. Dr. Charles Salmon, Dr. Charles Atkin and Dr. Hye-Jin Paek have modeled scholarship and practical engagement in the field of health communication. Each of these scholars asked probing questions and suggested refinements that strengthened the dissertation.

Special thanks to Marge Barkman whose knowledge of program logistics, timely responses and gracious, optimistic spirit calmed the sometimes choppy waters of my doctoral voyage.

It is a pleasure to express my sincerest appreciation to my faithful friends and colleagues, especially Marcia, Valerie, Allison, Craig and Mike, for their encouragement and prayers. Their support, often from a distance through emails and phone calls, was immeasurable. Each of them, along with my family, reflected God's love and faithfulness to me.

I would like to express my thankfulness to my mother, whose belief in me and in the value of education inspired me to pursue my undergraduate and graduate degrees. Those beliefs as well as her personal and financial sacrifice paved the way for my doctoral degree and academic career.

Finally, I owe my most heartfelt gratitude to my faithful and loving husband, John, and our children, Ashley, Victoria, Justin, Hayley, and Josiah. Without complaining, John frequently sacrificed his time and interests, including work on his own doctoral degree, to make my work possible by doing everything from running errands, representing both of us at meetings and events, doing household chores—including the ones he dislikes most—and offering technical assistance on my dissertation, from procuring inter-library loan materials to learning how to format page numbers. Our children, who grew up with both parents working full time and pursuing doctoral degrees, unselfishly gave themselves to make the household run smoothly. They helped each other with projects and homework, and joyfully sang and danced their way through dinner clean-ups while limiting arguments—at least most of the time—to whose iPod to use for the musical accompaniment. I'm indebted to both John and our children for their enduring joy, laughter, and love while cheering me on through the long doctoral process.

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CHAPTER 1

INTRODUCTION

This chapter describes the purpose of the present research and defines the variables of interest: intention, self-efficacy, and health behavior. This chapter also previews the organization of the dissertation.

Purpose of the Research

The goal of many health communication campaigns and interventions is behavior change. Health and risk communication researchers and practitioners attempt to achieve that goal by applying principles found in social-psychological theories of behavior change. According to many of these theories, behavior change is realized by creating messages that influence beliefs and attitudes in order to alter intention states which ultimately motivate behavior. Specifically, several of these theories assert that the path from beliefs and attitudes to behavior is mediated by behavioral intention (Ajzen & Fishbein, 1973; Ajzen & Fishbein, 1980a; Kim & Hunter, 1993). Thus, the theories assume that individuals "do what they intend to do and do not do what they do not intend" (Sheeran, 2002, p. 1). In addition, some of these theories postulate that individuals will perform a behavior when they possess self-efficacy—the perception that they have the capabilities necessary to accomplish the behavior—and will avoid behavior for which they do not possess self-efficacy. Thus, these theories assert that behavioral intention and self-efficacy are key and most proximate determinants of behavior.

This theoretical view prompts health researchers and practitioners to focus their behavior change efforts on influencing behavioral intention, self-efficacy, or affect behavior. This focus often leads to treating intention or self-efficacy themselves as

outcome variables (see, for example, Mohtasham et al., 2009; Verbeke et al., 2008), a notion that is likely convenient for both researchers and practitioners given the relative ease of measuring a person's intentions or self-efficacy in lieu of measuring a person's actual behavior. However, such practice is warranted only to the degree to which the underlying assumption—that behavioral intention and self-efficacy are highly associated with health behavior—is correct.

The size of these associations has been reported in both basic and applied research involving various types of behavior including health behavior. Meta-analysis has been used to quantitatively synthesize these research results in order to estimate effects of behavioral intention and self-efficacy on behavior in general. Since some of these meta-analyses do not limit themselves to health behavior in their inclusion criteria for studies, the association between either behavioral intention or self-efficacy and health behavior cannot be distinguished from their association with other types of behavior. In other meta-analyses, the synthesized results come from health behavior alone but the focus of the study is limited in some way. For example, meta-analysis has been applied to studies of health behavior in order to estimate the effects for a targeted health behavior type (e.g., condom use in Sheeran & Orbell, 1998). It also has been employed to evaluate the predictive validity of a particular theory (e.g., protection motivation theory in Milne, Sheeran, & Orbell, 2000). And, meta-analysis has been used to examine conceptual and measurement issues (e.g., control constructs in Rodgers, Conner, & Murray, 2008). In light of criticisms of the fragmentation and confusion regarding inquiry in the field of health communication as well as the resulting calls for more synthesis and clarification (see, for example, Noar & Zimmerman, 2005), empirically determining the relationship

of these three variables across health communication theories and target behaviors would be an important contribution to the continually growing field of health communication. The purpose of this present study is to synthesize the results of health-related meta-analyses to assess the relationships between behavioral intention, self-efficacy and health behavior.

To make this assessment, a meta-analysis of meta-analyses is performed to estimate the effect sizes of the efficacy-behavior and intention-behavior relationships. The meta-analyses used in the study are retrieved through a broad search of the research literature in the social sciences as well as in science and medicine to ensure inclusion of as many health behavior studies as possible. The results of the search are then evaluated for study inclusion based on several criteria. These criteria require that studies include meta-analytic findings that have limited the units of analysis to applications of health behavior and report sample-weighted correlations for health behavior and either intention or self-efficacy or both or include statistics from which the relationships can be calculated. Studies meeting these standards are included in the meta-analysis of meta-analyses in which estimates of the relationships between the three variables and relevant statistics to test for heterogeneity are calculated using the product moment correlation.

Key Definitions

Definitions are provided for health behavior, behavioral intention, and self-efficacy. In addition, issues with self-efficacy at the conceptual and operational levels are discussed.

Health behavior. In this study health refers to an individual's physical well-being and health behavior refers to "any activity undertaken for the purpose of preventing or

detecting disease or for improving health and well-being" (Conner & Norman, 2005a, p. 2). In this study, health behavior is explored at the level of the individual as opposed to the level of a community or a society, and is performed for an individual's personal physical well-being. Therefore, health behavior is limited to activities performed by the individual on behalf of that individual's physical well-being. Health behavior can be either something a person does or refrains from doing (Gochman, 1997). Health behaviors therefore include behaviors that maintain, restore or improve health (Gochman, 1997).

Behavioral intention. Behavioral intention or simply *intention*, as it will be referred to throughout this dissertation, refers to an individual's belief state that he or she will willfully perform a future action. It indicates the amount of "effort [individuals] are planning to exert," and captures "the motivational factors that influence a behavior" (Ajzen, 1991, p. 181). Therefore, intention is identified as a proximal predictor and key determinant of behavior (see reviews by Abraham, Sheeran, & Johnston, 1998; Conner & Norman, 1996; Eagly & Chaiken, 1993; Sheeran, 2002).

Self-efficacy. The term *self-efficacy* represents "beliefs in one's capabilities to organize and execute the courses of action required to manage prospective situations" (Bandura, 1995, p. 2). That is, self-efficacy is the degree to which individuals perceive themselves capable of performing a given behavior (Bandura, 1977a). Implicit in the construct is the degree of control individuals perceive they have in performing a behavior (Bandura, 1997). In at least one theory, a person's perception of control over a behavior is considered a proxy for measuring actual control (Ajzen, 1991; Ajzen 2002). Whether or not it is regarded as a proxy for control, many theories posit that self-efficacy not only

directly determines behavior but also indirectly determines it through its effect on intention.

Some form of the self-efficacy construct from social cognitive theory (Bandura, 1986) has been adopted by most major models of behavior change (Conner & Norman, 2005b, p. 194) including the health belief model (Rosenstock, 1988), protection motivation theory (Rogers, 1975; Rogers, 1983), and the theory of planned behavior (Ajzen, 1991). In the theory of planned behavior, the self-efficacy component is called *perceived behavioral control* (*pbc*) (Ajzen, 1991). Some have argued that pbc is not the same as self-efficacy, either positing that pbc is really two distinct constructs, perceived control and perceived difficulty (Trafimow, Sheeran, Conner, & Finlay, 2002) or positing that it is comprised of three dimensions: perceived control, perceived difficulty and self-efficacy (Rodgers et al., 2008). Ajzen (2002) asserts that pbc and self-efficacy are similar, saying that self-efficacy together with controllability are both dimensions of the pbc construct. Discussions by both Ajzen (2002) and Bandura (1997) about pbc and self-efficacy suggest "considerable conceptual overlap in the operationalizations of each of the constructs" (Rodgers, et al., 2008, p. 608). Given the overlap in the measurement of these control constructs, the term *self-efficacy* will be used to identify the various forms of the construct in the present study except when a theory or a study identifies a particular term. Both intention and self-efficacy are delineated further within the discussion of theory in the following chapter.

Outline of Chapters

The current chapter has presented the purpose of the dissertation research and has provided definitions of health behavior, intention, and self-efficacy. Chapter 2 reviews

major theories that have been applied to health behavior research, further delineating self-efficacy and intention. Chapter 3 reviews the findings of the meta-analytic literature as well as some qualitative reviews of the relationships of interest to this study and poses the research questions guiding the present study. Chapter 4 outlines the methods guiding the research including procedures used in the literature search, the application of inclusion criteria, the coding of studies, and the meta-analysis itself. Chapter 5 reports the results of the meta-analysis, including tests of heterogeneity. For the purpose of comparison the results from two meta-analytic methods and from three tests of heterogeneity are reported. Finally, Chapter 5 discusses the results of the meta-analysis. In doing so, it highlights issues, implications, and limitations of the dissertation while suggesting directions for future research.

CHAPTER 2

THEORETICAL PERSPECTIVES

Several social-psychological theories incorporate the constructs of intention and self-efficacy as key predictors of behavior. Some of these theories, such as the theory of reasoned action and the theory of planned behavior, were developed to explain or predict behavior in general and then were applied to health behavior in particular, while others, such as the health belief model, were developed specifically for the purpose of predicting and ultimately changing health behavior. This chapter outlines the theories and models most frequently utilized in health behavior research that describe the role of intention and self-efficacy in behavioral prediction.

Social Cognitive Theory

Evolving out of the work of Albert Bandura (1977a, 1977b, 1982), social cognitive theory (SCT) attempts to explain how human behavior works. It posits several constructs that influence behavior—self-efficacy expectations, response-outcome expectations, goals, impediments, and inducements to behavior. Of these four constructs, self-efficacy is viewed as "the main and the most proximal predictor and antecedent of human behavior" (Luszczynska & Schwarzer, 2005, p. 133). A review of Bandura's (1977a) seminal work on self-efficacy elucidates self-efficacy's role in behavior change.

In the same year Bandura published his highly influential *Social Learning Theory* (1977b), he published his article highlighting the pivotal role of self-efficacy in the cognition-behavior relationship. In that article, Bandura (1977a) posits two types of expectations—self-efficacy expectations and response-outcome expectations. A self-efficacy expectation is "the conviction that one can successfully execute the behavior

required to produce the outcomes" (p. 193). A response-outcome expectation is "a person's estimate that a given behavior will lead to certain outcomes" (p. 193). Bandura makes a distinction between the two expectations because, he says, if a person doubts his or her ability to execute the specific activities necessary to produce a particular outcome (self-efficacy expectation), it is unlikely that he or she will act in spite of believing that those specific activities would indeed produce that particular outcome (response-outcome expectation). Therefore, self-efficacy is said to influence both the instigation of and perseverance in a behavior.

Self-efficacy influences the instigation of behavior because the more individuals believe a situation lies beyond their coping abilities, the more they will avoid it; conversely, the more individuals believe a situation lies within their coping abilities, the more they will engage in it. Self-efficacy influences perseverance in a behavior since individuals who experience success in a behavior will tend to continue that behavior even when obstacles are encountered. Self-efficacy, then, can "determine how much effort people will expend and how long they will persist in the face of obstacles and aversive experiences" (Bandura, 1977a, p. 194).

Self-efficacy is not enough to produce behavior; individuals also need the ability to actually perform the behavior as well as a reason to perform it (incentive). However, if these two components are present, self-efficacy is a "major determinant of people's choice of activities, how much effort they will expend, and of how long they will sustain effort in dealing with stressful situations" (Bandura, 1977a, p. 194).

There are four sources of self-efficacy: *performance accomplishments*, *vicarious experience* (*modeling*), *verbal persuasion*, and *physiological states* (*emotional arousal*)

(Bandura, 1977a). First, successful performance can lead to greater self-efficacy whereas failed performance, especially if experienced in the early stages of behavior change, can result in lower self-efficacy. Raised self-efficacy with respect to one type of behavior can generalize to greater self-efficacy in other behaviors as well. Second, modeling is seeing others successfully perform a behavior which, in turn, can encourage a sense of self-efficacy. However, modeling, also known as vicarious experience, is not as effective in raising self-efficacy as is actual performance. Third, verbal persuasion attempts to raise self-efficacy by imparting information that is designed to increase a sense of empowerment. It too is less successful than actual performance of the behavior, but when used in conjunction with performance opportunities, self-efficacy is increased to a greater degree than when performance opportunities are used alone. Fourth, physiological state is a reference to emotional arousal. Individuals who are "viscerally agitated" (p. 198) tend not to expect performance success. The fear they experience in thinking about engaging in the behavior can generate a greater fear than what is actually encountered during behavior performance.

Bandura (1977a) prescribes at least two conditions for the measurement of self-efficacy. First, self-efficacy and behavior should be measured at various stages of the behavior change process since each influences the other. Second, since self-efficacy relies on micro-analysis of a situation in all its factors, it should be measured specifically; that is, it should be measured in terms of a particular behavior within a particular context.

In brief, of the four variables in SCT that affect behavior change, self-efficacy is viewed as the most proximal to behavior. It has four possible sources in human experience, the most important of which is successful performance of the behavior itself.

Since behavior change is often incremental, self-efficacy strength can vary depending upon the stage of behavior change an individual has achieved. Measurements of self-efficacy must be tailored to the distinctive context within which the behavior is to be performed.

Theory of Reasoned Action and the Theory of Planned Behavior

Theory of reasoned action. The theory of reasoned action (TRA; Ajzen & Fishbein, 1980b; Fishbein & Ajzen, 1975) and the theory of planned behavior (TPB; Ajzen, 1991) are derived from the body of social psychological research on the attitudinal prediction of behavior. In this research, an individual's attitude toward an object is commonly conceived of as "a predisposition on his [sic] part to respond to the object in a consistently favorable or unfavorable manner (cf. Allport, 1935)" (Ajzen & Fishbein, 1973, p. 41). That is, attitude is thought to be a positive or negative evaluation of an object or behavior. In general, social psychologists implicitly assume that there is a strong explanatory relationship between attitude and behavior. However, in 1967, Fishbein observed that 75 years of attitude-behavior research had provided insufficient support for this belief (Fishbein, 1967). Wicker's (1969) review of the empirical research regarding attitude-behavior consistency supported Fishbein's observation, finding that attitude explained on average approximately ten percent of the variance in behavior. Wicker concluded that there was a greater likelihood of only a minimal or non-relationship between attitude and behavior than a close relationship.

A number of researchers, including Ajzen and Fishbein, attempted to explain the weak or insignificant attitude-behavior relationships found in the empirical research. Ajzen and Fishbein (1973) observed that the majority of explanations recognized the

insufficiency of traditional attitude measures, but viewed potential additional variables as sources of error variance rather than predictors of behavior. They proposed a theory, based on Dulany's (1968) theory of propositional control that integrated these behavioral determinants into a single conceptual framework in order to predict a specific behavior in a well-defined situation (Ajzen & Fishbein, 1973). Both Dulany's original theory and Ajzen and Fishbein's modified version, which became known as the theory of reasoned action, assumed that the overt behavior predicted by the theory is under a person's volitional control (rather than prompted by reflex or habit) and that "in a given situation, a person holds or forms a specific intention that influences his [sic] subsequent overt behavior" (Ajzen & Fishbein, 1973, p. 42). Therefore, the focus of these theories is on predicting a specific behavioral intention (Ajzen & Fishbein, 1973), implicitly assuming intention influences volitionally controlled behavior.

According to Ajzen (1991), behavioral intentions "are assumed to capture the motivational factors that influence a behavior; they are indications of how hard people are willing to try, of how much of an effort they are planning to exert, in order to perform the behavior" (p. 181). The theory of reasoned action asserts that intentions are determined by both a personal—attitudinal—factor as well as a social—normative—factor. The attitudinal factor constitutes a person's predisposition to respond favorably or unfavorably to performing a "particular act in a given situation with respect to a given object" (Ajzen & Fishbein, 1973, p. 42). As in their definition of behavioral intentions, Ajzen and Fishbein's definition of the attitudinal determinant emphasizes the importance of specifying the behavior as well as the conditions under which the behavior is to be performed. A person's attitude toward performing that behavior is dependent upon the

person's perceptions of both the consequences and the value of the particular behavioral act (Ajzen & Fishbein, 1973). In terms of health behavior, then, the attitudinal factor is a measure of a person's positive or negative evaluation of performing a specific health behavior in a given situation.

The normative factor, commonly referred to as subjective norm, consists of a person's beliefs about "the likelihood that members of a given reference group expect him [sic] to perform the behavior in question" (Ajzen & Fishbein, 1973, p. 43). The identity of one or more relevant reference groups—significant others—is dependent on the specific behavior and may be composed of individuals such as family members, friends, superiors or society as a whole (Ajzen & Fishbein, 1973). These subjective norms are modified by a person's motivation to comply with the relevant reference group(s). A subjective norm for a health behavior, then, consists of a measure of a person's belief about the expectations of significant others regarding his or her performance of the health behavior multiplied by his or her willingness to comply with significant others.

These two factors—attitude and subjective norm—are the only predictors of intention in the theory of reasoned action. They may be affected by other variables and consequently may vary in weight (Ajzen & Fishbein, 1973). To the extent these other variables influence behavior, they do so only by affecting attitude and subjective norm (Ajzen & Fishbein, 1973) which in turn affect intention.

Weighted measures of attitude and subjective norms should predict actual behavior when the relationship between behavioral intention and behavior is strong. Ajzen and Fishbein (1973) identify at least three conditions under which the intention-

behavior relationship may be weakened, thus decreasing the accuracy of prediction by the two major determinants. First, use of a general or abstract measure of intention, rather than a specific measure to predict a specific behavior, could reduce the intention-behavior relationship. Second, changes in a person's intention following measurement of intention but preceding measurement of behavior could lower intention-behavior correlation. Such changes may be due to new information about the consequences of performing the behavior or about the expectations of significant others. Third, lack of a person's complete volitional control over the behavior, possibly because of the person's abilities, circumstances or even other people, could weaken the intention-behavior relationship. Therefore, using specific measures of intention, shortening the time interval between measurement of intention and behavior, and ensuring volitional control should result in a close relationship between intention and behavior, and thus increase the predictive value of attitude and subjective norm for behavior.

