ADOLESCENT RISK PREFERENCE AND ASTHMA SYMPTOM SELF-MANAGEMENT: ASSESSING SYMPTOM MANAGEMENT SCENARIOS

By

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[Signature]

L. A. W. C.
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“To know that we know what we know, and that we do not know what we do not know, that is true knowledge”, Thoreau (Confucius)

As we journey through educational programs we quickly learn what we know and what we do not know. Most of us are humbled by the ‘knowledge’ we do not have and the ‘knowledge’ we need to be successful. I discovered early in life that learning is rarely accomplished without the support of family, friends, mentors, and colleagues. In my family the phrase ‘it takes a village’ has many meanings and at various times applies to all of us. This dissertation was a personal goal, but it was only achieved because of the love, friendship, support, and wisdom of a ‘village’ of people who I wish to thank.

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DEDICATION

"People are what they are because they have come out of what was" (Carl Sandburg)

This dissertation is dedicated to two people who championed my decision to commence doctoral education, but who are not here to celebrate my accomplishment.

To my father and my friend, your physical presence is greatly missed,
but your love and spiritual presence are felt everyday.

Samuel M. Welch
February 1914 to August 2001

and

Susan Campbell McRae
January 1946- June 2003
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ABSTRACT

Adolescent asthma symptom self-management choices frequently involve uncertain outcomes that include potential dangers such as trigger exposures or delays in treatments that can lead to increased morbidity or mortality. Nurses must understand factors that influence how adolescents make symptom decisions.

The purpose of the investigation was to assess eight adolescent asthma symptom scenarios for use with the standard gamble technique (SGT) for making choices. The aims were to: 1) estimate the internal consistency and content validity of the scenarios; 2) estimate the relationship between measured risk preferences, age, and gender; and 3) describe adolescent responses to using the SGT.

Thirty-six adolescents participated. Risk preferences or utilities elicited during face-to-face interviews with 31 adolescents were used to answer research questions. Data were analyzed using descriptive statistics, Cronbach’s alpha, Kendall’s tau correlations, and point biserial correlations. Content validity (CV) ratings from 36 adolescents were used to compute indexes and establish CV of the scenarios. Qualitative responses were analyzed using a modified case study strategy to further establish CV and assess using SGT with adolescents.

The estimates of internal consistency reliability and relationships between utilities, age, and gender were limited by the non-normal distributions of utility and age data sets and small sample size. The standardized alpha was .70 for the eight-scenario composite. Eight significant inter-item correlations and seven significant item-total correlations were identified. One significant correlation between age and an individual
scenario utility score was found. No significant relationships between age and mean utility scores or gender and the individual or mean utility scores were seen.

The CV indexes support the relevancy of the content of the eight-scenario composite as evidenced by 94.5% of the adolescents rating the individual scenarios as CV for the domains and 92% for the risk areas. In addition, the adolescents rated 94% percent of the composites as CV. The qualitative responses support the quantitative data and describe the SGT as a method that adolescents can use.

Future studies are needed with a larger sample to further examine the internal consistency of the scenarios and the relationships between age, gender, and utility scores measured with the SGT.
Chapter 1

*The expression of preference by means of choice and decision making is the essence of intelligent and purposeful behavior* (Slovic, 1991).

**INTRODUCTION**

According to the National Heart Lung and Blood Institute (NHLBI), symptom self-management is an essential component of asthma treatment. The goal of self-management is to prevent negative disease outcomes through symptom control by the individual (Expert Panel, 1997). An asthma symptom self-management action is an individual behavioral response to the multiple physiological, psychological, social, and environmental factors associated with the symptoms of asthma (ATS, 1999). Critical to the behavioral response is the decision process that precedes the action. Adolescent asthma symptom self-management decisions frequently involve uncertain outcomes and nurses must understand factors that influence decisions made in symptom situations. In this investigation symptom self-management decisions are defined as choices or the conscious act of choosing an alternative with the intention of producing a preferred outcome or consequence (Tversky & Fox, 1995). Choice decisions have well defined alternatives and a person chooses one by forming an opinion or likelihood judgment about it’s possible consequences.

Symptom self-management choices that have uncertain consequences are said to involve risk because the decision-maker faces a possible loss. Asthma symptom self-management decisions that involve risk may include potential dangers such as exposures to triggers or delays in treatments. These potential dangers can expose adolescents to
increased asthma morbidity and/or mortality (Yoos & McMullen, 1999). Adolescent symptom self-management choices involving risk can be explained within a framework of theories related to decision-making (Tversky & Kahneman, 1986), adolescent cognitive development (Piaget, 1972), and expected utility (von Neumann & Morgenstern, 1947). The theories may explain how adolescents use prior symptom knowledge and cognitive abilities to recognize symptoms, to identify self-management alternatives, to form opinions related to the probable consequences of the alternatives, and finally to choose an alternative based on the consequence they prefer.

Choices made in situations that involve risk are influenced by a person’s risk preference. Risk preference refers to the value a person places on a choice that involves a gamble with known probabilities for losses. A gamble is defined as taking a chance on an uncertain outcome or consequence with the hope of gaining something (Yates, 1990). Adolescents who experiment by taking chances in situations where the consequences are uncertain are gambling and taking risks. Researchers have shown that many adolescents fall short of understanding how taking risks can impact their lives (Fischhoff, 1992; Frey, 1997; Kolbe, Vamos, Fergusson, & Elkind, 1998; Kolbe, Vamos, James, Elkind, & Garrett, 1996; Maggs, Schulenberg, & Hurrelmann, 1997). Yet, nothing is written about how adolescent risk preference may influence asthma symptom self-management decisions. This investigation provides a foundation for understanding risk preference as it pertains to asthma symptom self-management by describing eight asthma symptom scenarios for use with the standard gamble technique (SGT). The following sections
discuss the purpose, background, research questions, conceptual framework, and significance of the investigation.

**Purpose**

The purpose of this investigation was to assess eight investigator-developed adolescent asthma symptom self-management scenarios for use with the SGT. The scenarios were developed and formatted to measure risk preference in a series of gambles among outcomes using the SGT. The specific aims of the investigation were to: 1) estimate the internal consistency and content validity of the scenarios; 2) estimate the relationship between measured risk preferences, age, and gender; and 3) describe adolescent responses to using the SGT as a decision-making methodology.

An overview of how adolescent symptom self-management choices involving gambles are influenced by decision-maker risk preference is discussed in the background section of this chapter. Understanding of how risk relates to decision-making is needed in order to understand how risk preference relates to symptom self-management choices during adolescence. Risk is defined as a chance involving a loss with known probabilities (Yates 1990). A risky decision is a situation where one chooses between alternatives with unknown consequences that contain a chance for loss. The following section introduces adolescent symptom self-management decision-making from the perspectives of decision theory, cognitive development, and expected utility theory.
Background

Decision-Making

All decisions are intended to bring about outcomes with the greatest value for the
decision-maker (von Neumann & Morgenstern, 1947). Within this framework, decision
processes are considered consequential and preference-based. The processes are
consequential in that choices for action are dependent on anticipation of the future effect
of the current action, or interpretation of alternatives in terms of their expected
consequences. Decision processes are preference-based because the expected
consequences are considered in terms of personal desire. This means that the alternatives
are compared in terms of the extent to which the expected consequences are thought to
better serve the preference or desire of the individual (Kahneman & Tversky, 1984;
March, 1994; Schick, 1997; J.F. Yates, 1990a). Under this assumption a person makes a
choice conditional on: 1) the possible alternatives for action; 2) the likelihood of the
possible consequence, assuming the alternative is chosen (the expectation); 3) the value
of the consequences associated with each alternative (the preference); and 4) a decision
rule or the process used for choosing (Connolly, Arkes, & Hammond, 2000; Schick,
1997).

Decisions result from multi-step processes that include receiving information,
interpreting information, and acting on information. During the receiving process the
person is alerted to the need to make a decision. During the interpretation the person uses
their knowledge and cognitive capacity for reasoning to identify possible alternatives and
consequences, to form likelihood judgments or assign probabilities to possible
consequences, and finally to choose the alternative with the most preferred consequence. The action taken is preference-based or intended to bring about the outcome with the greatest value to the decision-maker.

Preferences are measures of the value an individual assigns to the possible consequences of a behavior or action (von Neumann & Morgenstern, 1947; J.F. Yates, 1990a). Understanding how the theories of decision-making, cognitive development, and expected utility relate to the preferences that may affect symptom self-management is imperative to asthma control within the adolescent population. The following sections introduce decision-making from the perspective of limited rationality, cognitive development, and expected utility as they pertain to adolescent symptom self-management decision-making involving risks.