Using specific measures and reducing time intervals are relatively easy when compared with ensuring volitional control. Few behaviors are within a person's total volitional control. Lack of time, finances, requisite skills and the support of others often diminish a person's actual control (Ajzen, 1985). Hence a person's actual control obviously will affect the probability of behavior performance. However, what is of interest to social psychologists is not actual control but the perception of control. Recognizing the importance of a person's perception of control prompted Ajzen to revise the theory of reasoned action.

Theory of planned behavior. Ajzen (1985, 1991) offered a revision of TRA, known as the theory of planned behavior (TPB), which retains all of the variables in the

original theory and introduces a single additional variable, perceived behavioral control (pbc; Ajzen & Madden, 1986), in order to predict behaviors not under total volitional control. In differentiating perceived behavioral control from other notions of control, Ajzen defined the construct as "the ease or difficulty of performing the behavior of interest" (1991, p. 183). Unlike locus of control, perceived behavioral control is situation specific and thus can vary widely depending on the context of the action and the action itself. Ajzen (1991) claimed perceived behavioral control was most similar to Bandura's (1977a, 1982) concept of perceived self-efficacy. Ajzen understands self-efficacy as the confidence one possesses to perform a particular action.

The construct of perceived behavioral control has proved to be a knotty one, even being called one of the "vexing problems" for the theory of planned behavior (Ajzen 2002, p. 666). Ajzen (2002) attempted to loosen the knot by attempting to clarify that pbc is not concerned with the outcome or results of a behavior but with the performing of it. Behavior outcomes are similar to Bandura's outcome expectations. In hindsight, Ajzen called perceived behavioral control "misleading" and indicated that pbc ought to be understood as "perceived control over performance of a behavior" (2002, p. 668). In the same article, Ajzen acknowledges the distinction between self-efficacy (beliefs about a behavior's ease or difficulty) and controllability (beliefs about to what degree a behavior lies within the control of the individual), but claimed these two constructs, rather than existing in isolation, together make up the "overarching, superordinate construct" of perceived behavioral control (2002, p. 680). For purposes of research, Ajzen maintains that studies can choose to treat pbc as a unified construct or can choose to distinguish between self-efficacy and controllability. Ajzen also argues that pbc is not related solely

to internal locus of control; rather, pbc is about beliefs regarding the execution of a behavior, whether the perceived obstacles or aids to the behavior are located internally or externally.

In the TPB, perceived behavioral control, attitude, and subjective norm independently influence behavioral intentions. Sometimes only one of these three constructs impacts intentions; at other times any two or all three might independently affect intentions. When pbc influences intentions, it indirectly influences behavior.

According to TPB, both perceived behavioral control and intention can directly predict behavior (Ajzen, 1985, 1991) depending on the context and the type of behavior. Intentions may be sufficient alone to predict behavior if an individual has total volitional control of an action. However, in cases where such control is lacking, perceived behavioral control will enhance prediction (Ajzen, 1991).

To summarize, a central premise of the theory of reasoned action is that behavioral intentions predict behavior when the behavior is volitionally controlled. The theory identifies two major determinants of behavioral intentions: attitude toward the behavior and subjective norms. It is assumed that all other variables potentially influencing intentions and behavior do so by influencing these two predictors. Attitude and subjective norms predict behavior when behavioral intentions are highly correlated with behavior. High correlation between intention and behavior is specified when the factors that lower the intention-behavior correlation, such as time interval, incomplete volitional control and lack of specificity in intention measurement, are avoided.

The theory of planned behavior extends TRA by including perceived behavioral control. The revision was necessary because TRA was not intended to predict behaviors

over which individuals did not have total volitional control. PBC constitutes a person's perceptions of control over enacting a behavior. These perceptions can directly affect behavior or can indirectly affect behavior by way of influencing intention.

Health Belief Model

The health belief model (HBM; Becker, 1974) originated in the field of public health in the 1950s and 1960s. It is comprised of three major components: perceived threat of a disease, perceived benefits of preventive behavior and perceived costs of preventive behavior (Becker, Maiman, Kirscht, Don & Drachman, 1977). Perceived threat consists of two elements—perceived susceptibility (the likelihood one will contract the disease) and perceived severity (the degree of physical and/or social harm brought on by the disease). Perceived benefits are what is believed to be gained from enacting a particular behavior and perceived costs are what is believed to be the associated loss—physical, social, financial—for engaging in the behavior. An additional component of the HBM is cues to action. These cues can originate internally, such as the experiencing of symptoms, or externally, such as a phone call to remind one to schedule a doctor's appointment. Demographic variables (age, race, gender, etc.) and social-psychological variables (personality, social status, peer group, etc.) are viewed as elements that could directly influence perceptions of susceptibility, severity, benefits and barriers, but they do not directly influence health behavior.

The original model was largely interested in avoiding illness. In order to account for new research findings in health behavior, Becker and associates (1977) recast the model to incorporate several other variables. One was a whole category of general health motivations which included a measure of an individual's intention to comply with

prescribed regimens. Added to the perceived benefits component was an assessment of "feelings of control over health matters" (Becker et al., 1977, p. 350). In this revision, intention and control were understood as part of the larger components of health motivation and perceived benefits respectively.

Later, the health belief model was revised again to incorporate the concept of self-efficacy as an independent variable (Rosenstock et al., 1988) joining the model's original variables of cues to action, perceived susceptibility, perceived severity, perceived benefits, and perceived barriers. In this revision, self-efficacy is viewed as having a direct effect on behavior.

Protection Motivation

Being a special application of expectancy-value theories, protection motivation theory (PMT; Rogers, 1975) stemmed from an attempt to provide conceptual clarity to fear appeals and their impact on attitude change. A fear appeal is made up of three components: the seriousness of the threat (*noxiousness* or *severity*), the likelihood the threat will be realized (*vulnerability*), and the efficacy of the suggested remedy (*response efficacy*). Each component is matched by a cognitive process which evaluates the corresponding fear appeal component. The noxiousness of the event will be assessed for severity while the event's likelihood will be assessed for probability. The proposed remedy will be assessed for efficacy. A positive evaluation of all 3 components—the threat is serious, the likelihood that the threat will be realized is high and the proposed remedy is efficacious—will produce a motivation to protect oneself from the threat. This motivation to protect oneself is synonymous with the formation of an intention to act

(Milne et al., 2000; Norman, Boer, & Seydel, 2005). The intention to act will not be formed if any one of these three components is appraised negatively (Rogers, 1975).

Refinements to PMT included the addition of self-efficacy as a fourth component to the theory (Maddux & Rogers, 1983). Self-efficacy was seen to have a direct effect on intention. Another refinement was the splitting of the appraisal process into two distinct appraisal activities—threat appraisal and coping appraisal (Rogers, 1983). The threat appraisal consists of evaluating the severity of the threat and of the probability of threat actualization. If a threat is deemed severe, and its actualization is considered probable, then the potential for intention formation is high. However, the possibility of intrinsic and extrinsic rewards for ignoring the fear appeal can promote maladaptive responses and derail the formation of protection motivation. Hence, the threat appraisal directly affects intention formation.

The coping appraisal phase involves evaluating the efficacy of the proffered remedy as well as evaluating one's confidence (self-efficacy) that one can implement it. Coping appraisal is affected by perceived barriers that might hamper realization of the adaptive behavior.

In sum, protection motivation theory postulates that the intention to adopt a behavior is directly influenced by five assessments including an assessment of the severity of the threat, the likelihood of the threat, the vulnerability to the threat, the antidotes to the threat, and the confidence in the antidote. PMT includes self-efficacy as one of three factors in coping appraisals which, along with threat appraisals, predict the intention to perform adaptive or maladaptive behaviors.

Transtheoretical Model (Stages of Change)

The transtheoretical model (TTM; Prochaska & DiClemente, 1982, 1983; Prochaska, DiClemente, & Norcross, 1992; Prochaska & Velicer, 1997) organizes behavioral change temporally into a series of stages of varying degrees of motivation to change. TTM was developed in large part as an attempt to bring a degree of synthesis among the many theories of psychotherapy (Prochaska & DiClemente, 1982). Because human behavior is a complex phenomenon, TTM assumes no one theory will offer full explanatory power of behavior change and therefore it attempts to glean the best insights from many theories. It has been called the most "dominant stage model in health psychology and health promotion" (Sutton, 2005).

Rather than envisioning behavior change as a single event, TTM recognizes behavior change as a process spanning six stages and realized via 10 processes of change (Prochaska & DiClemente, 1982; Prochaska & Velicer, 1997). Although ideally an individual would progress linearly from the first stage to the last, it is possible an individual could relapse to a former stage or could remain indefinitely within a stage (Prochaska & DiClemente, 1983).

In TTM, intention strength varies in the first three stages of behavior change. In the first stage of change—precontemplation—there is no intention to change in the foreseeable future. In the second stage—contemplation—there is intention to change in the next six months, while in the third stage—preparation—there is the intention to make immediate change (Prochaska & Velicer, 1997). Thus each stage reflects varying degrees of behavioral intention.

The final three stages reflect varying degrees of behavioral enactment. The fourth stage is the action stage in which behavior change has been initiated and maintained for less than six months. After six months of behavior change, one moves into the fifth, or maintenance, stage. The final stage is termination, described as "the stage in which individuals have zero temptation and 100% self-efficacy" (Prochaska & Velicer, 1997, p. 39). It is debatable whether an individual ever achieves termination; hence, researchers typically devote their energies to studying the first five stages (Prochaska & Velicer, 1997; Sutton, 2005).

In addition to intention and behavior, TTM recognizes the importance of self-efficacy in behavior change. Adopted from Bandura's (1977a) self-efficacy theory (Prochaska & DiClemente, 1983; Prochaska & Velicer, 1997), it is defined as "the situation-specific confidence people have that they can cope with high risk situations without relapsing to their unhealthy or high risk habit" (Prochaska & Velicer, 1997, p. 40). The TTM assumes that a person's behaviors are at least partially under his or her control; consequently interventions at the various stages of change have focused on strengthening the control dimension (Prochaska & Velicer, 1997, p. 41). Similar to intention, self-efficacy strength is stage specific; self-efficacy increases as one progresses through the stages of change. For example, compared to previous stages, the maintenance stage finds people "more confident" they can maintain their behavioral change (Prochaska & Velicer, 1997, p. 39).

To summarize, the transtheoretical model consists of six stages involving ten processes through which behavior change is realized. The first three stages of the model, precontemplation (no intention), contemplation (intention to change in next six months),

and preparation (intention to make immediate change) signify varying degrees of behavioral intention. The stages of action, maintenance and termination represent degrees of behavioral enactment. Self-efficacy is considered a determinant of change which increases as progress is made across the stages. Thus, as self-efficacy increases, intention increases such that intention translates into actual behavior.

This review of some of the major social-psychological and public health theories used in the study of health behavior reveals the importance of intention and self-efficacy in the explanation of human behavior. These constructs have garnered significant attention from researchers with respect to how they impact behavior and how they are inter-related to one another. Some of the results from some of this attention will are discussed in the following chapter.

CHAPTER 3

REVIEW OF PREVIOUS FINDINGS

This chapter examines former reviews of the relationships between intention, control and behavior, highlighting those that synthesize quantitative findings through the use of meta-analysis. In addition, the research questions guiding the present study are presented.

Intention and Behavior

Qualitative and quantitative reviews have examined intention-behavior consistency, the mediating role of intention between attitude and behavior, and the size of the effect of intention on behavior. These works have provided evidence for the role of intention as a proximal predictor of behavior as asserted in many social-psychological theories.

In an early explication of the theory of reasoned action, Ajzen and Fishbein (1973) examined ten studies conducted by Fishbein and his associates to provide empirical support for the predictive validity of their theory. Seven of the investigations, a number of which involved strategy games but which also included a study of undergraduates' premarital sexual intercourse, tested the theory's assumption of intention-behavior consistency. The reported intention-behavior correlations in these studies ranged from 0.17 (Fishbein, 1966) to 0.90 (Ajzen & Fishbein, 1970). According to Ajzen and Fishbein (1973), the varying results provided support for both intention-behavior consistency and the weakening effects of various conditions. The larger correlations led Ajzen and Fishbein to conclude that a high degree of accuracy in predicting behavior from intention can be achieved (p. 47), thus supporting the

assumption of intention-behavior consistency. The smaller correlations led the researchers to explain that prediction can be problematic when conditions such as a lack of specific measurement, incomplete volitional control, or the presence of intervening processes exacerbated by a larger time interval between measurement of intention and behavior reduce the relationship (Ajzen & Fishbein, 1973, p. 48). These conditions are similar to the reasons for heterogeneity in the intention and behavior relationship listed by Sutton (Sutton, 1998) in his review of the theory of reasoned action and the theory of planned behavior.

Kim and Hunter (1993) investigated the mediating effect of intention between attitude and behavior. Their meta-analysis involved studies measuring attitude, intention and behavior deemed to be under some degree of volitional control. Their population of studies represented a broad range of topics including health-related behaviors among other behaviors such as church attendance, television viewing, party attendance, and cheating. Forty-seven correlations of behavioral intent and behavior with a combined sample of 10,203 participants resulted in a weighted mean correlation of 0.46. A chief concern in the study was the attenuating effects of errors common to social scientific research, namely restriction in range stemming from the artificial dichotomization of variables and error of measurement. When corrections were made for artificial dichotomization, the mean correlation increased to 0.54. Finally, when corrections were made for artificial dichotomization and error of measurement, the correlation between intention and behavior increased to 0.82. These corrections produced some of the largest effect sizes for the intention and behavior relationship reported in the literature.

In addition to drawing attention to the effects of sources of error on the intention behavior relationship, Kim and Hunter's meta-analysis provided support for at least two other findings. First, the results supported the moderating effect of attitudinal relevance—the match in specificity between attitude and behavior—not only on the attitude-behavior relationship but also on the intention-behavior relationship such that a low match in attitudinal relevance was related to a lower intention-behavior correlation. Second, based on the results of the meta-analysis and the close fit for the data in tests of a path model, Kim and Hunter's research strengthened the argument for the mediating role of intention in the attitude-behavior relationship leading the researchers to conclude that "future theoretical work should assume the mediator view of intention" (Kim & Hunter, 1993, p. 355).

Several other meta-analyses have estimated the size of the relationship between intention and behavior. Their estimates have indicated medium to large effects for the relationship, according to Cohen's (1992) standards. For example, Sandberg and Conner (2008) reported a correlation of 0.40 ($k = 8$), a medium effect. Van den Putte (1991) as cited in Eagly and Chaiken (1993) reported a correlation of 0.62 ($k = 58$), a large effect. Effect sizes from several other meta-analyses have fallen within this range (see, for example, Armitage & Conner, 2001; Eckes & Six, 1994; Notani, 1998; Randall & Wolff, 1994; Sheppard, Hartwick, & Warshaw, 1988; Trafimow et al., 2002). Sheeran (2002) conducted a meta-analysis of 10 meta-analyses with what he considered to be a modest overlap of studies and found a large effect of 0.53 based on 422 tests and a sample size of 82,107. According to these results, intention explained approximately 28% of the variance in behavior.

Not all studies have yielded effect sizes as large as those just described. Webb and Sheeran (2006) conducted a meta-analysis limited to experimental tests to ascertain whether changing intention produces a subsequent change in behavior. They found that "a medium-to-large change in intention (d = 0.66) engenders a small-to-medium change in behavior (d = 0.36)" (p. 260). While these results provide evidence for intention as a proximal predictor of behavior, the size of the effect of intention on behavior was smaller than those found in the meta-analyses of correlation studies.

Reviews that have limited their units of analysis to health behavior studies have reported both medium and large effects for the association between intention and behavior. In their systematic review of the theory of planned behavior, Godin and Kok (1996) formulated seven categories of health behaviors, estimating the effect of intention and behavior for each behavior type. The categories included addictive behavior, auto-related behavior, clinical and screening behavior, eating behavior, exercise behavior, HIV/AIDS related behavior and oral hygiene. While Godin and Kok considered their review to be qualitative since their correlations were not sample-weighted, they calculated average correlations and ranked behaviors. The highest correlation for intention and behavior was 0.56 (k = 5) for addictive behavior and the lowest correlation was 0.35 (k = 6) for clinical and screening behavior. Godin and Kok estimated the average correlation of the combined health behavior categories to be 0.46 based on the 26 studies they reviewed.

Meta-analytic reviews of health behavior also have reported medium to large effects. For example, in a study primarily focused on physical activity but including other health behaviors (Hagger & Chatzisarantis, 2009), the average correlation between

intention and the health behaviors was 0.51(k = 28), a large effect (see also Rodgers et al., 2008). Milne (2000) found a medium effect for intention and health behaviors as did a number of quantitative analyses synthesizing studies focused on a single health behavior such as condom use (Albarracin, Kumkale, & Johnson, 2004; Sheeran & Orbell, 1998; Sheeran, Abraham, & Orbell, 1999), screening attendance (Cooke & French, 2008), and physical activity (Hagger, Chatzisarantis, & Biddle, 2002).

Self-Efficacy and Behavior

Meta-analytic research regarding the self-efficacy and related control variables such as perceived behavioral control (pbc) has examined the degree to which the variables predict behavior and has explored the nature of the constructs themselves, particularly in terms of precisely what they are measuring. These meta-analyses suggest a number of important conclusions.

Meta-analysis has provided support for the multi-dimensionality of perceived behavioral control and the relative effect of each dimension on behavior. PBC has been disaggregated into two (Trafimow et al., 2002) and three components (Armitage & Conner, 2001; Rodgers et al., 2008). Armitage and Conner (2001) distinguished between three types of perceived control measures. The first, self-efficacy, was defined as "confidence in one's own ability to carry out a particular behavior" (p. 479). Scales that measured participants' beliefs about their abilities, capabilities, or confidence regarding the performance of a behavior were coded as self-efficacy measures. The second measure, perceived control over behavior, was defined as "perceived controllability of behavior" (p. 479). Self-assessments of the degree to which participants believed performing a behavior was up to them or under their own control were categorized as

perceived control measures. Finally, pbc was defined as "perceived ease or difficulty of performing behavior" (p. 479). Measures of perceptions about the ease or difficulty of performing a behavior or mixed measures of ease/difficulty items or either or both of the other measures (self-efficacy or perceived control) were treated as perceived behavioral control. Perceived control over behavior had the smallest effect on behavior ($r = 0.18$, $k = 6$) and perceived behavioral control had the largest effect ($r = 0.40$, $k = 40$). Self-efficacy fell between the other two measures ($r = 0.35$, $k = 13$).