Limited Rationality Decision Theory

Most modern rational choice theories recognize there is uncertainty surrounding the future consequences of present action and assume that individuals choose among alternatives based on the likelihood of possible consequences rather than expected consequences (March, 1994; Schick, 1997). These are called theories of limited rationality and within these frameworks it is assumed that people make less than rational decisions because they may consider only a few alternatives, consider only some of the consequences, and or exhibit inconsistent preferences by choosing actions that are just good enough rather than the best or most valued (March, 1994; Schick, 1997). Theories of limited rationality assume individuals intend to be rational but they are hindered by incomplete information or limited cognitive capabilities and thus, their actions may be
less than rational in spite of their intentions and efforts. To accommodate for missing information or cognitive limitations, individuals may look for information, but actually see what they expect to see and overlook unexpected things making their reasoning flawed from a logical perspective (March, 1994; Schick, 1997). In other cases individuals construct information based on what they think might happen or reconstruct information based on what they believe happened in similar situations, making their reasoning flawed from a memory-based perspective (March, 1994; Schick, 1997).

Adolescent decision-making may be described within the framework of limited rationality because adolescent decisions are sometimes flawed by incomplete information and sometimes flawed by a limited cognitive capacity. During adolescence these flaws may be a result of a lack of experience, a lack of education, or a young age (Beyth-Maram & Fischhoff, 1997). Either flaw may alter adolescent beliefs related to available alternatives and possible consequences in symptom related situations that call for action. Likelihood judgments formed in these situations may be less than rational in spite of best intentions and efforts.

Likelihood Judgments

Likelihood judgments formed about disease and the role symptoms play in worsening or improving health conditions result from personal beliefs about one's disease and one's symptoms (Frey, 1997). Disease and symptom likelihood judgments are formed from knowledge, related to prior symptom experience or learned disease information, and the cognitive capacity for reasoning. From a decision theory perspective, symptom related likelihood judgments and their subsequent self-
management choices and action evolve from processes related to symptom recognition and the symptom interpretation. As with any decision process, symptom interpretation requires a person to form likelihood judgments related to the possible identified consequences (Teel, Meek, McNamara, & Watson, 1997). In the process a person estimates and assigns probabilities to the possible consequences they identify. The estimations are opinions or beliefs made from tangible data, which serve as cues to intangible events and circumstances (Connolly et al., 2000). For example, tangible data in the case of symptom self-management are the recognized symptoms that serve as cues for making judgments or drawing conclusions or inferences about consequences that are intangible or uncertain events. Likelihood judgments related to symptom choices are personal opinions about the chances of intangible symptom consequences or events that are inferred from past tangible symptom knowledge. Reasoning is the foundation for this process. Cognitive development from the perspective of knowledge development and the capacity for reasoning is discussed in the following section.

_Cognitive Development Theory_

The term development implies a continuous and unidirectional acquisition of abilities that occurs during specific periods of life. Theories of development have served as a basis for understanding how adolescents make decisions based upon their cognitive maturity (Maggs et al., 1997). According to Piaget a child is cognitively ready to make well thought-out choice when the child has acquired the necessary knowledge and developed the necessary reasoning capacity (Piaget, 1972). However, it has been shown that acquiring knowledge and developing reasoning are neither automatic nor inevitable
since both are dependent upon the cognitive maturation and life experience of the child (Jessor, 1991; Piaget, 1972).

**Knowledge Development**

All knowledge is developed from past sensory, motor, and cognitive experiences. A change in knowledge influences what a person believes and the choices they make (Piaget, 1954). Changes in knowledge influence the judgments formed about alternatives in decision-making situations and about the preference one assigns to possible consequences of the alternatives (Piaget, 1954; von Neumann & Morgenstern, 1947; J.F. Yates, 1990a). A lack of knowledge is a source of variability in the distribution of possible outcomes of all actions related to decisions, thus with greater knowledge there is lesser variability conditional on the alternative choices available (March, 1994).

Increases in knowledge can increase the expected mean performance for any activity including decision-making and can increase the dependability of an outcome in a given situation (March, 1994). Thus, with more knowledge decision-makers can improve their average performance and reduce their risk.