In another analysis of perceived behavioral control (Trafimow et al., 2002), measures were divided into perceived difficulty, and perceived control. Results indicated that perceived difficulty ($r = 0.48$, $k = 9$) correlated more highly with behavior than did perceived control ($r = 0.27$, $k = 12$).

Similarly, Rodgers and associates (2008) conducted a meta-analysis of variables from the theory of planned behavior in which they compared self-efficacy, perceived difficulty and perceived control as predictors of both intentions and health behaviors. Both self-efficacy and perceived control were operationalized in a manner comparable to their measurement in Armitage and Conner (2001). Perceived difficulty was similar to pbc but was limited to measures of perceived ease or difficulty of performing a behavior. As in Armitage and Conner (2001), perceived control ($r = 0.22$, $k = 16$) had the smallest effect on behavior among the three variables. However, unlike Armitage and Conner (2001), the effect for self-efficacy and behavior ($r = 0.46$, $k = 9$) was higher than the effect for perceived difficulty and behavior ($r = 0.39$, $k = 9$), leading to the conclusion that self-efficacy had the greatest predictive validity among the three variables.

Within the health behavior literature, the labels and distinctions made between the self-efficacy—or control—variables have been diverse. As previously described, some studies have made distinctions between three control-type variables: self-efficacy, perceived difficulty and perceived control (e.g., Rodgers, 2008). Others have distinguished between self-efficacy and perceived behavioral control (e.g., Norman & Hoyle, 2004) or have identified only one variable of interest (e.g., Cooke & French, 2008; Forcehimes & Tonigan, 2008). Still others have made no distinction between the variables, typically combining all self-efficacy/control measures (e.g., Gwaltney, Metrik, Kahler, & Shiffman, 2009).

The results from meta-analyses already cited and others surveyed have indicated small (e.g., Notani, 1998: $r = 0.24$, $k = 45$) to medium effects (e.g., Armitage and Conner, 2001: $r = 0.37$, $k = 60$) for various forms of the self-efficacy variable and behavior. Results from at least one study (Sandberg & Conner, 2008) have implied that the association between the perceived behavioral control and behavior was small ($r = .11$, $k = 8$) and not significant.

Meta-analyses that have focused on health behavior, such as Rodgers et al. (2008) discussed previously, have reported effect sizes that typically have fallen within the small (Milne, et al., 2000: $r = 0.22$, $k = 5$) to medium (Gary Holden, 1991: $r = 0.35$, $k = 45$) range both for combinations of health behaviors and for specific behaviors such as condom use (Albarracin, et al., 2004), screening programs (Cooke & French, 2008), alcohol abstinence (Forcehimes & Tonigan, 2008), and physical activity (Hagger et al., 2002; Hausenblas, Carron, & Mack, 1997). In their qualitative review, Godin and Kok (1996) reported an average correlation for perceived behavioral control and health

behavior of 0.39 (k = 23), with addictive behavior studies yielding the highest average correlation (r = 0.51, k = 3) and clinical screening studies yielding the lowest (r = 0.29, k = 6) among their behavioral categories.

Self-Efficacy and Intention

In addition to having a direct influence on behavior, according to theory, the self-efficacy variable is said to have an indirect influence through intention. Meta-analytic studies have provided evidence for the association between self-efficacy variables and intention, although the size of the association has varied. Rivis and Sheeran (2003) reported a small effect for perceived behavioral control and intention (r = 0.21, k = 14). However, a survey of meta-analyses suggests that medium effects are reported more frequently for the self-efficacy and intention relationship than are small effects. For example, Sandberg and Conner (2008) found a medium effect (r = 0.30, k = 24) as did Ouellette and Wood (1998: r = 0.49, k = 11).

Health-related meta-analyses have found both medium and large effects. Rodgers and associates (2008) found a large average correlation for self-efficacy and intention in health behavior studies (r = 0.63, k = 9). For health-related activities, Milne et al. (2000) reported a medium correlation of 0.33 (k = 13) while Haggar and Chatzisarantis (2009) found a large correlation of 0.51 (k = 24). Other meta-analyses of health behaviors have fallen within the range of medium effects (e.g., Albarracin et al., 2004; Cooke & French, 2008; Hagger et al., 2002).

In their systematic review, Godin and Kok's (1996) un-weighted correlation for intention and perceived behavioral control was 0.46 (k = 58) with the largest correlation

found for oral hygiene (r = 0.67, k = 6) and the smallest (r = 0.32) for two behavior categories, eating (k = 8) and HIV/AIDS (k = 8).

In their argument for the multi-dimensionality of perceived behavioral control, Trafimow and associates (2002) reported that perceived difficulty had a large effect on intention (r = 0.53, k = 12) while perceived control had only a small effect (r = .27, k = 12). Likewise, applying the same definitions to each control component as they did for these components' association with behavior, Armitage and Conner (2001) found a smaller correlation for perceived control (r = 0.23, k = 7) than they did for either self-efficacy or perceived behavioral control. The correlations for both self-efficacy (k = 28) and perceived behavioral control (k = 101) were identical (r = 0.44); however, self-efficacy (7%) explained a greater percent of the variance in intention than did perceived behavioral control (5%). Perceived control explained 1% of the variance in intention. When Rodgers et al. (2008) distinguished between self-efficacy, perceived difficulty and perceived control, they found large correlations for both self-efficacy and intention (r = 0.63, k = 9) and perceived difficulty and intention (r = 0.56, k = 9). In contrast, they found a small correlation for perceived control and intention (r = 0.24, k = 16). Consistent with their conclusion regarding the control components and behavior, Rodgers and associates argued that these results pointed to the conclusion that self-efficacy was a stronger predictor of intentions than were either perceived difficulty or perceived control.

Research Questions

The purpose of the present study is to empirically assess the relationships between intention, self-efficacy and health behavior. While theories assert that the relationships are positive and quantitative evidence supports the assertion, the magnitude of the

relationships for health behavior is less certain. In addition, there is some evidence supporting distinctions between self-efficacy type constructs, implying that there may be a difference between the associations of self-efficacy with both intention and health behavior and the associations of perceived behavioral control with both intention and health behavior. Therefore, five research questions guide the present research:

RQ1: What is the magnitude of the relationship between intention and health behavior?

RQ2: What is the magnitude of the relationship between self-efficacy and health behavior?

RQ3: What is the magnitude of the relationship between intention and self-efficacy?

RQ4: When a distinction is made between self-efficacy and perceived behavioral control, is there a significant difference between the magnitudes of their relationship with health behavior?

RQ5: When a distinction is made between self-efficacy and perceived behavioral control, is there a significant difference between the magnitudes of their relationship with intention?

CHAPTER 4

METHODOLOGY

The following discussion of the criteria for study inclusion, search strategies, treatment of studies, and meta-analytic procedures provides a basic overview of the methodology for the meta-analysis of meta-analyses.

Criteria for Study Inclusion

To be eligible for inclusion in the meta-analysis of meta-analyses, a study had to meet the following criteria.

Meta-analytic results. Eligible studies must have reported the results of a meta-analysis that used procedures consistent with those advanced by Glass (1976), Rosenthal and Rubin (1979), Hedges and Olkin (1985) or Hunter and Schmidt (1990).

Health behavior. To be considered for inclusion, a meta-analysis had to focus on health behavior. Health behavior was limited to the behavior of an individual, as opposed to a community or organization. As defined in Chapter 1, health behavior refers to activities that individuals perform in order to prevent or detect disease or to improve their own physical well-being (Conner & Norman, 2005a). Therefore, health behavior can be either something a person does or refrains from doing (Gochman, 1997).

For this study, the outcome behavior of every study within a meta-analysis had to be a health behavior. A meta-analysis could focus on a single type of health behavior, such as condom use (Sheeran et al., 1999) or could include several types of health-related behavior (Holden, 1991). Each meta-analysis was coded for health behavior type.

Key relationships. To be included in this study, a meta-analysis had to assess the statistical relationship between either health behavior and intention or health behavior

and self-efficacy. For this study, the self-efficacy variables were self-efficacy and perceived behavioral control (pbc). A meta-analysis could report the relationship between health behavior and one or both self-efficacy variables or, as done in this study, could report the relationship between health behavior and a combined control variable including both self-efficacy and pbc.

Relevant statistics. To be included in this meta-analysis, the study had to provide sufficient information for analysis. Eligible meta-analyses had to report sample-weighted correlations for the relationships of interest. In addition, eligible meta-analyses had to include the number of participants (*N*), and the number of studies in the meta-analysis (*k*) for each correlation.

Language. While inclusion criteria were not set for publication date or type, participant populations, or geographical location, a restriction was set requiring eligible studies to be available in English.

Search Strategies

Several electronic databases were searched to retrieve potential meta-analytic studies for inclusion in the present analysis. Selected for their content's relevance to health behavior, these databases included the Web of Knowledge, PsycInfo, ComAbstracts, and ProQuest Dissertations and Theses.

Description of databases. The Web of Knowledge includes the MEDLINE and the Web of Science as well as other science-related databases. MEDLINE, the National Library of Medicine's bibliographic database, provides bibliographic information from articles in approximately 5400 national and international biomedical journals from 1947 to the present concerned with biomedicine and health. The Web of Science includes the

Science Citation Index Expanded (SCI-EXPANDED) from 1900 to the present, Social Sciences Citation Index (SSCI) from 1956 to the present and, the Arts and Humanities Citation Index (A&HCI) from 1975 to the present. The Science Citation Index Expanded includes 5300 journals from multiple disciplines including medicine. The Social Sciences Citation Index covers the journal literature from 1956 to the present. It includes the complete contents of 1700 journals in addition to selected articles from 3300 scientific and technical journals representing more than 50 disciplines.

PsycInfo, produced by the American Psychological Association, includes citations from psychology and related disciplines relevant to this study, including sociology, nursing and health. In addition to bibliographic information from more than 1300 journals, it includes citations from books and book chapters, dissertations and technical reports. The database includes citations dating back to 1806.

The ComAbstracts database includes citations from over 50 journals in addition to book chapters, reports, and other resources relating to the field of communication, some of which date back to 1935. ProQuest Dissertations and Theses contains citations and abstracts for dissertations and theses from both United States and international institutions.

Search terms. The term *meta-analysis* was combined with forms of twelve other terms using Boolean operations in a series of searches of titles, abstracts and key descriptors (for PsycInfo, *keywords* and Web of Knowledge, *topic*). Seven of the terms related to theories and models that incorporate the variables of interest: *reasoned action, planned behavio*, health belief, protection motivation, social cognitive, health action, transtheoretical, behavio* prediction.* Each of the terms was combined with *meta-*

analysis in a search of all databases. Five additional terms were related to the variables of interest: *intend**, *intent**, *self-efficacy*, *perceived behavio* control*, and *perceived control*. All five terms were combined with either *meta-analysis* or its variation, *meta-analytic review*. The combinations were employed in all database searches with the exception of the search of the Web of Knowledge where combinations of *meta-analysis* or *meta-analytic review* with *intent** or *intend** were limited to searches of the Social Science Citation Index. This limitation was placed on the search because of the return of numerous irrelevant results due to the widespread use of *intent** and *intend** in common language as well as the use of *intention-to-treat* in health-related research.

While the intent of the database search was to locate meta-analyses focusing on health behavior only, the search was not limited by the terms *health*—or any specific health behavior—in an effort to include all possible health behavior meta-analyses. The reason for this decision was two-fold. First, not all health-related meta-analyses use the term *health* in their titles, abstracts, or as key descriptors. Second, while many studies identify specific health behaviors in their titles, abstracts, or as key descriptors, it was considered possible that some meta-analyses could be missed if a specific health behavior—or forms of its related terms—were not included in the list of terms combined in the database search. Therefore, rather than assume that all health behaviors had been identified as search terms, no specific health behavior terms were included.

Results of search. This search for any meta-analyses related to the variables of interest and relevant theories produced 931 results. Removing duplicates reduced the number of results to 749. Studies that did not involve a health behavior were excluded reducing the number of potential studies to 145. These studies were hand searched,

applying the other criteria for study inclusion. Those that did not limit their focus to health behavior were excluded (e.g., Sheppard, Hartwick, & Warshaw, 1988). Studies that did not report results of a meta-analysis were rejected (Norman and Hoyle, 2004). Studies were removed if they did not include intention, self-efficacy or perceived behavioral control as variables (e.g., Baer, 2003). Studies were excluded if they did not report a correlation between the variables of interest (e.g., Floyd, Prentice Dunn, & Rogers, 2000). Studies that did not include health behavior as an outcome variable but instead treated intention (e.g., Mohtasham, 2009) or self-efficacy (e.g., Netz, Wu, Becker, & Tenenbaum, (2005) as outcome variables were excluded. Those that combined intention and behavior into a single outcome variable were removed (e.g., Casey, Timmermon Allen, Krahn, Turkiewicz, 2009). Finally studies that did not report statistics necessary for meta-analysis, such as sample size, were excluded (e.g., Gillis, 1993).

At least two dissertations (Agnew, 1994; Forsyth, 2000) that required further investigation to determine whether they should be included in the study were not available at the time of this study. When dissertations appeared to meet inclusion criteria, they were compared with published works by the same author. When identical meta-analytic findings were reported in both (e.g., Holden, 1990, 1991), only one set of findings—the published version—was retained since it was considered more easily retrievable by future researchers.

Through these processes, the search for meta-analyses resulted in 12 meta-analyses eligible for inclusion in the present study. This number was reduced further after an inspection of the studies within each meta-analysis to determine any overlap. That is, to address violations of the assumption of data independence, the eligible meta-analyses

were inspected to determine whether any of their studies were incorporated into more than one of the eligible meta-analyses. The following section elaborates on the inspection for overlap and discusses further treatment of the studies, including coding and retrieval of correlations.

Treatment of studies

In meta-analysis, the assumption of independence means "the value of any statistic which is included should in no way be predictable from the value of any other included statistic (Tracz, Elmore, & Pohlmann, 1992, p. 880). The assumption of independence is considered important to the validity of meta-analyses (Hunter & Schmidt, 1990). However, some evidence based on monte carlo tests has indicated that violations of the assumption of independence do not adversely affect the results of correlation-based meta-analyses (Tracz et al., 1992).

Meta-analysts typically manage within-study independence by either selecting only one measure from each sample of participants within a study or creating a single averaged measure for each sample. As a precaution against violating independence in this study, when eligible meta-analyses reported an association for both self-efficacy with health behavior and also perceived behavioral control with health behavior, only one of the associations was included in this meta-analysis. The same practice was used with associations of either self-efficacy or pbc with intention. This decision was made in light of the possibility that the same sample may have contributed to both associations. However, both associations were retained for inclusion in a test comparing the effects of self-efficacy to perceived behavioral control in their relationships with the other two variables of interest (Research Questions 4 and 5).

In addition, meta-analysts address between-study independence by including only one instance of each set of study results when those results have been presented or published in more than one research report. As already noted, dissertations and published works by the same author were compared to determine whether identical meta-analytic findings were presented in both reports. If so, the published report, rather than the dissertation, was included in the set of eligible meta-analyses for ease of future retrieval. The 12 eligible research reports were compared with one another to ensure that no two research reports contained the results of the same meta-analysis.

Since eligible meta-analyses attempted to integrate all possible health-related studies meeting their particular set of criteria, it seemed plausible that one or more studies might have become a unit of analysis in more than one meta-analysis. Therefore, eligible meta-analyses were inspected for overlap, that is, the degree to which an eligible meta-analysis included studies that were also included in another eligible meta-analysis.

A tension exists, however, between the preservation of data independence and the inclusive—even comprehensive—nature of meta-analysis which entails the incorporation of most—if not all—possible relevant study results. In an effort to include as many health behavior studies as possible, the degree to which a meta-analysis made a unique contribution to this meta-analysis of meta-analyses was considered when making decisions about data independence. A unique contribution meant that a meta-analysis included studies that were not included in the calculations of any other eligible meta-analyses, thereby enhancing the richness of the data.

As a result of these considerations, each of the 12 studies meeting the inclusion criteria for this meta-analysis was inspected for overlap as well its unique contribution to

the meta-analysis. One eligible meta-analysis (Albarracin, Johnson, Fishbein, & Muellerleile, 2001) was excluded because approximately 95% of its studies (37 out of 39) were part of a later meta-analysis (Albarracin et al., 2004). Both of these meta-analyses addressed the same behavior type, condom use. The latter analysis (Albarracin et al., 2004) was selected in lieu of the former (Albarracin et al., 2001) for inclusion in the present study because its effect size estimates were based on both a larger sample size and on a greater number of studies (i.e., higher level of unique contribution than the former meta-analysis). For this decision, as well as others made regarding exclusion due to overlap, the sample size for each correlation of interest was higher for those meta-analyses that included the greater number of studies in the calculations of those correlations..

The eleven remaining meta-analyses reviewed 439 individual studies. However, 25 of those individual studies were evaluated in two or more meta-analyses resulting in at least 5.7% overlap of studies. Further investigation indicated that three condom use-related studies (Albarracin et al., 2004; Sheeran et al., 1999; Sheeran & Orbell, 1998)) were responsible for the majority of the overlap (20 out of 25 studies). Albarracin et al. (2004) was retained while Sheeran & Orbell (1998) and Sheeran et al. (1999) were excluded. The decision was made in light of minimizing overlap to the greatest extent while retaining the meta-analysis with the largest samples sizes and number of studies contributing to the associations between the variables of interest.

The nine remaining meta-analyses reviewed 329 studies. Four instances of overlap were obvious and one was inferred. This inference was made regarding a study for which two meta-analyses cited the same author and title but identified different

sources. Since investigation suggested that the difference may have been the result of a reference error and therefore the citations may refer to the same study, the study was counted as an instance of overlap. As a result, five out of 329 unique studies were deemed present in two meta-analyses reducing the overlap to 1.5%. These nine meta-analyses with 329 unique studies and 1.5% overlap became the units of analysis for the present study.

To remove all overlap would have required the removal of three more meta-analyses, increasing the loss of information available about health behavior from these meta-analyses. With the intent of this meta-analysis to estimate the size of the relationships of intention, self-efficacy and the widest coverage of health behavior studies possible, a decision was made to tolerate the 1.5% overlap and retain the nine meta-analyses.