New knowledge in young children is developed or constructed primarily as sensory and motor experiences. New experiences are integrated into their prior knowledge through a cognitive process of classifying new stimuli into existing knowledge units, which are eventually reflected in patterns of behavior (Piaget, 1972). With age or maturity the stimuli for knowledge become more cognitive in nature meaning that with age people primarily use thought processes to develop new knowledge. For example a person can become more knowledgeable about asthma by learning about
the disease through education not just by experiencing symptoms of the disease. By adolescence knowledge develops primarily as a result of cognitive processing (Piaget, 1972). An exception can include new knowledge stimulated by the sensory experience from a new symptom.

Knowledge developed from prior symptom experience and prior learned information is used to inform the decision process in symptom self-management (Teel et al., 1997). Past symptom knowledge is needed to identify self-management alternatives and possible consequences, to develop likelihood opinions about the consequences, and to assess one's preference related to an expected consequence of symptom management action. For example when a person experiences a symptom he or she sifts through their current collection of symptom experience for one that characterizes the perceived symptom. If a similar symptom is identified, the person begins the decision process using that knowledge. If the symptom is new the process begins as the new knowledge is assimilated into his existing knowledge units. This does not alter the knowledge it just causes it to expand.

Cognitive Capacity for Reasoning

The capacity for decision-making requires reasoning and rationality. Reasoning is the cognitive ability to comprehend, infer, or think in an orderly or logical fashion (J.F. Yates, 1990a). Rationality is defined as having reason (Webster's, 1989). A rational decision is a decision based upon reasoning, however, a rational decision may or may not lead to a good outcome. Choices made by people are always dependent on the alternatives they consider and on two judgments they form about the future. The first
judgment is about the person’s future conditional on what they believe are the possible outcomes of the alternatives they consider. The second judgment is about the person’s future conditional on how they will feel about that future when it is experienced (March, 1994; Schick, 1997; J.F. Yates, 1990a). The first judgment is consequence-based and the second judgment is preference-based.

According to Piaget rational reasoning processes begin to develop between seven and eleven years of age during the developmental period of concrete operations (Piaget, 1977). The early reasoning of concrete operations is limited to solving tangible concrete problems known in the present. During this period a child is unable to reason about complex verbal problems or those involving the future (Piaget, 1972). Children begin to develop a formal operational thought process between the ages of eleven and fifteen years and reach a point of maturation between the ages of thirteen and seventeen years (Piaget, 1972). According to Piaget once formal operation thought processes are fully matured they serve individuals for the rest of their lives (Piaget, 1972). With fully matured operational thought processes an individual uses their cognitive abilities to conceptualize or construct all outcome possibilities and formulate contrary-to-fact hypotheses based upon probabilities (Beyth- Marom & Fischhoff, 1997; Cohn, Schydower, Foley, & Copeland, 1995; Piaget, 1972). These abilities allow for more realistic understandings of the likelihood judgments or probabilities for various decision outcomes.

With each new stage of cognitive development children become obsessed with their newfound powers of thought. During adolescence, children become obsessed with
their powers of reasoning and they try to reduce all reasoning to what they think is rational. However, the criterion for rational reasoning during this stage becomes what is rational or reasonable to the adolescent (Piaget, 1972). In the adolescent mind what is rational or reasonable to them is always right and what is irrational or unreasonable is always wrong (Inhelder & Piaget, 1958). Thus, in many situations the adolescent rationality is flawed by their obsession with their new powers of reasoning. This obsession with one’s own thought processes is known as egocentric thought and according to Piaget it accompanies each stage of cognitive development (Piaget, 1954). The adolescent egocentric thoughts and behaviors that accompany the development of formal operations are believed by some to be subjectively attractive and necessary to fulfill certain essential needs with regard to personality development (J. A. Anderson & Olnhausen, 1999; Maggs, Almeida, & Galambos, 1995; Maggs et al., 1997). However, regardless of how attractive or necessary, adolescent egocentric beliefs can create potentially harmful situations when adolescents make flawed or irrational decisions in situations involving risk or a chance for loss.