Zero-order correlations between intention and behavior, self-efficacy and behavior, and intention and self-efficacy were retrieved from all eligible meta-analyses. Information regarding sample size (N) and number of studies (k) for each correlation was collected as were any confidence intervals or credibility intervals that were reported. Study characteristics such as health behavior type(s) and theoretical basis for the meta-analysis were coded. In addition, the type of self-efficacy variable (self-efficacy, perceived behavioral control, or a combination of the two) was coded. When a study reported correlations for both self-efficacy and pbc with either intention or behavior, both correlations were collected for a meta-analysis of their relative effects on either intention or behavior.

Meta-analytic Procedures

Following is an outline of the procedures used in conducting this meta-analysis. First, the random effects model is discussed, and then two approaches to meta-analysis are described.

Random effects model. A meta-analysis was conducted employing a random effects model to synthesize the correlations for relationships between intention, self-efficacy and health behavior in order to assess the direction and magnitude of each of the associations. Random effects models assume that "population parameters may vary across studies and attempt to estimate that variance" (Hunter & Schmidt, 2004 p. 201). In other words, random effects models allow for the possibility that there may be more than one population effect size (in this case, correlation) underlying the data and that the observed correlations reflect this true variation in the population (Hunter & Schmidt, 2004; Schwarzer, 1989b). Thus, the model does not assume that all variance in observed effect sizes is due solely to artifacts such as sampling error; rather, the variance may be due to sampling error plus between-study differences.

The random effects model separates observed variance into an estimate of variance due to sampling error (and other artifacts) and an estimate of the variance in the underlying population values (Hedges & Olkin, 1985), also referred to as *residual variance*. One can use this residual variance to assess the degree of homogeneity or heterogeneity in the distribution of effects sizes. If the variance is due solely to sampling error (i.e., no residual variance), the data are considered homogeneous. A decision that the distribution is homogeneous implies that "even though the studies may differ on a variety of characteristics, methodological and substantive, none of those differences

matter in terms of the magnitude of the effects found in the studies" (Lipsey & Wilson, 2001, 162). Therefore the overall average of observed correlations can be considered a meaningful approximation of the population value (Lipsey & Wilson, 2001).

Concluding that the distribution is heterogeneous implies that there are differences in the distribution not accounted for by artifacts such as sampling error. A decision of heterogeneity leaves open two possibilities. Either the unexplained variance may be due to random factors other than sampling error or it may be due to one or more systematic between-study differences (Lipsey & Wilson, 2001). The first possibility is more likely when the residual variance is small in relation to sampling error. The second possibility is more likely when the residual variance is large in relation to sampling error. In light of this second possibility, the observed differences in the distribution of effect sizes is likely a reflection of more than one population value in the distribution of effect sizes for the relationship of interest. One can proceed to search for reasons for the differences in the distribution by looking for factors (both "methodological and substantive" study characteristics) that may moderate the relationship of interest (Lipsey & Wilson, 2001, p. 162).

Meta-analytic approaches. Applying the random effects model, a series of meta-analyses was performed for the Pearson product moment correlations (*r*) that were reported in the eligible meta-analyses for the relationships of interest. The Pearson product moment correlation, with a range from -1.0 to +1.0, describes both the direction and the magnitude of the relationship between two variables. The meta-analyses were conducted using Schwarzer's (1989a) *META* program.

Two approaches to meta-analysis were employed in the present study. The first approach is the method espoused by Hedges and Olkin (1985) which calculates sample-weighted correlations *with* Fisher's *Z* transformation. While Hunter-Schmidt (1990) meta-analytic techniques are applied to these transformed correlations in the sample-weighted meta-analyses using Fisher's Z transformation, the practice of using Fisher's *Z* will at times be referred to as the Hedges-Olkin approach in this and the following chapters (and tables) since it is the method Hedges and Olkin (1985) espouse. The second approach, advocated by Hunter and Schmidt (1990; 2004) calculates sample-weighted correlations *without* Fisher's *Z* transformation. Meta-analytic practices using un-transformed sample-weighted correlations will at times be referred to as the Hunter-Schmidt approach in this chapter and the following chapters.

The Hedges and Olkin approach uses the Fisher's *Z* transformation because it corrects for a negative bias in the correlation coefficient (*r*) resulting from the increasing skewness in the distribution of the correlation coefficient as its population value deviates from zero (Rosenthal, 1991). Conversely, the Hunter-Schmidt approach does not make the transformation because the Fisher's *Z* transformation not only creates a positive bias in *r* but also creates one is that is less accurate than the original negatively biased *r*, because the *Z* transformation increases the weight given to correlations as their size increases (Hunter & Schmidt, 2004). Thus, comparing the Hedges and Olkin approach to the Hunter-Schmidt approach can bring to light the effects of these negative and positive biases on effect size.

Cohen's effect size standards. Although any attempt to index the magnitude of an effect is somewhat arbitrary, Cohen's (1992) guidelines were applied to the effect

sizes (correlations) to provide some qualitative interpretation of their size. For the correlation coefficient (r), 0.10 was considered a small effect, 0.30 was considered a medium effect and 0.50 was considered a large effect.

Confidence intervals. Two types of confidence intervals were calculated. Although they are calculated and interpreted differently, both types of intervals can be referred to as confidence intervals (see discussion in Hunter & Schmidt, 2004, pp. 205 - 207). The use of this term for both types of intervals has been a source of confusion (Whitener, 1990). To avoid that confusion, they were distinguished in the present study by the terms *confidence intervals* and *credibility intervals*.

In this study, the term *confidence interval* is applied to those intervals more common to statistical analysis that use the standard error of the mean to place a confidence interval around the mean. They estimate "the range within which the populations mean is likely to be, given the observed data" (Lipsey & Wilson, 2001, p. 114). Thus, confidence intervals provide information about the accuracy of the mean effect size estimate. A 95% confidence interval of this type is calculated for the present study's analyses that apply the Fisher's Z transformation to the sample-weighted correlation (i.e, Hedges-Olkin approach).

Just as confidence intervals provide information about a single mean effect size, the confidence intervals referred to in this study as *credibility intervals* provide information about the distribution of effect sizes. Credibility intervals use the residual standard deviation statistic, that is, the square root of the remaining variance after variance due to sampling error is removed. They place a credibility interval around the mean correlation corrected for sampling error. Credibility intervals provide information

about the homogeneity or heterogeneity of a distribution. That is, they provide information regarding whether the mean corrected correlation is an approximation of a single population effect size or is an average of more than one sub-population effect sizes (Whitener, 1990). According to Hunter and Schmidt (2004), unless the residual standard deviation is very small, credibility intervals are "more critical and more important than confidence intervals" in meta-analysis since the concern in meta-analysis is often with the distribution of population values rather than the estimate of a single population value (p. 206). Both confidence intervals and credibility intervals are calculated for this study's analyses that use Hunter and Schmidt meta-analytic approach.

Significance of effect sizes. Decisions regarding the significance of mean effect sizes were made based on two considerations. First, the probability of whether an estimated population effect size differed from zero was calculated for each relationship. Second, effect sizes were inspected using the criterion that the average correlation should be at least twice as large as the residual standard deviation (Schwarzer, 1989b).

Tests of homogeneity. Three tests of homogeneity were conducted for the sample-weighted effect sizes: a chi-square test of homogeneity, Hunter, Schmidt and Jackson's (1982) 75% rule regarding observed variance, and the actual amount of residual variance after accounting for sampling error variance. For the chi-square test, a nonsignificant outcome means that the hypothesis of homogeneity cannot be rejected. Conversely, a significant result leads to rejection of the null and a conclusion of heterogeneity.

The second test draws conclusions based on the percent of the total variance explained by sampling error. When 75% or more of the observed variance is due to

sampling error, then the remaining (residual) variance may be considered inconsequential (Schwarzer, 1989b). This result indicates homogeneity. When less than 75% of the observed variance is accounted for by sampling error, then heterogeneity is indicated.

Rather than base conclusions on the percent of variance remaining, as the second test does, the third test considers the actual amount of variance remaining after sampling error is removed. A small amount of residual variance indicates homogeneity. According to Schwarzer (1989b), Stoffelmayr, Dillavou and Warshaw (1983) suggest that a residual standard deviation that is no larger than 25% of the population correlation indicates that only a minimal amount of variance remains.

Fail-safe N. The *fail-safe N* (FSN) was calculated for each of the effect size analyses. This statistic estimates the number of studies reporting null results that would be required to alter the conclusion that an overall effect size was not significant at a specific criterion level such as $p < .05$. In doing so, the *fail-safe N* can be used to address the *file drawer problem* (Rosenthal, 1979). The file drawer problem suggests the possibility of studies that report findings of no relationship between the variables of interest that were unpublished or for some reason not located for a given meta-analysis. In addition, the FSN can be an indicator of the stability of the overall effect sizes (Carson, Schriesheim, & Kinicki, 1990) in relation to future studies.

Rosenthal (1979) proposed a tolerance level for the *fail-safe N* of $5k + 10$ that, if reached, implies that results of a meta-analysis can be considered resistant to the file drawer problem (p. 640). The *fail-safe N* is compared to the tolerance level calculated for each of the three relationships.

Comparison of self-efficacy and perceived behavioral control. To compare the magnitude of effects for self-efficacy and perceived behavioral control on intention and behavior, separate meta-analyses were conducted within each of the two self-efficacy variables for each of the two relationships of interest. That is, correlations from eligible meta-analyses reporting relationships between self-efficacy and intention were averaged in a meta-analysis of this subset. Likewise, correlations from eligible meta-analyses reporting relationships between pbc and intention were averaged in a meta-analysis of this subset. The resulting sample-weighted mean correlations from the subsets were compared by performing a test of differences between correlations and inspecting confidence intervals for overlap. The same techniques were applied to the relationships between behavior and self-efficacy or pbc. These procedures are those used to conduct a moderator analysis. Therefore, these comparisons not only assess the relative contribution of the two variables in explaining intention or behavior, they also investigate the moderating effect of the self-efficacy variable on either relationship (i.e., intention or behavior). Finally, homogeneity tests were performed to assess the degree of heterogeneity present in these subsets to explore whether other moderators may be responsible for any differences in effect sizes.

Summary

This chapter described the methods used in the present study. It identified the criteria for study inclusion which included the requirements of meta-analytic results, limited to one or more types of health behavior, report of relationships between health behavior and either intention or self-efficacy, correlations and relevant statistics (N and k), and availability of study in the English language. The chapter identified and described

the databases used in the search for meta-analytic studies: Web of Knowledge, PsycInfo, ComAbstracts, and ProQuest Dissertations and Theses. It specified the search terms used for the retrieval process. They included terms related to meta-analysis, the variables of interest, and theories applied in health-related studies of these variables. The chapter reported the results of the search and discussed the application of inclusion criteria. It then described the further treatment of studies, identifying procedures of study selection with regard to data independence and coverage of research domain. Finally, the chapter outlined the meta-analytic procedures used in this study. These included the use of the random effects model and two approaches to meta-analysis (called, in this study, the Hedges and Olkin's approach using Fisher's Z transformation for the sample-weighted correlation and Hunter-Schmidt approach using the un-transformed sample-weighted correlation). Other practices included the application of Cohen's effect size standards to correlations, the calculation of confidence intervals, tests of significance, homogeneity analyses, and calculation of the *fail-safe N*. The results of these procedures are reported in the next chapter.

CHAPTER 5

RESULTS

This chapter presents the results of the meta-analysis of meta-analyses. It begins with a description of the studies from which effect sizes were obtained for use in this meta-analysis. The chapter then summarizes the findings of the meta-analysis in relation to the five research questions posed in the study. For the three research questions investigating the relationships between intention, self-efficacy and health behavior, the chapter reports estimated population effect sizes and related findings based on sample-weighted calculations of the mean correlation with and without Fisher's *Z* transformation. For comparison, the results of these two sets of calculations are presented in table format. For clarity and simplicity in the text, only findings related to the sample-weighted mean correlation *without* Fisher's *Z* transformation (Hunter-Schmidt approach) are provided as support for interpretations. Likewise, using the Hunter-Schmidt approach, the non-transformed sample-weighted correlation is the basis of both the estimations of effects and tests of significance used to answer the final two research questions distinguishing the effects of self-efficacy and perceived behavioral control on intention and health behavior. The sample-weighted mean correlation *without* Fisher's *Z* transformation, as recommended by Hunter-Schmidt (1990; 2004), was selected for report within the text because it is considered a more conservative estimate of population effect size than is Hedges and Olkin's (1985) approach using the transformed sample-weighted mean correlation.

Description of Meta-analyses

Table 1 presents the characteristics and effect sizes of each meta-analysis used in this study. The table identifies the type of behavior explored in each meta-analysis and reports the correlations for intention-behavior, self-efficacy-behavior, and intention-self-efficacy. In addition, the table provides confidence intervals as well as sample sizes (N), and the number of tests (k) synthesized within each meta-analysis for each of the three relationships of interest.

The nine meta-analyses used in this study reviewed 329 individual studies (i.e., tests of relationships) from both published and unpublished sources. Five of those studies were evaluated in more than one meta-analysis resulting in 1.5% overlap of studies. The meta-analyses were published in nine journals between the years 1991 and 2009. The median publication date was 2004. Four of the meta-analyses examined more than one type of health behavior while the remaining five meta-analyses focused on a single health behavior: condom use ($k = 1$), screening attendance ($k = 1$), physical activity ($k = 1$), alcohol abstinence ($k = 1$), and positive health practices ($k = 1$).

RQ1: The Intention-Health Behavior Relationship.

Six meta-analyses provided effect sizes of the intention-behavior relationship from 174 tests with a combined sample of 36,168 participants. The effect sizes (r) from these studies ranged from 0.40 to 0.57, medium to large effects.

As shown in Table 2, the sample-weighted mean correlation (r_+) for the relationship between intention and behavior was $r_+ = 0.4480$ with a 95% confidence interval from 0.440 to 0.456, and a credibility interval of 0.3635 to 0.5325. This correlation is a medium to large effect according to Cohen's (Cohen, 1992) criteria. The

Table 1

Characteristics, Correlations, and Statistics for Studies Included in the Meta-Analysis

Study	Behavior type	Intention-behavior measure	Self-efficacy-behavior measure[a]	Intention-self-efficacy measure
Albarricin, Kumkale & Johnson (2004)	Condom use	$r_+ = 0.44$ CI_{95} [0.42, 0.46] $k = 47$ $N = 8622$	$r_+ = 0.24$ (se & pbc) CI_{95} [0.21, 0.26] $k = 25$ $N = 6541$	$r_+ = 0.48$ CI_{95} [0.47, 0.50] $k = 60$ $N = 17,777$
Cooke & French (2008)	Screening program attendance	$r_+ = 0.42$ CI_{95} [0.40, 0.44] $k = 19$ $N = 8148$	$r_+ = 0.19$ (pbc) CI_{95} [0.17, 0.21] $k = 18$ $N = 7942$	$r_+ = 0.46$ CI_{95} [0.45, 0.48] $k = 25$ $N = 10,746$
Forcehimes & Tonigan (2008)	Alcohol abstinence	-	$r_+ = 0.33$ (se) CI_{95} [-] $k = 11$ $N = 2240$	-

Table 1 (cont'd).

Hagger & Chatzisarantis (2009)	Health-related[b]	$r_+ = 0.51$ CI_{95} [0.52, 0.69] C_rI_{90} [0.24, 0.97] $k = 28$ $N = 5822$	$r_+ = 0.30$ (pbc) CI_{95} [0.29, 0.48] C_rI_{90} [0.03, 0.73] $k = 22$ $N = 4487$	$r_+ = 0.51$ CI_{95} [0.53, 0.71] C_rI_{90} [0.27, 0.97] $k = 24$ $N = 5708$
Hagger, Chatzisarantis & Biddle (2002)	Physical activity	$r_+ = 0.42$ CI_{95} [0.45, 0.67] C_rI_{90} [0.17, 0.85] $k = 60$ $N = 10,985$	$r_+ = 0.31$(pbc) CI_{95} [0.33, 0.45] C_rI_{90} [0.12, 0.66] $k = 35$ $N = 7173$	$r_+ = 0.44$ (pbc) CI_{95} [0.51, 0.63] C_rI_{90} [0.25, 0.90] $k = 49$ $N = 16,732$
Holden (1991)	Health- related[c]	-	$r_+ = 0.35$ (se) CI_{95} [-] $k = 45$ $N = 3220$	-
Milne, Sheeran & Orbell (2000)	Health-related[d]	$r_+ = 0.40$ CI_{95} [-] $k = 4$ $N = 432$	$r_+ = 0.22$ (se) CI_{95} [-] $k = 5$ $N = 512$	$r_+ = 0.33$ CI_{95} [-] $k = 13$ $N = 2181$

Table 1 (cont'd).

Rodgers, Conner & Murray (2008)	Health-related[e]	$r_+ = 0.57$ CrI_{90} [0.38, 0.77] $k = 16$ $N = 2159$	$r_+ = 0.46$ (se) CrI_{90} [0.46, 0.46] $k = 9$ $N = 1204$	$r_+ = 0.63$ (se) CrI_{90} [0.48, 0.78] $k = 9$ $N = 1204$
Yarcheski, Mahon, Yarcheski & Cannella (2004)	Positive health practices[f]	-	$r_+ = 0.31$ (se) CI_{95} [-] $k = 3$ $N = 517$	-

Note: r_+ = sample-weighted mean correlation. CI_{95} = 95% confidence interval. CrI_{90} = 90% credibility interval. k number of studies. N = number of participants. [-] = not reported or not tested within the study.

[a]Type of self-efficacy variable specified in each study is indicated in parentheses as se (self-efficacy) or pbc (perceived behavioral control) or both. [b]Health-related behaviors include physical activity (32 studies), condom use (2 studies), diet (1 study), and breast feeding (1 study). [c]Health-related behaviors include smoking (17 studies), pain tolerance (10 studies), weight control (8 studies), physical activity (6 studies), compliance (3 studies), arthritis (3 studies), dental health (3 studies), eating disorders (1 study), alcohol (1 study), heart rate (1 study), relapse (1 study), back pain (1 study), and diet (1 study). [d]Health-related behaviors include sexual behavior (8 studies), screening (5 studies), exercise (4 studies), diet (3 studies), oral care (3 studies), substance abuse (2 studies), compliance (2 studies), sun exposure (1 study), hearing (1 study), smoking (1 study), and nurse safety (1 study). The study categorizes the behaviors as being either a detection behavior or a prevention behavior. [e]Health-related behaviors include food intake (5 studies), exercise (4 studies), condom use (3 studies), drug use (2 studies), and self-exam (1 study). [f]Defined by Personal Lifestyle Questionnaire (see Yarcheski et al., 2004).

Table 2

Results of Meta-Analysis for Intention and Health Behavior

Statistic	Hunter-Schmidt	Fisher's *Z* transformation
r_+	0.4480	0.4492
r^2	0.2007	0.2018
Observed variance	0.0020	0.0032
Observed SD	0.0443	0.0569
CI_{95}	[0.440, 0.456]	[0.4409, 0.4574]
g	1.0021	1.1053
N_{fs} (tolerance)	47.7564 (40)	47.9043(40)

Note. Hunter-Schmidt = approach which calculates sample-weighted correlations without Fisher's *Z* transformation. Hedges-Olkin = approach which calculates sample-weighted correlations with Fisher's *Z* transformation. Results are based on six meta-analyses with 174 tests and 36,168 participants. All correlations are significant at $p < .001$. r_+ = mean correlation. r^2 = explained variance. Observed variance and Observed SD = variance and standard deviation, respectively, observed in the distribution of effect sizes combined for this study. CI_{95} = 95% confidence interval. g = mean standardized difference, an indicator of size of effects. N_{fs} = fail-safe *N*. (tolerance level) = Rosenthal's (1979) tolerance level of $5k + 10$ (placed in parentheses for comparison to N_{fs}). A fail-safe *N* greater than the tolerance level is an indicator of the stability of the average effect size, meaning that the study's results are resistant to the impact of unpublished, un-retrieved, or future null effects studies.

results of the significance test ($p < .001$) and the observation that the average correlation ($r_+ = 0.4480$) was greater than twice the size of the residual standard deviation ($2\ SD_{res} = 0.0862$) indicated that the effect size representing the relationship between intention and behavior was significantly different from zero.

The variance in health behavior explained by intention was nearly 20% for the sample-weighted analysis ($r^2_+ = 0.2007$). The association between intention and behavior was the strength of approximately one standard deviation as indicated by the standardized mean difference ($g = 1.0021$).

The fail-safe N ($N_{fs} = 47.7564$) exceeded Rosenthal's (1979) tolerance level of $5k + 10$, which for this study equaled 40 with $k = 6$. Exceeding the tolerance level indicated that results were resistant to the impact of null results from unpublished, un-retrieved or future studies.

As Table 3 shows, the results of the homogeneity analyses were mixed. The residual standard deviation ($SD_{res} = 0.0431$) was considered small since it did not exceed 25% of the estimated population effect size (0.25 ES = 0.1120). Therefore, homogeneity can be assumed. However, the results of the other two tests of homogeneity did not provide evidence for that conclusion. The variance accounted for by sampling error (5.39%) fell well below the 75% minimum suggested by Hunter et al. (1982), and the chi-square test was significant, $\chi^2 (5, N = 36{,}168) = 111.2222, p < .001$, rejecting the null hypothesis of homogeneity.

RQ2: The Self-Efficacy-Health Behavior Relationship.

Table 4 shows the results of the meta-analysis for the relationship between health behavior and the self-efficacy variables, either self-efficacy or perceived behavioral

Table 3

Results of Tests of Homogeneity for Intention and Health Behavior

	Weighted Hunter-Schmidt		Weighted Fisher's *Z* transformation	
Test	Statistic	Conclusion	Statistic	Conclusion
SD_{res} (.25% ES)	0.0431 (< 0.112)	Homogeneous	0.0561 (< 0.112)	homogeneous
% Variance	5.39%	Heterogeneous	3.00%	heterogeneous
χ^2	$\chi^2 = 111.2222$* $df = 5$ $N = 36{,}168$ $p < .001$	Heterogeneous	$\chi^2 = 184.0016$ $df = 5$ $N = 36{,}168$ $p < .001$	heterogeneous

Note. Results are based on six meta-analyses with 174 tests and 36,168 participants. Hunter-Schmidt = approach which calculates sample-weighted correlations without Fisher's *Z* transformation. Hedges-Olkin = approach which calculates sample-weighted correlations with Fisher's *Z* transformation. SD_{res} = residual standard deviation, indicating amount of remaining variance once sampling error variance has been removed. (.25% ES) = population effect size estimate (sample-weighted mean correlation) multiplied by .25. A small residual standard deviation, not exceeding 25% of the population effect size estimate, is an indicator of homogeneity. % Variance = percent of observed variance due to sampling error. If 75% or more of the observed variance is accounted for by sampling error, then homogeneity is indicated. χ^2 = Chi-square test of

Table 3 (cont'd).

homogeneity. *df* = degrees of freedom. *N* = number of participants. *p* = probability value. A chi-square that does not reach significance is an indicator of homogeneity.

Table 4

Results of Meta-Analysis for Self-Efficacy and Health Behavior

Statistic	Hunter-Schmidt	Fisher's *Z* transformation
r_+	0.2761	0.2775
r^2	0.0762	0.0770
Observed variance	0.0043	0.0044
Observed SD	0.0655	0.0661
CI_{95}	[0.2660, 0.2860]	[0.2676, 0.2873]
g	0.5745	0.5945
N_{fs} (tolerance)	40.6947 (55)	40.9405 (55)

Note. Hunter-Schmidt = approach which calculates sample-weighted correlations without Fisher's *Z* transformation. Hedges-Olkin = approach which calculates sample-weighted correlations with Fisher's *Z* transformation. Results are based on nine meta-analyses with 173 tests and 33,836 participants. All correlations are significant at $p < .001$. r_+ = mean correlation. r^2 = explained variance. Observed variance and Observed SD = variance and standard deviation, respectively, observed in the distribution of effect sizes combined for this study. CI_{95} = 95% confidence interval. g = mean standardized difference, an indicator of size of effects. N_{fs} = fail-safe *N*. (tolerance level) = Rosenthal's (1979) tolerance level of $5k + 10$ (placed in parentheses for comparison to N_{fs}). A fail-safe *N* greater than the tolerance level is an indicator of the stability of the average effect size, meaning that the study's results are resistant to the impact of unpublished, un-retrieved, or future null effects studies.

control. The analysis combined effect sizes from nine meta-analyses with 173 tests and 33,836 participants. The ten effect sizes ranged from 0.19 to 0.46, small to medium effects.

The sample-weighted mean correlation was $r_+ = 0.2761$, a moderate effect, with a 95% confidence interval from 0.266 to 0.286 and a credibility interval from 0.1511 to 0.4010. The estimated population effect size for self-efficacy and behavior was significantly different from zero based on the results of significance testing ($p < .001$) and an effect size ($r_+ = 0.2761$) greater than twice the size of the residual standard deviation ($2\ SD_{res} = 0.1275$).

The coefficient of determination indicated that self-efficacy variables explained approximately 7.6% of the variance in health behavior ($r^2_+ = 0.0762$). Based on the standardized mean difference the effect of self-efficacy on health behavior was the strength of more than half a standard deviation, $g = 0.5745$.

The fail-safe N ($N_{fs} = 40.6947$) failed to reach Rosenthal's (1979) tolerance level ($5k + 10$) which for this analysis was 55 with $k = 9$. The failure suggested that the results were less stable and less resistant to the impact of null effects studies than those that exceed the tolerance level.

The results of the homogeneity tests for health behavior and self-efficacy were mixed (see Table 5). The residual standard deviation ($SD_{res} = 0.0638$) was less than the value of 25% of the population effect size (0.25 ES = 0.069). This small residual standard deviation provided evidence for homogeneity while the other two tests failed to support that conclusion. The observed variance accounted for by sampling error (5.29%) was less than the 75% minimum guideline for a conclusion of homogeneity. The chi-square test

Table 5

Results of Tests of Homogeneity for Self-Efficacy and Health Behavior

	Weighted Hunter-Schmidt		Weighted Fisher's *Z* transformation	
Test	Statistic	Conclusion	Statistic	Conclusion
SD_{res} (.25% ES)	0.0638(< 0.0690)	homogeneous	0.0644 (< 0.0690)	homogeneous
% Variance	5.29	heterogeneous	5.14	heterogeneous
χ^2	$\chi^2 = 170.1763$ $N = 33,836$ $df = 8$ $p < .001$	heterogeneous	$\chi^2 = 173.5534$ $N = 33,836$ $df = 8$ $p < .001$	heterogeneous

Note. Results are based on nine meta-analyses with 173 tests and 33,836 participants. Hunter-Schmidt = approach which calculates sample-weighted correlations without Fisher's *Z* transformation. Hedges-Olkin = approach which calculates sample-weighted correlations with Fisher's *Z* transformation. SD_{res} = residual standard deviation, indicating amount of remaining variance once sampling error variance has been removed. (.25% ES) = population effect size estimate (sample-weighted mean correlation) multiplied by .25. A small residual standard deviation, not exceeding 25% of the population effect size estimate, is an indicator of homogeneity. % Variance = percent of observed variance due to sampling error. If 75% or more of the observed variance is accounted for by sampling error, then homogeneity is indicated. χ^2 = Chi-square test of

Table 5 (cont'd).

homogeneity. *df* = degrees of freedom. *N* = number of participants. *p* = probability value. A chi-square that does not reach significance is an indicator of homogeneity.

was significant, χ^2 (8, N = 33,836) = 170.1763, p < .001, suggesting at least some degree of heterogeneity.

RQ3: The Intention-Self-Efficacy Relationship.

The results for the meta-analysis of the two dependent variables, intention and self-efficacy (or perceived behavioral control) are shown in Table 6. Calculations were based on correlations from six meta-analyses with 180 tests and 54,348 participants. These correlations ranged from 0.33 to 0.66, medium to large relationships.

The sample-weighted mean correlation (r_+) for the relationship between intention and self-efficacy was r_+ = 0.4642, a medium to large effect, with a 95% confidence interval from 0.458 to 0.471 and a credibility interval from 0.3822 to 0.5462. Results of significance testing (p < .001) and the size of the effect in relation to the residual standard deviation (r_+ = 0.4642 > 2 SD_{res} = 0.0837) indicated that the estimated population effect size of intention and self-efficacy was significantly different from zero. Nearly 22% of the variance between intention and self-efficacy was shared (r^2_+ = 0.2155).

The fail-safe N (N_{fs} = 49.7022) exceeded the tolerance level ($5k$ + 10) which for this study was 40, k = 6. The size of fail-safe N indicated that the findings from this meta-analysis were resistant to the impact of null results from unpublished, un-retrieved or future studies.

The results of the homogeneity analyses, as shown in Table 7, were mixed. The residual standard deviation (SD_{res} = 0.0418) indicated homogeneity since it was less than the value of 25% of the population effect size (0.25 ES = 0.1160). However, sampling error variance (3.74%) was small, falling below the 75% minimum guideline for a

Table 6

Results of Meta-Analysis for Intention and Self-Efficacy

Statistic	Hunter-Schmidt	Fisher's *Z* transformation
r_+	0.4642	0.4653
r^2	0.2155	0.2165
Observed variance	0.0018	0.0034
Observed *SD*	0.0426	0.0584
CI_{95}	[0.4580, 0.4710]	[0.4587, 0.4719]
g	1.0481	1.1673
N_{fs} (tolerance)	49.7022 (40)	49.8371 (40)

Note. Hunter-Schmidt = approach which calculates sample-weighted correlations without Fisher's *Z* transformation. Hedges-Olkin = approach which calculates sample-weighted correlations with Fisher's *Z* transformation. Results are based on six meta-analyses with 180 tests and 54,348 participants. All correlations are significant at $p < .001$. r_+ = mean correlation. r^2 = explained variance. Observed variance and Observed SD = variance and standard deviation, respectively, observed in the distribution of effect sizes combined for this study. CI_{95} = 95% confidence interval. *g* = mean standardized difference, an indicator of size of effects. N_{fs} = fail-safe *N*. (tolerance level) = Rosenthal's (1979) tolerance level of $5k + 10$ (placed in parentheses for comparison to N_{fs}). A fail-safe *N* greater than the tolerance level is an indicator of the stability of the average effect size, meaning that the study's results are resistant to the impact of unpublished, un-retrieved, or future null effects studies.

Table 7

Results of Tests of Homogeneity for Intention and Self-Efficacy

	Weighted Hunter-Schmidt		Weighted Fisher's *Z* transformation	
Test	Statistic	Conclusion	Statistic	Conclusion
SD_{res} (.25% ES)	0.0418 (< 0.116)	homogeneous	0.0579 (< 0.116)	homogeneous
% Variance	3.74	heterogeneous	1.80	heterogeneous
χ^2	$\chi^2 = 160.4836$ $df = 5$ $N = 54{,}348$ $p < 0.001$	heterogeneous	$\chi^2 = 301.7300$ $df = 5$ $N = 54{,}348$ $p = <0.001$	heterogeneous

Note. Results are based on six meta-analyses with 180 tests and 54,348 participants. Hunter-Schmidt = approach which calculates sample-weighted correlations without Fisher's *Z* transformation. Hedges-Olkin = approach which calculates sample-weighted correlations with Fisher's *Z* transformation. SD_{res} = residual standard deviation, indicating amount of remaining variance once sampling error variance has been removed. (.25% ES) = population effect size estimate (sample-weighted mean correlation) multiplied by .25. A small residual standard deviation, not exceeding 25% of the population effect size estimate, is an indicator of homogeneity. % Variance = percent of observed variance due to sampling error. If 75% or more of the observed variance is accounted for by sampling error, then homogeneity is indicated. χ^2 = Chi-square test of

Table 7 (cont'd).

homogeneity. *df* = degrees of freedom. *N* = number of participants. *p* = probability value. A chi-square that does not reach significance is an indicator of homogeneity.

conclusion of homogeneity. Likewise, the chi-square test was significant, χ^2 (5, N = 54,348) = 160.4836, $p < .001$, rejecting the null hypothesis of homogeneity.

RQ4: Comparison of Effects of Self-Efficacy and PBC on Health Behavior.

Two meta-analyses were performed within a subset of studies, the first calculating the effect size for self-efficacy and health behavior and the second calculating the effect size for perceived behavioral control (pbc) and health behavior.

The meta-analysis of self-efficacy and health behavior combined correlations from six studies with 82 tests and 10,095 participants. The correlations ranged from 0.22 to 0.46, small to medium effects. The sample-weighted mean correlation was $r_+ = 0.3524$, a medium effect, with a 95% confidence interval of 0.3350 to 0.3690 and a 95% credibility interval of 0.2640 to 0.4408. The estimated effect size was significantly different from zero based on the significance test ($p < .001$) and the size of the effect ($r_+ = 0.3524$) in relation to the size of the residual standard deviation (2 $SD_{res} = 0.0902$).

For perceived behavioral control and behavior, correlations were retrieved from four studies with 84 tests and 20,752 participants. These correlations ranged from 0.19 to 0.39, small to medium effects. The sample-weighted mean correlation was $r_+ = 0.2664$, a medium effect, with a 95% confidence interval of 0.2540 to 0.2790 and a 95% credibility interval of 0.1453 to 0.3874. Both significance testing ($p < .001$) and the size of the effect ($r_+ = 0.2664$) in relation to the residual standard deviation (2 $SD_{res} = 0.1235$) indicated that the effect size was significantly different from zero.

Comparing some of the results of the two meta-analyses, self-efficacy accounted for approximately 12.4% of the variance in health behavior while pbc accounted for

approximately 7.1%. The standardized mean difference indicated that the effect of self-efficacy on health behavior was the strength of approximately three-fourths of a standard deviation (g = 0.7532), while the strength of the effect for pbc on health behavior was approximately half of a standard deviation (g = 0.5527).

Results of homogeneity testing were mixed for both the self-efficacy and pbc subsets. For the self-efficacy subset, homogeneity was assumed in the test comparing residual standard deviation (SD_{res} = 0.0601) to 25% of the population effect size (0.25 ES = 0.088). However, heterogeneity was indicated in the other two tests since the observed variance accounted for by sampling error was 18.32% (<75%) and the chi-square test was significant, χ^2 (5, N = 10,095) = 32.7570, p < .001. For the pbc subset, comparing the residual standard deviation (SD_{res} = 0.0612) to 25% of the population effect size (0.25 ES = 0.067) indicated homogeneity while the percent of sampling error variance (4.18% < 75%) and the chi-square test χ^2 (3, N = 20752) = 95.7268, p < .001 indicated heterogeneity.

When the relationships of self-efficacy and pbc with health behavior were submitted to a significance test of differences in correlations, the effect size of self-efficacy and health behavior (r_+ = 0.3524) was significantly larger than the effect size of pbc and health behavior (r_+ = 0.2664). A comparison of confidence intervals indicated that there was no overlap of the intervals for self-efficacy-health behavior 95%CI [0.3350, 0.3690] and pbc-health behavior 95%CI [0.2540 to 0.2790]. The lack of overlap supports the conclusion of the significance test indicating that self-efficacy-health behavior relationship is significantly larger than the pbc-health behavior relationship.

Likewise, the results indicate that type of self-efficacy variable has a moderating effect on the self-efficacy-health behavior relationship.

RQ5: Comparison of Effects of Self-Efficacy and PBC on Intention.

The same procedures used in the previous research question were applied to this question regarding the relative effects of self-efficacy and perceived behavioral control on intention.

The meta-analysis performed within the subset of self-efficacy and intention combined correlations from three studies with 33 tests and 6,226 participants. The three correlations retrieved from these studies were $r_+ = 0.33$, $r_+ = 0.47$, and $r_+ = 0.63$. Meta-analysis produced a sample-weighted mean correlation of $r_+ = 0.4519$, a medium effect, with a 95% confidence interval of 0.432 to 0.471 and a credibility interval of 0.2446 to 0.6591. This effect size was significant based on the significance test ($p < .001$) as well as the size of the effect ($r_+ = 0.4519$) in relation to the size of the residual standard deviation ($2\ SD_{res} = 0.2115$).

For perceived behavioral control and intention, four studies with 107 tests and 34,336 participants were combined to compute a sample-weighted mean correlation. The correlations from these studies ranged from 0.44 to 0.56. When these results were averaged, the sample-weighted mean correlation was $r_+ = 0.4619$ with a 95% confidence interval of 0.4540 to 0.4700 and a credibility interval of 0.4041 to 0.5197. Results of the significance test ($p < .001$) and the size of the effect ($r_+ = 0.4619$) in relation to size of the residual standard deviation ($2\ SD_{res} = 0.059$) indicated that the effect size was significantly different from zero.

Self-efficacy explained approximately 20% of the variance in intention; pbc explained approximately 21%. Based on the standardized mean difference, the effect of each variable, self-efficacy (g = 0.1.013) and pbc (g = 1.0416), on behavior was approximately one standard deviation.