*Expected Utility Theory*

The EUT theory has been used to explain the chances people take in health related decisions that involve uncertain outcomes and it has relevance for investigating adolescent asthma symptom management decisions. Expected Utility Theory (EUT) defines what it means to make rational decisions when faced with uncertainty (Hellinger, 1989). The theory provides a method by which individual preferences are revealed through choices made in a series of gambles (Hellinger, 1989; von Neumann &
Morgenstern, 1947). EUT can only explain risk preference in choice situations that involve sure things and true gambles. Preference is defined in the theory as a probability of the value or desirability of consequences to alternative courses of action in choices made under risk, in situations that involve unknown outcomes with known probabilities (von Neumann & Morgenstern, 1947). Preferences are labeled utilities when they are elicited through a standard reference gamble where a person provides a judgment as to their indifference between a sure option, an alternative with a sure outcome, and a two-outcome gamble (Kahneman & Tversky, 1984; Tversky & Kahneman, 1986; von Neumann & Morgenstern, 1947; J. Frank Yates, 1990). A two-outcome gamble is an alternative where one consequence is a gain and the other consequence is a loss. The utility score calculated through this gamble process represents the value the individual places on the known outcome.

Decisions where one must choose between alternatives with known probabilities for unknown outcomes are risky decisions and the choices made are influenced by risk preferences. Risk preference is defined globally as the value a person places on a choice that involves a chance for loss (Yates, 1990). Measures of risk preference lie on a continuum between risk aversion and risk seeking. A person who chooses an alternative with a known or certain outcome over an alternative that involves a chance for an outcome of higher or equal expectation is considered a risk averse person (J. Frank Yates, 1990). A person who rejects an alternative with a known outcome in favor of one with a gamble that involves a loss is considered risk seeking (J. Frank Yates, 1990). A person who shows no preference for an alternative that involves a gamble is considered risk
Despite knowledge and or cognitive maturity people sometimes engage in risk behavior just because they value the possible outcome of the behavior. Risk preference is best explained within the framework of expected utility theory.

Summary

When cognitively immature adolescents face symptom self-management situations that involve risks, their limited reasoning abilities may predispose them to making flawed symptom decisions. In situations involving gambles adolescents may have difficulty understanding how trigger exposures or treatment delays may lead to life threatening symptoms. Adolescents, who lack the cognitive abilities to make rational decisions, may make less than optimal ones because they may be unable to make judgments based on symptoms. For example, an adolescent with asthma may make a less than optimal symptom self-management decision related to using or not using a rescue inhaler as a pre-treatment for participating in sports because he or she may be unable to estimate or assign probabilities for developing or not developing symptoms during a game if he or she pre-treats or does not pre-treat.

To better understand how to prepare adolescents with asthma for symptom self-management decisions, clinicians and researchers may benefit from understanding of adolescent risk preferences as they pertain to making choices related to symptom self-management. Consequently, this investigation described using the standard gamble technique with eight investigator-developed scenarios for measuring risk preference related to asthma symptom self-management decisions involving gambles. The
following sections present the research questions and conceptual model used for the investigation.

Research Questions

The following research questions were answered as they pertain to the aims of the investigation. Aim 1 was to estimate the internal consistency reliability and content validity of eight investigator-developed adolescent asthma symptom self-management scenarios. The research questions were:

(1) What are the inter-item correlations of the utility scores of the individual scenarios?

(2) What are the item-total correlations between the utility scores on the individual scenarios and the total utility scores for the eight scenarios?

(3) To what extent do the scenarios reflect adolescent asthma symptom self-management domains?

(4) To what extent do the scenarios reflect adolescent asthma symptom self-management risks?

(5) What other adolescent asthma symptom self-management domains exist?

(6) What other adolescent asthma symptom self-management risks exist?

Aim 2 was to estimate the relationship between measured risk preferences and adolescent age and gender. The following research questions were answered:

(7) What is the correlation between age and the individual item utility scores?

(8) What is the correlation between gender and the individual item utility scores?

(9) What is the correlation between age and the mean utility score?
(10) What is the correlation between gender and the mean utility score?

Aim 3 was to describe adolescent thoughts related to using the SGT as a decision-making methodology. The following research questions were answered:

(11) What do adolescents think about teenagers making choices using the SGT?
(12) What do adolescents think about the burdens related to using the SGT?

Conceptual Model

The conceptual model for this investigation was developed to explain how risk preference influences the symptom self-management decisions made by adolescents with asthma. The model evolved from theories of decision-making (Tversky & Kahneman, 1986), adolescent cognitive development (Piaget, 1972), and expected utility (von Neumann & Morgenstern, 1947). The theories were used to explain relationships between risk preference and the judgments adolescents make when facing choices involving gambles. The model incorporated the Symptom Interpretation Model (Teel et al., 1997) to explain how symptom knowledge relates to the processes of forming likelihood judgments in symptom management choices (see Figure 1).

The model uses the theories to explain the reasoning process that occurs from perception or anticipation of a symptom through choosing a symptom self-management alternative. The theories provide a framework for explaining how adolescents use prior symptom knowledge and cognitive abilities to first identify self-management alternatives and consequences, second form likelihood judgments about the probabilities of the consequences, and finally consider their preference for one of the alternatives based upon the possible consequences. In this investigation the model was the framework for
describing the influence of risk preference on investigator-developed adolescent asthma symptom self-management scenario choices that involved gambles. An in depth discussion of the model is provided in Chapter 2.

![Diagram of Conceptual Model of Risk Preferences with Symptom Interpretation]

**Figure 1.** Conceptual Model of Risk Preferences with Symptom Interpretation. A model for explaining the influence of risk preference on rational adolescent asthma symptom self-management choices

**Significance of Research**

Adolescent asthma symptom self-management decision behaviors are actions in response to symptoms. Knowledge and cognitive maturity influence the judgments adolescent’s form in symptom self-management situations. Frequently symptom self-management situations involve choices with uncertain outcomes or consequences. Choices that involve uncertain outcomes with known probabilities are known as risks. A gamble is a choice that involves uncertain outcomes with the possibility of gaining something. When adolescents make choices that involve risks related to exposures to
triggers or delays in treatments they may be gambling with increased morbidity and/or mortality (Yoos, McMullen, & Kitzman, 1999). However, when provided with sophisticated information adolescents' have the cognitive abilities to make decisions involving risks (Beyth-Marom, Austin, Fischhoff, Palmgren, & Jacobs-Quadrel, 1993; Fischhoff, 1996). Thus if as suggested earlier, there is significant variability in the risk preference among individuals for any given gamble and significant variability in the risk preference of a given individual towards different gambles (Hellinger, 1989), then risk preference may influence adolescent symptom self-management choices in situations involving gambles.

If the phenomenon of risk preference is a factor that may explain adolescent choices in the face of situations involving gambles, then nurses and other health providers must begin to understand the phenomenon prior to developing intervention strategies for improving asthma symptom self-management efforts in this population. This investigation provides foundational information about using the SGT to measure risk preferences in a series of gambles among outcomes using eight asthma symptom self-management scenarios. The investigation estimates the internal consistency reliability and content validity of the investigator-developed scenarios; determines the relationship between risk preferences, age, and gender; and describes adolescent thoughts about using the SGT as a decision-making methodology.
Chapter 2

LITERATURE REVIEW

This chapter begins with an overview of adolescent asthma symptom self-management and proceeds to a review of literature related to adolescent decision-making as it pertained to conceptualizing this investigation. Discussed are theories of decision-making, symptom interpretation, cognitive development, and expected utility as a framework for studying the risk preferences that may influence the phenomenon of adolescent asthma symptom self-management involving unknown outcomes. Although each theory might individually explain the phenomenon, this investigation proposes a collective use to assess eight adolescent symptom self-management scenarios for measuring risk preferences with the standard gamble technique (SGT).

Adolescent Asthma Symptom management

Nature of Asthma

Asthma is defined as an obstructive pulmonary disease characterized by reversible airway obstruction, airway inflammation and increased airway hyper-responsiveness (Kobzik & Schoen, 1994). Airway manifestations of asthma are caused by several physiological responses that include constriction of the bronchial smooth muscles, bronchial tissue edema, increased mucous secretion, and the infiltration of inflammatory cells resulting in a restriction of air-flow into and out of the lungs (Taitel, Allen, & Creer, 1998). Most individuals demonstrate recurrent episodes of symptoms that can include cough, wheeze, and shortness of breath. Current national recommendations classify asthma as being mild, moderate, or severe in intensity of symptom and intermittent or
persistent in frequency of symptom episodes (NHLBI, 1997). Asthma is characteristically described as variable, intermittent, and reversible. Variability refers to the severity of the disease as identified by the intensity of the symptom episodes in response to stimuli. Intermittence refers to the frequency or persistence of the asthma symptom episodes that vary from individual to individual and the reversibility of asthma is measured by an improvement in airflow in response to an inhaled B2 agonist (Taitel et al., 1998).