Homogeneity tests resulted in mixed conclusions for both self-efficacy and pbc. For the self-efficacy subset, in the test comparing residual standard deviation (SD_{res} = 0.1058) to 25% of the population effect size (0.25 ES = 0.0113), homogeneity was indicated. However, heterogeneity was indicated in the other two tests since the observed variance accounted for by sampling error was 2.66% (<75%) and the chi-square test was significant, χ^2 (2, N = 6226) = 112.9519, p < .001. For the pbc subset, the test of comparison of the residual standard deviation (SD_{res} = 0.0295) to 25% of the population effect size (0.25 ES = 0.115). The percent of sampling error variance (7.65% < 75%) and the chi-square test χ^2 (3, N = 34336) = 52.2579, p < .001 indicated heterogeneity.

The result of a test of differences in sample-weighted mean correlations from self-efficacy-intention and pbc-intention was not significant (p = .1790) at the p < 05 level. In addition, the confidence intervals from self-efficacy-health behavior 95%CI [0.432, 0.471] and pbc-health behavior 95%CI [0.454 to 0.470] show substantial overlap. This overlap along with the failure to reject the null of no difference leads to the conclusion that there is no significant difference in the relationships between intention and either self-efficacy or perceived behavioral control.

CHAPTER 6

DISCUSSION

The goal of the dissertation was to assess the relationships between health behavior and two theoretically specified predictors of behavior: intention and self-efficacy. Previous meta-analyses have synthesized correlations between these relationships from both published and unpublished studies. However, the focus of previous meta-analyses has been either too broad—they did not limit their subject to health behavior—or too narrow—they limited their subject to a single health behavior type, an issue, or a theory—to be representative of the population of relevant studies in the health behavior domain. This dissertation contributed to health communication research by being the first to extract the correlations for the relationships of interest from meta-analyses limited to health behavior studies and synthesize them in order to assess the relationships between health behavior, intention and self-efficacy across health-related theories and behaviors.

Statement of Major Findings

The dissertation posed five research questions to guide the assessment of relationships. Answers to each of these are summarized in this section.

The first question assessed the magnitude of the relationship between intention and behavior. The mean association between intention and health behavior from 174 studies in six meta-analyses was $r = 0.45$, with intention accounting for 20% of the variance in health behavior. This approaches what is conversionally considered a large effect size and is consistent with Godin and Kok's (1996) un-weighted estimation of the intention-health behavior relationship. It also is consistent with findings from more

general-behavior meta-analyses such as Kim and Hunter (1993)—corrected for sampling error only—and Armitage and Conner (2001), among others (e.g., Notani, 1998; Randall & Wolff, 1994). However, the association is smaller than the large effects found in Sheeran's (2002) meta-analysis of meta-analyses and other general-behavior meta-analyses (Eckes & Six, 1994; Sheppard et al., 1988; Van den Putte, 1991). One explanation for the pattern of results is that the intention-behavior association may not be as large for health behavior as it is for other often studied non-health behaviors. This explanation is consistent with the results of Eckes and Six (1994) in which the average correlation between intention and health behavior was smaller than the intention-behavior correlation when all behavior types were combined, although both were medium effects. A second explanation is that there may be more than one value of the intention-health behavior relationship in a distribution similar to the range of effects found in former meta-analyses. The credibility interval around the intention-health behavior correlation in the present study indicates variability in the dataset such that the distribution of possible values from 0.36 to 0.53 could include both medium and large effects. This distribution would be consistent with the values found in former findings. Together, the findings suggest a substantial association between intention and behavior.

The second research question investigated the magnitude of the relationship between health behavior and a second predictor variable, self-efficacy. The mean correlation between self-efficacy (combined perceived behavioral control and self-efficacy) and health behavior from 173 studies in nine meta-analyses was $r = 0.28$, with self-efficacy accounting for 7.6% of the variance in behavior. This correlation is smaller than the medium correlation from Godin and Kok's (1996) un-weighted set of studies.

Meta-analyses of general behavior report associations that also are larger than those in the present results (e.g., Armitage & Conner, 2001), although the present results are consistent with Notani (1998) and larger than the correlation of $r = 0.11$ reported in Sandberg and Conner (2008). Former findings indicate a range of small to medium effects. Similar to intention-health behavior, there may be a distribution of values for the relationship between self-efficacy and health behavior that could parallel the range in former findings. The credibility interval for this study—from 0.15 to 0.40—reflects the small to medium effects reported in former meta-analytic findings. These findings suggest that the self-efficacy is reliably associated with behavior, but self-efficacy predicts behavior less strongly than intention.

The third research question examined the magnitude of the relationship between the two predictor variables, intention and self-efficacy, in the health behavior domain. The mean correlation between the variables from 180 studies in six meta-analyses was $r = 0.46$, with 22% of the variance shared between the two variables. This medium to large effect size is consistent with the medium to large un-weighted correlation in Godin and Kok's (1996) qualitative review of health behaviors. The effect size also is consistent with those found in general-behavior meta-analyses (Armitage & Conner, 2001; Ouellette & Wood, 1998; Sandberg & Conner, 2008), although a smaller effect size was reported by Rivis and Sheeran (2003). The credibility interval for this study ranges from 0.33 to 0.66, medium to large effects. Again, the distribution may indicate more than one value underlying the health behavior domain as represented in the data. Nevertheless, the two predictors appear to correlate at least as highly with each other as they do with the outcome variable, behavior.

For the fourth and fifth research questions, a distinction was made between two self-efficacy variables—perceived behavioral control and self-efficacy—in order to estimate and compare the size of their associations with both intention and health behavior. In essence, these questions investigated the potential moderating effects of alternative self-efficacy variables. Research Question 4 compared the magnitude of the relationship between health behavior and self-efficacy to that of health behavior and perceived behavioral control. For self-efficacy and health behavior, the mean correlation of $r = 0.35$—a medium effect—is consistent with the self-efficacy-behavior relationship reported by Armitage and Conner (2001) in which distinctions were made between the self-efficacy variables. The correlation from Rodgers et al. (2008) for self-efficacy and health behavior studies—which is included in the present analysis—is larger ($r = 0.46$) than the mean correlation for the present study ($r = 0.35$). For perceived behavioral control and health behavior, the effect size is $r = 0.27$, smaller than the medium effect size found for pbc-behavior ($r = 0.40$) in Armitage and Conner (2001) and perceived difficulty-health behavior ($r = 0.39$) in Rodgers et al. (2008).

Significance testing and inspection of the confidence intervals both indicate that the correlations of the two variables with health behavior are different from one another, such that the correlation between self-efficacy and health behavior is larger than the correlation between pbc and health behavior. These differences indicate that the type of self-efficacy variable has a moderating effect on the self-efficacy-health behavior relationship. This pattern of results is consistent with Rodgers et al. (2008). However, it is not consistent with the pattern in Armitage and Conner (2001) in which the pbc-behavior

correlation was larger than the self-efficacy-behavior correlation, although both were medium effects.

There are at least three reasons for caution when interpreting the comparison of the self-efficacy-behavior to pbc-behavior. First, the identification of self-efficacy and perceived behavioral control measures are based on the variables' identification at the level of the unit of analysis for this study (meta-analyses) rather than based on inspection of the actual measures used in each of the individual studies within each meta-analysis. Therefore, the distinctions between the two variables in this analysis may not be as clear as those made in studies such as Rodgers et al. (2008) in which variables were categorized by the content of their measures. Second, there is overlap in the credibility intervals for self-efficacy-health behavior—0.26 to 0.44—and pbc-health behavior—0.14 to 0.39, suggesting that there may be little to no difference found between the two relationships in some applications. Third, the two subsets of meta-analyses (i.e., self-efficacy-behavior and pbc-behavior) may not be homogeneous, based on mixed results of the tests of homogeneity as well as inspection of the credibility intervals. Therefore, other moderators may be responsible for any difference between the two relationships. Nevertheless, there is a statistically significant trend toward larger effects for self-efficacy than for perceived behavioral control in the prediction of behavior.

The fifth question compared the magnitude of the relationship between intention and each of the two self-efficacy variables. The mean correlation of $r = 0.45$ for self-efficacy and intention is consistent with the correlation of $r = 0.44$ reported in Armitage and Conner (2001) but smaller than the large effect ($r = 0.63$) reported in Rodgers et al. (2008). Similarly, in this study, the mean correlation of $r = 0.46$ for pbc and intention is

consistent with the correlation of $r = 0.44$ found in Armitage and Conner (2001) but smaller than the large effect ($r = 0.56$) in Rodgers et al. (2008).

Unlike the present study's findings for health behavior and self-efficacy or pbc, significance testing and inspection of both the confidence intervals and credibility intervals fail to show a difference between the correlations for self-efficacy-intention and pbc-intention. The results did not show a moderating effect for type of self-efficacy variable in the self-efficacy-intention relationship. This pattern is consistent with Armitage and Conner (2001) who reported identical correlations between intention and the two variables. The results are not consistent with Rodgers et al. (2008) who concluded that there is a difference between the two correlations such that self-efficacy-health behavior has a larger effect size than pbc-health behavior. As discussed in Research Question 4, caution must be taken when interpreting these results since there may be inconsistencies in distinctions made between the variables at the level of the unit of analysis (meta-analyses) for this study.

Implications for Theory and Practice

The study's findings have implications for both health communication theory and practice. The theory of reasoned action, the theory of planned behavior, the health belief model, protection motivation theory, and the transtheoretical model posit that behavioral intention has a direct effect on behavior. This view of the intention-behavior relationship is consistent with this study's finding of a moderately large relationship between intention and health behavior. The finding suggests that health communication practitioners may find it worthwhile to tap these theories for constructs positively related to intention for which messages can be designed that could increase individuals'

intentions to act. One of those constructs is self-efficacy. Self-efficacy's direct effect on behavior in both social cognitive theory and the health belief model is consistent with the finding in this study of a moderate relationship between self-efficacy and health behavior. Self-efficacy's relationship to intention as posited by the theory of planned behavior, protection motivation theory and the transtheoretical model is consistent with the finding of a moderately large relationship between self-efficacy and health behavior. These findings imply that designing health communication messages targeted at increasing self-efficacy could be worthwhile.

Health practitioners may want to take a theoretically integrative approach in which effects of self-efficacy-related messages are measured both indirectly (with intention) and directly (with behavior). Because the relationship between intention and health behavior is strong but far from perfect, health practitioners are cautioned against assuming an effect of self-efficacy on behavior merely because of evidence for its effect on intention. In other words, practitioners should take care to measure self-efficacy's relationship to behavior in addition to measuring its relationship to intention.

The self-efficacy construct has been specified in theories in different ways. Social cognitive theory defines self-efficacy as a conviction or the degree of confidence individuals have regarding their capability to successfully perform a behavior (Bandura, 1977a). The theory of planned behavior specifies an "overarching, superordinate construct" (Ajzen, 2002, p. 680) —perceived behavioral control—that consists of self-efficacy (i.e., individuals' degree of confidence in their capabilities to perform a behavior) in addition to controllability (individuals' perceptions of the ease or difficulty of performing a behavior as well as their perception of their control over a behavior). The

finding of this study implies that self-efficacy, as specified in social cognitive theory, correlated with health behavior more strongly than perceived behavior control, as specified in the theory of planned behavior, correlated with health behavior, although both were moderate effects. However, the self-efficacy constructs from both theories related similarly (moderately strong) to health intention. These findings could mean that health communication practitioners may find it worthwhile to focus on constructing messages that target individuals' level of confidence in their ability to successfully perform behavior while also incorporating messages regarding individuals' perceptions of controllability, specifically their perceptions of the ease of performing a targeted health behavior.

In addition to these implications related to the chief findings of the research questions guiding this meta-analysis of meta-analyses, a number of additional implications can be drawn from this study for health communication research and practice. These implications relate to issues that arise from this meta-analysis. They are discussed in the following section.

Issues and Limitations

Effect size standards. Interpreting effect sizes is somewhat arbitrary and can make an effect appear less valuable than it may be in terms of practical application. For example, Sutton (1998) argues that "percentage of variance explained may give a rather pessimistic impression" (p. 1334). He demonstrates this using an example of a smoking cessation intervention in which 100 smokers in the intervention condition are compared to 100 smokers in a control condition. Success rates (quitting smoking) were 70% for the intervention and 30% for the control group. The success rate was improved 40% by the

intervention and the odds of success were five times higher for the intervention group. While these results indicate that the intervention had a "substantial and clinically useful effect" (p.1322), the percent of variance accounted for by the independent variable was 16%, which may make the effect seem "unimpressive" (p. 1322).

Sutton (1998) further demonstrates how an effect may have substantial practical value while accounting for what might be considered only a small amount of variance in an outcome measure. He uses a real world example of breast cancer screening in which women were asked if they would attend a screening if they received an invitation to do so. After subsequently receiving an invitation, 30% of the women who said they definitely would not attend if invited did attend a screening while nearly 90% of those who said they definitely would attend a screening if invited did attend. In this case, only 10% of the variance in behavior was explained by the intention/behavioral expectation measure. Sutton goes on to demonstrate that the problem in this case is scale correspondence since the intention measure consisted of five categories while the behavior measure was dichotomous. He uses this example to illustrate how it is possible to have a perfect linear relationship between two variables and yet at best explain approximately 50% of the variance in behavior (for further explanation, see Sutton, 1998). These two examples suggest that what might seem to be less than impressive amounts of variance in outcome variables such as health behavior explained by variables such as intention (20%) and self-efficacy (7.6%) may have substantial practical value.

A common research practice is to index the magnitude of effects in terms of Cohen's (1992) standards, as was done in the present study. For correlations, a small effect is $r = 0.10$, a medium effect is $r = 0.30$, and a large effect is $r = 0.50$. However,

Cohen intended these so-called standards to be used only when other guidelines were not available. It is preferable to consider effects in relation to those found in the field or even in the specific domain most relevant to the research being performed. The present research in health communication and behavior change may be considered to be part of the health psychology domain which is a subset of the field of social psychology. The effect sizes (product moment correlation coefficients) found in this field have been summarized by Richard, Bond, and Stokes-Zoota (2003). The effect sizes in social psychology were derived from 322 meta-analyses consisting of more than 25,000 studies and more than 8 million participants. The distribution of effect sizes was positively skewed with a mean effect size of $r = 0.21$ and a median effect size of $r = 0.18$. Approximately 30% of effect sizes were equal to or less than 0.10. Approximately 24% of the effect sizes were equal to or greater than 0.30, with just over 5% falling at or above 0.50. In relation to social psychology, then, the guidelines for effect size would be $r = 0.10$ for small effects, with approximately 30% of effects having values considered to be small. Medium effects would be approximately $r = 0.20$ with about half of social psychological effects falling near this value. Large effects would be approximately $r = 0.30$ with less than 25% of effects found to be large. For the present meta-analysis of meta-analyses, the relationships between intention, self-efficacy, and health behavior would be considered close to or above the guideline for large effect size.

Richard et al. (2003) also reported effect sizes found in the field of health psychology, although these include mental health and may be considered limited in scope in relation to possible health-related outcomes. These health-related effect sizes ranged from $r = 0.00$ to $r = 0.40$, with a median effect size of $r = 0.16$ (rounded up). In terms of

effect sizes falling within the domain of health psychology, the findings of this study are large, supporting the assertion that the relationships of interest to this study are strong.

Fisher's *Z* transformation. Two approaches to calculating sample-weighted correlations were compared in this study. One approach calculated correlations with Fisher's *Z* transformation since, according Hedges and Olkin (1985), the transformation corrects for negative bias in the correlation coefficient. The other approach calculated correlations without Fisher's *Z* transformation since, according to Hunter and Schmidt (1990), the transformed correlation is both positively biased and less accurate than the untransformed correlation. While results of this study are reported using the more conservative Hunter-Schmidt approach, results for the three relationships of interest for both approaches are compared in Tables 2 – 7. The correlations follow the pattern expected; correlations with the Fisher's Z transformation are larger than those without the transformation. However, the differences between the correlations and their related statistics make no difference in the study's conclusions, including decisions based on significance tests and tests of homogeneity. Although the Hunter-Schmidt approach is recommended here as the more conservative and accurate means of calculating correlation coefficients (1990, 2004), using Hedges-Olkin's (1985) approach produces similar conclusions, at least when both approaches are correcting only for sampling error, using large sample sizes and producing significant correlations, as found in this study. In short, the results suggest that this is a technical statistical issue that has no substantive implications for health research.

Homogeneity or heterogeneity. The discussion of the findings for the research questions acknowledges the possibility that there is more than one effect size underlying

the data. The distribution of those effects could be reflected in the credibility intervals. While the confidence intervals around the means in this study are narrow, indicating that the mean correlations are relatively accurate, the credibility intervals are wider, indicating a degree of variability remaining in the data even after sampling error is removed. The implication of this variability in observed correlations (as seen in the credibility intervals) is that it may be due to true variation in the population (Hunter & Schmidt, 2004; Schwarzer, 1989b).

As discussed in Chapter 3, the random effects model used in this meta-analysis assumes the existence of more than one effect size, although the model also can detect the existence of a single effect size. Determining whether or not there is a single value (homogeneity) or multiple values (heterogeneity) underlying the data is based on tests of homogeneity and inspection of credibility intervals. Most meta-analyses select one of these tests, typically the chi-square test, which—as a significance test—has the problems of significance testing, especially difficulty in accepting a null (see Hunter & Schmidt, 2004). This meta-analysis compared the results of three tests of homogeneity and calculated credibility intervals in order to make decisions about homogeneity. If the tests indicate homogeneity and the credibility intervals are relatively narrow, then one concludes that there is the likelihood of a single effect size value underlying the data; if the results of these tests indicate heterogeneity and the credibility intervals are wide or include zero, then one can conclude that there is more than one effect size value underlying the data.

For this study, results of tests of homogeneity are mixed. Some results lead to a conclusion of heterogeneity. The chi-square tests for all three relationships between

intention, self-efficacy and health behavior were significant, indicating heterogeneity. Likewise, results of tests using Hunter's 75% rule (Hunter & Schmidt, 2004) regarding percent of variance due to sampling error in relation to observed variance also indicate heterogeneity in each of the relationships. However, considering the actual amount of residual variance in relation to the effect size indicates homogeneity. Credibility intervals indicate at least some degree of heterogeneity of the data, particularly for self-efficacy and behavior for which the 95% distribution of values—from 0.15 to 0.40—is the widest range among the three associations. The self-efficacy-behavior relationship also has the largest residual standard deviation (rounded down to 0.06) of the three associations, nearing 25% of its effect size (rounded up to 0.07), which if exceeded would have resulted in a conclusion of heterogeneity. Thus, two of the tests and inspection of credibility intervals indicate some degree of heterogeneity. And, of the three relationships, the self-efficacy-behavior association seems to indicate the most variability.