Asthma is the leading chronic illness in children and accounts for 14 million missed school days annually (National Center for Health Statistics, 2000-2001). In the United States there are approximately 6.3 million children with asthma under the age of eighteen (American Lung Association, 1998; National Center for Health Statistics, 2000-2001). Adolescents are identified as a high-risk group for life-threatening asthma (Expert Panel, 1997). Asthma prevalence data related to children in Arizona is limited, however, in the year 2000 the Arizona Department of Health Services (ADHS) reported an age-specific hospital discharge rate of 102.6 per 100,000 populations for children 10-14 years and a rate of 47.1 for individuals 15-17 years. Rates for these populations for Maricopa County were 188.9 and 48.5 and Pima County rates were 73.0 and 52.6 respectively (Talbot, 2002).

Steadily increasing rates of asthma prompted the National Institutes of Health (NIH), National Heart Lung and Blood Institute (NHLBI) National Asthma Education Prevention Program (NAEPP) to establish guidelines for asthma management that focus
on standardization of medical treatment and improvement in symptom self-management in adults and children (NHLBI, 1997). Within the NAEPP published guidelines are goals for preventing recurrent asthma exacerbation include minimizing need for emergent care; maintaining normal activity levels; preventing chronic and troublesome symptoms; and management strategies for assessing disease severity, utilizing appropriate pharmacotherapy, providing education, monitoring objective lung function, and encouraging trigger avoidance (Expert Panel, 1997).

Individuals with asthma exhibit symptoms in response to many stimuli including chemical agents, viral infections, exercise, cold air, hyperventilation, allergens, and emotion. Asthma exacerbations are acute or sub-acute episodes of progressively worsening shortness of breath, cough, wheezing and chest tightness or some combination of these symptoms (Manning, 2000). Early medical and self-management strategies of exacerbations are needed to avoid potentially life-threatening situations. Care in acute situations must be prompt with primary goals of early treatment to prevent or correct hypoxemia and to rapidly reverse airway obstruction (Manning, 2000). The following section discusses symptom self-management as it has been studied and how it relates to decision processes that are developing during the adolescent years.

Asthma Symptom Self-Management

Asthma symptom self-management requires individuals to act in response to their internal and external environments. Critical to symptom self-management is the person's ability to accurately perceive and interpret his environment for possible compromise and for the need for possible action (Clark, Evans, Zimmerman, Levison, & Mellins, 1994;
Clark & Star-Schneidkraut, 1994; Creer, 1998). Like all decisions, symptom self-management decisions are conscious, voluntary, and intended to bring about outcomes decision-makers prefer (J. Frank Yates, 1990). Like all decision-making, symptom self-management decision-making is dependent upon the individual's knowledge about the topic and their cognitive abilities to recognize a need, identify alternatives and consequences, determine likelihood judgments of possible consequences, and understand what the person hopes to attain (Fischhoff, 1999). Symptom self-management choices, like all choices in decision situations, are motivated by personal beliefs and personal desires (von Neumann & Morgenstern, 1947). The expected value of the chosen alternative is the hope that the outcome provides a benefit in contrast to a loss.

Asthma symptom self-management decision-making has been studied and described primarily from the perspectives of self-efficacy. Models exist that identify the relevant processes of asthma symptom self-management, however, within existing models decision-making is identified as necessary but secondary to measuring clinical outcomes and patient education (Clark & Dodge, 1999; Clark et al., 1988; Creer, 1998). The literature is nonexistent in areas of adolescent decision-making related to asthma symptom self-management involving risks defined as unknown outcomes with known probabilities. A greater understanding of factors that may affect symptom self-management decisions involving risk may assist in reducing asthma morbidity and mortality during adolescence.

The developmental stage of adolescence is especially challenging for the adolescent with asthma because it is the time when responsibility for symptom
management begins to transition from parents, physicians, and other adult care providers, to the child. This transition occurs over time within the context of cognitive development and the ongoing effects of chronic illness (Breitmayer & Gallo, 1992; Deatrick & Knafl, 1990; Eiser, 1992; Ladelbauche, 1997; Yoos, 1987).

Factors that may affect the asthma symptom self-management choices made by adolescents are the focus of this investigation. The investigation describes the phenomenon of risk preference as it relates to adolescent asthma symptom self-management choices. The following section describes the evolution of a framework for understanding adolescent risk preference pertaining to making asthma symptom self-management choices that involve unknown outcomes with known probabilities.