While this evidence for heterogeneity in the relationships seems to warrant a search for moderators influencing effect sizes, some caution needs to be taken in the interpretation of results. First, at least some of the variability is almost certainly due to random factors other than sampling error (Lipsey & Wilson, 2001), as is typically the case (Hunter & Schmidt, 2004). Second, in spite of the small percentage of observed variance that is due to sampling error, the actual amount of residual variance also could be considered small. Of course, *small* is a relative term; one can ask, "How small is *small*?" The third test of homogeneity attempts to offer a rule of thumb to answer that question by suggesting that *small* refers to any residual standard deviation that is less than

one-fourth the size of the mean effect. Schwarzer (1989b) asserts that this test may be the most important test of the three. Whether or not this is the case, care must be taken in interpreting residual variance, especially when it is small (Rothstein, Erwin, Schmidt, Owens, & Sparks, 1990; Hunter & Schmidt, 1990). Based on this relative lack of heterogeneity within the data, health researchers and practitioners may consider the effects of these relationships to be similarly robust across health behaviors.

Moderators. It is possible that many factors moderate the relationships between intention, self-efficacy and health behavior even with relatively small amounts of residual variance between the meta-analyses used in this study. There is evidence from previous meta-analyses for several moderators of the relationships of interest. For example, Table 8 summarizes factors that have been explored as potential moderators in some of the meta-analyses used in this study. The table includes the outcomes of the moderator analyses, indicating whether the factors were found to have a moderating effect and identifying which relationships were influenced by the moderators.

The reason why the effects of moderators might not be obvious in the present study is that the average correlations extracted from each meta-analysis also represent the average of the effects of some—if not all—levels of certain moderators. That is, the levels of the moderators are conflated. For a moderator to be detected at the level of this study, an individual meta-analysis would have to represent just one level of a moderator rather than multiple levels of that moderator. Of course, for comparison of levels, other meta-analyses would have to represent a different level of that moderator. The subsets created could be submitted to moderator analysis, as was the case in Research Questions 4 and 5. Otherwise, to detect moderators, one would have to return to the individual study

Table 8

Examples of Potential Moderators Evaluated for Each Relationship (Intention-Behavior; Self-Efficacy-Behavior; Intention-Self-Efficacy) in Health-Related Meta-Analyses

Moderators[a]	I-B Relationship	SE-B Relationship	I-SE Relationship
Conceptual Moderators			
Attitude-Intention Strength	Yes (Hagger, 2002)		
Behavior type[b]	Yes (type of screening; Cooke & French, 2008)	Yes (exercise vs. other health-related behaviors; Hagger, 2009)	Yes (type of screening; Cooke & French, 2008)
	Yes (condom use with casual vs. steady partner; Sheeran & Orbell, 1998)	Yes (five types of health behavior; Holden, 1991)	No (exercise vs. other health-related behaviors; Hagger, 2009)
	No (exercise vs. other health-related behaviors; Hagger, 2009)	No (type of screening; Cooke & French, 2008)	
Past behavior	Yes (Albarracin, 2004)	Yes (Albarracin, 2004)	
	No (Hagger, 2002)		

Table 8 (cont'd).

Study Characteristics			
Age	Yes (Albarricin, 2004) Yes (Hagger , 2002) Yes (Sheeran & Orbell, 1998) No (Hagger, 2009)	Yes (Albarricin, 2004) No (Hagger, 2009)	Yes (Albarricin, 2004) No (Hagger, 2009)
Education	Yes (Albarricin, 2004)	Yes (Albarricin, 2004)	Yes (Albarricin, 2004)
Ethnicity	Yes (Albarricin, 2004)	Yes (Albarricin, 2004)	Yes (Albarricin, 2004)
Gender	No (Sheeran, 1998) No (Hagger, 2009)	No (Albarricin, 2004) No (Hagger, 2009)	Yes (Albarricin, 2004) No (Hagger, 2009)
Publication status	No (Hagger, 2009)	No (Hagger, 2009)	No (Hagger, 2009)
Study design (correlation vs. experimental/intervention)	No (Hagger, 2009)	No (Hagger, 2009)	No (Hagger, 2009)
Intervention Characteristics			
Cost of screening	Yes (Cooke & French, 2008)	Yes (Cooke & French, 2008)	Yes (Cooke & French, 2008)
Invitation to screen			Yes (Cooke & French, 2008)
Timing of invitation	Yes (Cooke & French, 2008)	Yes (Cooke & French, 2008)	Yes (Cooke & French, 2008)
Location of recruitment	Yes (Cooke & French, 2008)	No (Cooke & French, 2008)	No (Cooke & French, 2008)

Table 8 (cont'd).

Measurement Factors			
Measurement correspondence	Yes (Albarricin, 2004)	Yes (Sheeran, 1999)	Yes (Albarricin, 2004)
Measurement specificity	Yes (Albarricin, 2004)	Partial (Albarricin, 2004)	Partial (Albarricin, 2004)
Type of variable measure[c]	No (intention vs. self-predictions; Albarricin, 2004) No (intention vs. expectation; Sheeran & Orbell, 1998)	No (se vs. pbc; Albarricin, 2004)	No (se vs. pbc, Albarricin, 2004)

Note. Yes = results of moderator evaluation in meta-analytic study indicate a moderating effect for the factor (citation of meta-analytic study in which moderator was evaluated in parentheses). No = results of moderator evaluation in meta-analytic study do not indicate a moderating effect for the factor (citation of meta-analytic study in which moderator was evaluated in parentheses). I = intention; B = behavior; SE (se) = self-efficacy. pbc = perceived behavioral control.

[a]Moderator categories adopted from Webb and Sheeran (2006). [b]Specific types of behavior evaluated as potential moderators are identified in parentheses with the citation of the meta-analytic study in which it was evaluated. [c]Specific types of variable measure evaluated as potential moderators are identified in parentheses with the citation of the meta-analytic study in which it was evaluated.

level within each meta-analysis to create subgroups of studies whose correlations could then be averaged across the meta-analyses for each level of a potential moderator to examine their effects within health behavior. Nevertheless, the bottom line is that moderators may exist, but they are likely small in comparison to the main effects which are the focus of this research.

Overlap within meta-analyses. A potential limitation in this study is the overlap of individual studies (i.e., individual tests of relationships) between one meta-analysis and another. Overlap is a threat to the assumption of independence and therefore it is a threat to validity. The threat was addressed by removing entire meta-analyses from the set of eligible meta-analyses, thereby reducing overlap. However, in the interest of representing as many studies within health behavior as possible (i.e., avoiding loss of information about health behavior), meta-analyses were retained that represented the greatest number of unique studies—tests—for the relationships of interest. In addition, in order to include a greater number of meta-analyses, some overlap (approximately 1.5%) was tolerated. To investigate whether results would have been different had this study used the larger set of meta-analytic studies or had reduced the number of meta-analytic studies to where overlap was zero, meta-analyses were performed within the larger set of studies (i.e., eligible meta-analyses) with the greater amount of overlap (more than 5.7% with 25 individual studies used at least twice) and within the smaller set of studies with no overlap of individual studies.

Table 9 shows the results from each meta-analysis and Table 10 identifies the studies (i.e., eligible meta-analyses) used in each meta-analysis. The sample-weighted

Table 9

Comparison of Sample-Weighted Mean Correlations from Meta-Analyses of Data Sets Containing Different Percentages of Overlap

Relationship of variables	M-A with 0% overlap	M-A with 1.5% overlap	M-A with >5.7% overlap
Intention-behavior	0.4258	0.4480	0.4461
Self-efficacy-behavior	0.2652	0.2761	0.2729
Self-efficacy-intention	0.4545	0.4642	0.4642

Note. M-A = meta-analysis

Table 10

Studies Included in One or More of the Three Meta-Analyses Containing Different Percentages of Overlap

Study	M-A with 0% Overlap	M-A with 1.5% Overlap	M-A with > 5.7% Overlap
Albarricin, Kumkale & Johnson (2004)	x	x	x
Cooke & French (2008)	x	x	x
Forcehimes & Tonigan (2008)	x	x	x
Hagger, Chatzisarantis & Biddle (2002)	x	x	x
Yarcheski, Mahon, Yarcheski & Cannella (2004)	x	x	x
Holden (1991)	x[a]	x	x
Milne, Sheeran & Orbell (2000)	x[b]	x	x
Hagger & Chatzisarantis (2009)		x	x
Rodgers, Conner & Murray (2008)		x	x
Sheeran, Abraham & Orbell (1999)			x
Sheeran & Orbell (1998)			x

Note. Meta-Analytic Study = citation of eligible meta-analysis included in one or more of the three meta-analyses performed to compare effects of overlap on correlations of relationships between intention, self-efficacy, and health behavior. M-A = meta-analysis. x = meta-analytic study is included in meta-analysis of meta-analyses at stated level of % overlap.
[a]Only the correlation of the self-efficacy-behavior relationship from this meta-analytic study is included in the meta-analysis with 0% overlap. [b]Only the correlations of the intention-behavior and intention-self-efficacy relationships from this meta-analytic study are included in the meta-analysis with 0% overlap.

average correlations from these sets were submitted to tests of difference between correlations, and both confidence and credibility intervals were inspected. For both the self-efficacy-behavior relationship and the intention-self-efficacy relationship, the test of differences failed to reject the hypothesis of no difference. Both confidence intervals and credibility intervals overlapped, indicating similarity within the results. These results imply that there would have been no difference in the conclusions made for the study. For the intention-behavior relationship, the test for differences reached significance ($p <$ .001). Pairwise tests failed to reach significance for the two larger datasets with some degree of overlap but did reach significance for both pairwise tests of the zero percent overlap with the other two sets. The confidence intervals overlapped only for the two larger datasets. The credibility intervals showed overlap in both relationships with the 1.5% dataset used in the study; however, there was no overlap between the larger dataset with more than 5.7% overlap and the zero percent overlap. Although there may be some difference among the studies, one cannot conclude that the difference is a result of overlap but more likely due to other factors related to the reduction in the studies used in the zero percent meta-analysis. If the zero percent set of studies would have been used for this meta-analysis in lieu of the dataset with 1.5% overlap, the magnitude of the intention-behavior relationship would have been smaller ($r = 0.43$) in relation to the present study ($r = 0.45$) and the dataset would be considered homogeneous based on unanimous decisions from the tests of homogeneity and the zero variability in the credibility interval.

Correlation versus causation. Another potential limitation to this study is that it is based on correlation data, as are most meta-analyses investigating the variables of

interest in this study. Correlation data limits the implications that can be made from the results of the meta-analysis. Weinstein (2007) argues that many meta-analyses make erroneous claims about causal relationships between variables or about the efficacy or superiority of a particular theory because they confuse correlation with causation. Correlation data derived from cross-sectional or even prospective designs cannot be used to infer causation. Weinstein (2007) argues that these designs, which are those typically used in health behavior studies, have errors that can overestimate or underestimate effects. His arguments relate to the third criterion for causation (in addition to the criteria of association and time order): elimination of alternative explanations. To make his point, Weinstein uses the example of past behavior, which has been found to be a strong predictor of future behavior (Ouellette & Wood, 1998). Weinstein describes how, even in a prospective study, past behavior may be shaping intentions or self-efficacy and influencing future behavior in such a way that one cannot distinguish between the causal effects of past behavior, intention or self-efficacy. This influence of past behavior could be creating an exaggerated impression of the causal effect of intention or self-efficacy on future behavior (see Weinstein, 2007, for further explanation of the issues). Therefore, no inferences should be drawn from studies such as this present meta-analysis about causal relationships between intention, self-efficacy and behavior; rather, implications should limited to those regarding prediction rather than explanation.

Future Research

Since the magnitude of the relationship between the two predictors themselves is medium to large for health behavior, the question of their unique contribution to the prediction of health behavior is more difficult to assess from this study. While the

question of unique contribution was not a focus of the present study, it has been addressed within former reviews and meta-analyses of both health-related and general behavior studies. Specifically, researchers have questioned the degree to which self-efficacy and perceived behavioral control directly influence behavior independent of the other predictor variable of interest, intention. Armitage and Conner (2001) reported a medium effect for both pbc-behavior and self-efficacy-behavior but found that each explained only an additional two percent of the variance in behavior beyond the variance explained by intention. While this may suggest that, independent of intention, self-efficacy and pbc contribute little to behavior, there is support in the meta-analytic literature for the two variables operating in a manner that is both independent and additive at least in relation to one type of health behavior—condom use (Albarracin et al., 2004).

In Godin and Kok's (1996) review of health behaviors, only about half of the applications (21 out of 41) that addressed the contribution of perceived behavioral control beyond intention reached the level of significance. However, in the studies that reached significance, perceived behavioral control explained an average of 11.5% of the variance in health behaviors beyond that explained by intention.

Some researchers have argued that self-efficacy has a direct influence on behavior but perceived behavioral control does not (Dzewaltowski, 1990). In another health behavior quantitative review, Albarracin et al. (2001) tested the fit of both the theory of reasoned action and the theory of planned behavior for findings related to condom use and found that in spite of a moderate correlation for perceived behavioral control and behavior ($r = 0.25$, $k = 23$), the path coefficient was not significant, implying a "lack of

support for a direct influence of perceived behavioral control on actual condom use" (p. 154). The reason for the differences between a self-efficacy variable's small to medium correlations and the small and sometimes non-significant findings regarding its direct contribution to behavior may be due to its relationship to intention. Given the similar findings in this study regarding self-efficacy's relationship to intention and an even smaller correlation for the self-efficacy-behavior relationship than what has been reported in some of the research just mentioned, it is possible that the degree to which self-efficacy or perceived behavioral control uniquely contributes to the prediction of behavior may be smaller than what has been reported in other studies. However, this remains unknown. Because of the disparate findings from former research, future research should consider using experimental designs to investigate the independent contributions of intention and self-efficacy within the health behavior domain.

In this study, the investigation of the differences between self-efficacy and perceived behavioral control in their association with health behavior indicated a difference, and thus provided support for the moderating effect of type of self-efficacy for the self-efficacy-health behavior relationship. However, the investigation of the differences between the two types of self-efficacy variable and intention failed to show a difference between the two relationships. Thus, there was a lack of evidence for the moderating effect of type of self-efficacy variable for the self-efficacy-intention relationship. However, these results may have been due to the way in which self-efficacy and pbc were distinguished from one another in this study. As discussed in Chapter 3, former research has reported differences between these relationships, although there have been disparities in the pattern of those differences (Armitage & Conner, 2001; Rodgers et

al., 2008). Future research should consider using experimental designs to investigate the effects of self-efficacy and perceived behavioral control for both intention and health behavior when these constructs are more precisely distinguished than they were in this study.

Because of their limitations, Weinstein (2007) suggests that correlation-based studies consider themselves to be *pilot studies* that make recommendations regarding the direction of future experimental research. If this is the case, then the present study provides a synthesis of pilot studies relating to the relationships between intention, self-efficacy and behavior across several dimensions of the health behavior domain. A meta-analysis is the most accurate way to provide this synthesis and is useful to inform future research. While there may be dimensions of health behavior that were under-represented or not represented at all within this study, this study advises against making a research priority out of creating more correlation studies to assess these relationships for a different health behavior type or in light of a different sample or a different set of study characteristics. Instead, given the robust results derived from meta-analysis, the present study argues that it may be worthwhile to move away from more correlation research and to move toward more experimental research of the relationships between intention, self-efficacy and health behavior. Such research could provide evidence for moving intention and self-efficacy from their status as predictors to that of causal agents by ruling out alternative explanations for their respective effects on behavior. Experimental research could more clearly test the direct and indirect unique contributions of self-efficacy and intention, as well as compare the effects of different measures of self-efficacy (e.g., pbc

and self-efficacy). Moving from prediction to causation in this way could be of great value to both the research and practice of health communication for behavior change.

Conclusion

Meta-analyses can make important contributions to research, policy, and practice by "moving discussion away from individual studies toward an overview of the whole body of research bearing on a given topic" (Lipsey & Wilson, 2001, p. 167). Toward this end, this study used meta-analysis to synthesize the results of health-related meta-analyses to provide a clearer and more comprehensive overview of the magnitude of the relationships between intention, self-efficacy and health behavior. Despite the various differences and moderators affecting these relationships within previous individual studies and meta-analyses, the results of this study imply that the magnitude of the intention-health behavior relationship is medium to large, and the magnitude of the self-efficacy-health behavior relationship is small to medium, in terms of Cohen's standards. However, in relation to social psychology and to the health domain in particular, these relationships are large and moderate, respectively. From these results, both intention and self-efficacy appear to be valuable predictors of health behavior. Given the lack of heterogeneity in the results, health communication researchers and practitioners should consider the size of the relationships between intention, self-efficacy and health behavior to be similar across health behavior types.

Consistent with social-psychological theories applied to health communication, intention is substantially related to health behavior and thus health communication researchers are encouraged to experimentally study the way in which messages and constructs drawn from these theories might have the strongest effects on intention. Health

communication practitioners tentatively are encouraged to develop messages related to constructs from these theories that are positively associated with intention. One of those constructs is self-efficacy. Given its moderately strong relationship to intention and its moderate relationship to health behavior, as posited by social-psychological theories, health communication practitioners tentatively are encouraged to develop messages targeting self-efficacy while measuring effects on both intention and behavior. Health communication researchers are encouraged to experimentally examine self-efficacy's unique, direct effect on health behavior apart from its relationship to intention. In addition, health communication researchers are encouraged to experimentally test the relative effects of self-efficacy-related messages designed to increase individuals levels of confidence in their ability to successfully perform health behaviors versus messages designed either to increase individuals' perceptions of the ease of performing health behaviors or to increase individuals' perceptions of their control over health behaviors.

In terms of meta-analysis of health behavior research, choosing to apply either the Hunter-Schmidt (1990, 2004) or Hedges-Olkin (1985) meta-analytic approach should not make a substantive difference in the resulting effect sizes for the relationships of interest. Researchers are encouraged, however, to avoid making decisions about the degree of heterogeneity within their health behavior data solely on the basis of a chi-square test or even Hunter's 75% rule (Hunter & Schmidt, 2004). Rather, the actual amount of residual variance in relation to the effect size should be considered. Finally, based on these findings, health communication researchers can be confident that intention and self-efficacy have predictive value but not causal effect. Therefore, both intention and self-efficacy are worth further investigation with experimental designs to rule out alternative

explanations for their effect on behavior and, if found to have causal effects, to understand the mechanisms responsible for those effects. Such investigation would benefit the field of health communication in its efforts to design messages that produce health behavior change.

REFERENCES

References marked with an asterisk indicate studies included in the meta-analysis.

Abraham, C., Sheeran, P., & Johnston, M. (1998). From health beliefs to self-regulation: Theoretical, advances in the psychology of action control. *Psychology and Health, 13* 569-591.

Agnew, C. R. (1994). *Interdependent social behaviors: Behavioral prediction using individual- and dyad-level models* (Unpublished doctoral dissertation) The University of North Carolina at Chapel Hill, North Carolina.

Ajzen, I. (1985). From intentions to action: A theory of planned behavior. In J. Kuhl & J. Beckmann (Eds.), *Action-control: From cognition to behavior* (pp. 11-39). New York: Springer.

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes, 50*(2), 179-211.

Ajzen, I. (2002). Perceived behavioral control, self-efficacy, locus of control, and the theory of planned behavior. *Journal of Applied Psychology, 32*(4), 665-683.

Ajzen, I. & Fishbein, M. (1970). The prediction of behavior from attitudinal and normative variables. *Journal of Experimental Social Psychology, 6*, 466-487.

Ajzen, I. & Fishbein, M. (1973). Attitudinal and normative variables as predictors of specific behaviors. *Journal of Personality and Social Psychology, 27*, 41-57.

Ajzen, I. & Fishbein, M. (1980a). Factors influencing intentions and the intention-behavior relation. *Human Relations, 27*, 1-15.

Ajzen, I. & Fishbein, M. (1980b). *Understanding attitudes and predicting social behavior*. Englewood-Cliffs, NJ: Prentice-Hall.

Ajzen, I. & Madden, T. J. (1986). Prediction of goal-directed behavior: Attitudes, intentions and perceived behavioral control. *Journal of Personality and Social Psychology, 22*, 453-474.

Albarracin, D., Johnson, B. T., Fishbein, M., & Muellerleile, P. A. (2001). Theories of reasoned action and planned behavior as models of condom use: A meta-analysis. *Psychological Bulletin, 127*(1), 142-161.

*Albarracin, D., Kumkale, G. T., & Johnson, B. T. (2004). Influences of social power and normative support on condom use decisions: a research synthesis. *AIDS Care, 16*(6), 700-723.

Allport, G. W. (1935). Attitudes. In C. Murchison (Ed.), *A handbook of social psychology*. Worcester, MA: Clark University Press.

Armitage, C. J., & Conner, M. (2001). Efficacy of the theory of planned behaviour: A meta-analytic review. *British Journal of Social Psychology, 40*, 471-499.

Baer, R. A. (2003). Mindfulness training as a clinical intervention: A conceptual and empirical review. *Clinical Psychology: Science and Practice, 10*(2), 125-143.

Bandura, A. (1977a). Self-Efficacy: Toward a unifying theory of behavioral change. *Psychological Review, 84*(2), 191-215.

Bandura, A. (1977b). *Social learning theory*. New York: General Learning Press.

Bandura, A. (1982). Self-efficacy mechanism in human agency. *American Psychologist, 37*, 122-147.

Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*. Englewood Cliffs, NJ: Prentice Hall.

Bandura, A. (1995). Exercise of personal and collective efficacy in changing societies. In A. Bandura (Ed.), *Self-efficacy in changing societies*. Cambridge: Cambridge University Press.

Bandura, A. (1997). *Self-efficacy: The exercise of control*. New York: Freeman.

Becker, M. H. (1974). The health belief model and personal health behavior. *Health Education Monographs, 2*(4).

Becker, M. H., Maiman, L. A., Kirscht, J. P., Don, P. H., & Drachman, R. H. (1977). The health belief model and prediction of dietary compliance: A field experiment. *Journal of Health and Social Behavior, 18*(4), 348-366.

Carson, K. P., Schriesheim, C. A., & Kinicki, A. J. (1990). The usefulness of the fail-safe statistic in meta-analysis. *Educational and Psychological Measurement, 50*(2), 233-243.

Casey, M. K., Timmermann, L., Allen, M., Krahn, S., & Turkiewicz, K. L. (2009). Response and self-efficacy of condom use: A meta-analysis of this important element of AIDS education and prevention. *Southern Communication Journal, 74*(1), 57 - 78.

Cohen, J. (1992). A power primer. *Psychological Bulletin, 112*, 155-159.

Conner, M., & Norman, P. (1996). *Predicting health behaviour*. Buckingham, U.K.: Open University Press.

Conner, M., & Norman, P. (2005a). Predicting health behaviour: A social cognition approach. In M. Conner & P. Norman (Eds.), *Predicting health behavior* (pp. 1-27). New York: Open University Press.

Conner, M., & Norman, P. (Eds.). (2005b). *Predicting health behavior* (2nd ed.). New York: Open University Press.

*Cooke, R., & French, D. P. (2008). How well do the theory of reasoned action and theory of planned behaviour predict intentions and attendance at screening programmes? A meta-analysis. *Psychology & Health, 23*(7), 745-765.

Dulany, D. E. (1968). Awareness, rules, and propositional control: A confrontation with S-R behavior theory. In D. Horton & T. Dixon (Eds.), *Verbal behavior and S-R behavior theory*. New York: Prentice-Hall.

Dzewaltowski, D. A., Noble, J. M., & Shaw, J. M. (1990). Physical activity participation-social cognitive theory versus the theories of reasoned action and planned behavior. *Journal of Sport and Exercise Psychology, 12*, 388-405.

Eagly, A. H., & Chaiken, S. (1993). *The psychology of attitudes*. Fort Worth: Harcourt Brace Jovanovich.

Eckes, T., & Six, B. (1994). Fact and fiction in research on the relationship between attitude and behavior: A meta-analysis. *Zeitschrift fur Sozialpsychologie, 25*(4), 253-271.

Fishbein, M. (1966). *Sexual behavior and propositional control*. Paper presented at the Psychonomic Society, St. Louis.

Fishbein, M. (1967). Attitude and the prediction of behavior. In M. Fishbein (Ed.), *Readings in attitude theory and measurement*. New York: Wiley.

Fishbein, M., & Ajzen, I. (1975). *Belief, attitude, intention, and behavior: An introduction to theory and research*. Reading, MA: Addison-Wesley.

Floyd, D. L., Prentice Dunn, S., & Rogers, R. W. (2000). A meta-analysis of research on protection motivation theory. *Journal of Applied Social Psychology, 30*(2), 407-429.

*Forcehimes, A. A., & Tonigan, J. S. (2008). Self-efficacy as a factor in abstinence from alcohol/other drug abuse: A meta-analysis. *Alcoholism Treatment Quarterly, 26*(4), 480-489. doi: 10.1080/07347320802347145

Forsyth, A. D. (2000). *The relationship of self-efficacy beliefs to condom use: A meta-analysis of HIV prevention research* (Unpublished doctoral dissertation). Syracuse University, Syracuse, NY.

Gillis, A. J. (1993). Determinants of a health-promoting lifestyle: An integrative review. *Journal of Advanced Nursing, 18*(3), 345-353.

Glass, G. V. (1976). Primary, secondary and meta-analysis of research. *Educational Researcher, 5*, 3-8.

Gochman, D. S. (Ed.). (1997). *Handbook of health behavior research: Personal and social determinants* (Vol. 1). New York: Plenum.

Godin, G., & Kok, G. (1996). The theory of planned behavior: A review of its applications to health-related behaviors. *American Journal of Health Promotion, 11*(2), 87-98.

Gwaltney, C. J., Metrik, J., Kahler, C. W., & Shiffman, S. (2009). Self-efficacy and smoking cessation: A meta-analysis. *Psychology of Addictive Behaviors, 23*(1), 56-66.

*Hagger, M. S., & Chatzisarantis, N. L. D. (2009). Integrating the theory of planned behaviour and self-determination theory in health behaviour: A meta-analysis. *British Journal of Health Psychology, 14*, 275-302. doi: 10.1348/135910708x373959

*Hagger, M. S., Chatzisarantis, N. L. D., & Biddle, S. J. H. (2002). A meta-analytic review of the theories of reasoned action and planned behavior in physical activity: Predictive validity and the contribution of additional variables. *Journal of Sport & Exercise Psychology, 24*(1), 3-32.

Hausenblas, H. A., Carron, A. V., & Mack, D. E. (1997). Application of the theories of reasoned action and planned behavior to exercise behavior: A meta-analysis. *Journal of Sport and Exercise Psychology, 19*(1), 36-51.

Hedges, L. V., & Olkin, I. (1985). *Statistical methods for meta-analysis*. New York: Academic Press.

Holden, G. (1990). *The relationship of self-efficacy appraisals to subsequent health-related outcomes: A meta-analysis* (Unpublished doctoral dissertation). Columbia University, New York.

*Holden, G. (1991). The relationship of self-efficacy appraisals to subsequent health related outcomes: A meta-analysis. *Social Work in Health Care, 16*(1), 53-93.

Hunter, J. E., & Schmidt, F. L. (1990). *Methods of meta-analysis: Correcting error and bias in research findings*. Newbury Park: Sage.

Hunter, J. E., & Schmidt, F. L. (2004). *Methods of meta-analysis: Correcting error and bias in research findings* (2nd ed.). Thousand Oaks, CA: Sage.

Hunter, J. E., Schmidt, F. L., & Jackson, G. B. (1982). *Meta-analysis. Cumulating research findings across studies*. Beverly Hills: Sage.

Kim, M. S., & Hunter, J. E. (1993). Relationships among attitudes, behavioral intentions, and behavior: A meta-analysis of past research: II. *Communication Research, 20*(3), 331-364.

Lipsey, M. W., & Wilson, D. B. (2001). *Practical meta-analysis* (Vol. 49). Thousand Oaks, CA: Sage.

Luszczynska, A., & Schwarzer, R. (2005). Social cognitive theory. In M. Conner & P. Norman (Eds.), *Predicting health behavior: Research and practice with social cognition models* (pp. 127-169). New York: Open University Press.

Maddux, J. E., & Rogers, R. W. (1983). Protection motivation and self-efficacy: A revised theory of fear appeals and attitude change. *Journal of Experimental Social Psychology, 19*(5), 469-479.

*Milne, S., Sheeran, P., & Orbell, S. (2000). Prediction and intervention in health-related behavior: A meta-analytic review of protection motivation theory. *Journal of Applied Social Psychology, 30*(1), 106-143.

Mohtasham, G., Shamsaddin, N., Bazargan, M., Anosheravan, K., Elaheh, M., & Fazlolah, G. (2009). Correlates of the intention to remain sexually inactive among male adolescents in an Islamic country: Case of the Republic of Iran. *Journal of School Health, 79*(3), 123-129.

Netz, Y., Wu, M. J., Becker, B. J., & Tenenbaum, G. (2005). Physical activity and psychological well-being in advanced age: A meta-analysis of intervention studies. *Psychology and Aging, 20*(2), 272-284.

Noar, S. M., & Zimmerman, R. S. (2005). Health behavior theory and cumulative knowledge regarding health behaviors: Are we moving in the right direction? *Health Education Research, 20*(3), 275-290.

Norman, P., Boer, H., & Seydel, E. (2005). Protection motivation theory. In M. Conner & P. Norman (Eds.), *Predicting Health Behavior* (2nd ed., pp. 81-126). New York: Open University Press.

Norman, P., & Hoyle, S. (2004). The theory of planned behavior and breast self-examination: Distinguishing between perceived control and self-efficacy. *Journal of Applied Social Psychology, 34*(4), 694-708.

Notani, A. S. (1998). Moderators of perceived behavioral control's predictiveness in the theory of planned behavior: A meta-analysis. *Journal of Consumer Psychology, 7*(3), 247-271.

Ouellette, J. A., & Wood, W. (1998). Habit and intention in everyday life: The multiple processes by which past behavior predicts future behavior. *Psychological Bulletin, 124*, 57-74.

Prochaska, J. O., & DiClemente, C. C. (1982). Transtheoretical therapy: Toward a more integrative model of change. *Psychotherapy: Theory, Research & Practice, 19*(3), 276-288.

Prochaska, J. O., & DiClemente, C. C. (1983). Stages and processes of self-change of smoking: Toward an integrative model of change. *Journal of Consulting and Clinical Psychology, 51*(3), 390-395.

Prochaska, J. O., DiClemente, C. C., & Norcross, J. C. (1992). In search of how people change: Applications to addictive behavior. *American Psychologist, 47*, 1102-1114.

Prochaska, J. O., & Velicer, W. F. (1997). The transtheoretical model of health behavior change. *American Journal of Health Promotion, 12*, 38-48.

Randall, D. M., & Wolff, J. A. (1994). The time interval in the intention-behaviour relationship: Meta-analysis. *British Journal of Social Psychology, 33*(4), 405-418.

Richard, F. D., Bond, C. F., Jr., & Stokes-Zoota, J. J. (2003). One hundred years of social psychology quantitatively described. *Review of General Psychology, 7*(4), 331-363.

Rivis, A., & Sheeran, P. (2003). Descriptive norms as an additional predictor in the theory of planned behaviour: A meta-analysis. *Current Psychology: Developmental, Learning, Personality, Social, 22*(3), 218-233.

*Rodgers, W. M., Conner, M., & Murray, T. C. (2008). Distinguishing among perceived control, perceived difficulty, and self-efficacy as determinants of intentions and behaviours. *British Journal of Social Psychology, 47*, 607-630. doi: 10.1348/014466607x248903

Rogers, R. W. (1975). A protection motivation theory of fear appeals and attitude change. *Journal of Psychology, 91*, 93-114.

Rogers, R. W. (1983). Cognitive and physiological processes in fear appeals and attitude change: A revised theory of protection motivation. In J. T. Cacioppo & R. E. Petty (Eds.), *Social Psychophysiology: A Sourcebook.* London: Guilford.

Rosenstock, I. M., Strecher, V. J., & Becker, M. H. (1988). Social learning theory and the health belief model. *Health Education Quarterly, 15*(2), 175-183.

Rosenthal, R. (1979). The "file drawer problem" and tolerance for null results. *Psychological Bulletin, 86*, 638-641.

Rosenthal, R. (1984). *Meta-analytic procedures for social research.* Beverly Hills: Sage.

Rosenthal, R. (1991). *Meta-analytic procedures for social research* (2nd ed.). Newbury Park, CA: Sage.

Rosenthal, R., & Rubin, D. B. (1979). A note on percent variance explained as a measure of importance of effects. *Journal of Applied Psychology, 9*, 395-396.

Rothstein, H. R., Erwin, F. W., Schmidt, F. L., Owens, W. A., & Sparks, C. P. (1990). Biographical data in employment selection: Can validities be made generalizable? *Journal of Applied Psychology, 75*(2), 175-184.

Sandberg, T., & Conner, M. (2008). Anticipated regret as an additional predictor in the theory of planned behaviour: A meta-analysis. *British Journal of Social Psychology, 47*, 589-606.

Schwarzer, R. (1989a). META: Programs for secondary data analysis (Version 5.3) [Computer Software]. Berlin: Free University of Berlin. Retrieved from http://web.fu-berlin.de/gesund/gesu_engl/meta_e.htm

Schwarzer, R. (1989b). META: Programs for secondary data analysis (Version 5.3) [Manual]. Berlin: Free University of Berlin. Retrieved from http://web.fu-berlin.de/gesund/gesu_engl/meta_e.htm

Sheeran, P. (2002). Intention-behavior relations: A conceptual and empirical review. In M. Hewstone & W. Stroebe (Eds.), *European review of social psychology* (Vol. 12, pp. 1-36). New York: J. Wiley.

Sheeran, P., Abraham, C., & Orbell, S. (1999). Psychosocial correlates of heterosexual condom use: A meta-analysis. *Psychological Bulletin, 125*(1), 90-132. doi: 10.1037/0033-2909.125.1.90

Sheeran, P., & Orbell, S. (1998). Do intentions predict condom use? Meta-analysis and examination of six moderator variables. *British Journal of Social Psychology, 37*, 231-250.

Sheppard, B. H., Hartwick, J., & Warshaw, P. R. (1988). The theory of reasoned action: A meta-analysis of past research with recommendations for modifications and future research. *Journal of Consumer Research, 15*(3), 325-343.

Stoffelmayr, B. E., Dillavou, D., & Hunter, J. E. (1983). Premorbid functioning and outcome in schizophrenia: A cumulative analysis. *Journal of Consulting and Clinical Psychology, 51*, 338-352.

Sutton, S. (1998). Predicting and explaining intentions and behavior: How well are we doing? *Journal of Applied Social Psychology, 28*(15), 1317-1338.

Sutton, S. (2005). Stage theories of health behavior. In M. Conner & P. Norman (Eds.), *Predicting health behavior* (2nd ed., pp. 223-275). New York: Open University Press.

Tracz, S. M., Elmore, P. B., & Pohlmann, J. T. (1992). Correlational meta-analysis: Independent and nonindependent cases. *Educational and Psychological Measurement, 52*(4), 879-888.

Trafimow, D., Sheeran, P., Conner, M., & Finlay, K. A. (2002). Evidence that perceived behavioural control is a multidimensional construct: Perceived control and perceived difficulty. *British Journal of Social Psychology, 41*(1), 101-121.

van den Putte, B. (1991). *Twenty years of the theory of reasoned action of Fishbein and Ajzen: A meta-analysis*. Unpublished manuscript. University of Amsterdam, Amsterdam, Netherlands.

Verbeke, W., Vanhonacker, F., Frewer, L. J., Sioen, I., De Henauw, S., & Van Camp, J. (2008). Communicating risks and benefits from fish consumption: Impact on Belgian consumers' perception and intention to eat fish. *Risk Analysis, 28*(4), 951-967. doi: 10.1111/j.1539-6924.2008.01075.x

Webb, T. L., & Sheeran, P. (2006). Does changing behavioral intentions engender behavior change? A meta-analysis of the experimental evidence. *Psychological Bulletin, 132*(2), 249-268.

Weinstein, N. D. (2007). Misleading tests of health behavior theories. *Annals of Behavioral Medicine, 33*(1), 1-10.

Whitener, E. M. (1990). Confusion of confidence intervals and credibility intervals in meta-analysis. *Journal of Applied Psychology, 75*(3), 315-321.

Wicker, A. W. (1969). Attitudes versus actions: The relationship of verbal and overt behavioral responses to attitude objects. *Journal of Social Issues, 25*, 41-78.

*Yarcheski, A., Mahon, N. E., Yarcheski, T. J., & Cannella, B. L. (2004). A meta-analysis of predictors of positive health practices. *Journal of Nursing Scholarship, 36*(2), 102-108.