Adolescent Symptom Decisions

Decision-Making

Decision science is a body of knowledge for describing, explaining, and predicting how individuals or groups of individuals choose among a set of alternatives by considering the possible consequences or outcomes. Decision scientists study the rationality or logic of decisions, as well as the judgments or personal beliefs and preferences or personal desires driving decisions. The science addresses how decisions should be made and how they are made. Theories that arise from or underlie scientific efforts in decision research consider the uncertainty of a situation, the information available about options or alternatives and outcomes or consequences, the resources available, and the preferences that drive decisions (Connolly et al., 2000; Fischhoff, 1988). All decision-making requires individuals have the ability to recognize the need
for a decision, understand what they hope to attain from the decision, identify alternatives and consequences of a decision, and determine the likelihood or probability that a consequence will occur (Fischhoff & De Bruin, 1999). Individuals who lack these cognitive abilities will make less than optimal decisions.

Cognitive ability as it relates to decision-making within the above framework is defined as cognitive capacity. Specifically it is the capacity to assemble mental resources for the reasoning necessary to make choices (Beyth-Marom et al., 1993; Fischhoff, 1988, 1992). Capacity within this definition includes abilities to focus attention, keep several facts in mind, and consider abstract as well as concrete issues. Decision-making is a conscious voluntary process of choosing, evaluating, or constructing alternatives for action or non-action taken with intention of producing outcomes one prefers over other possible outcomes (March, 1994; Schick, 1997). Decisions are successful if they bring about outcomes at least as satisfying as what might be yielded by any other actions, otherwise the decision fails (Yates, 1990).

Decision theories offer techniques and procedures for revealing judgments and preferences in conditions of certainty, uncertainty, and risk (Schick, 1997; Slovic, Fischhoff, & Lichtenstein, 1977; von Neumann & Morgenstern, 1947; J.F. Yates, 1990a). A decision made under certainty is a choice between alternatives that have known outcomes. Conditions of uncertainty apply to alternatives with several possible outcomes and probabilities for the outcomes are unknown. Conditions of risk apply to alternatives with several possible uncertain outcomes with known probabilities and a risk decision basically becomes a choice between the probabilities (March, 1994).
Decisions are classified as choices, evaluations, and or constructions (Schick, 1997; Slovic et al., 1977; J. F. Yates, 1990a). Choice decisions have well-defined alternatives usually in the form of probabilities for the outcomes. Evaluation decisions require people to assign values to alternatives that represent potentials for affecting outcomes the decision-maker cares about. The alternatives in evaluation decisions are expressed qualitatively or quantitatively. A qualitative example is ‘a good alternative’ or ‘an excellent alternative’. A quantitative example might be a rating of ‘5’ on a scale of 1-5. Construction decisions require decision-makers to build alternatives with a set of limited resources. The decision-maker assembles alternatives that have the most value considering the resources available (March, 1994; J.F. Yates, 1990a). Decisions classified as choices are the focus of this investigation and the following section discusses choices from the theories of rational choice and limited rationality.

Rational Choice Decision Theory

Rationality is linked with making choices as a way to describe, explain, or predict the intelligence of the outcomes, known as substantive rationality, and the reasonableness of the process, known as procedural rationality (March, 1994; Schick, 1997; J.F. Yates, 1990a). Although rational decisions are based upon reasoning, the outcomes may or may not be good outcomes because choices are always dependent on considered alternatives and two judgments the individual forms about the future. The first judgment is about the individual’s future conditional on the choice and the second judgment is about how the individual will feel about that future when it is experienced (March, 1994).
Theories of rational choice assume that decision processes are consequence-based and preference-based (Kahneman & Tversky, 1984; March, 1994; Schick, 1997; J.F. Yates, 1990a). The processes are consequence-based because choices are dependent on the anticipation of future effects of current actions, or the interpretation of alternatives in terms of expected outcomes. Decision processes are preference-based because the expected outcomes are evaluated in terms of personal desires. More specifically the alternatives are compared based on how the expected consequences are thought to better serve the preferences or desires of the individual decision-maker. Under these assumptions, rational procedures pursue logic on consequence and preference. More specifically rational choice is conditional on the possible alternatives; the likelihood of possible consequences assuming an alternative is chosen; the value of the consequences associated with the alternative or preference; and the thought process for choosing (Connolly et al., 2000; Schick, 1997).

Pure versions of rational choice theories work under the assumptions that all alternatives are known, all outcomes are well defined by the environment and are known with certainty, and all preferences relevant to the choice are known, precise, consistent, and stable (Schick, 1997; J.F. Yates, 1990a). Pure versions of rational choice theories are hard to accept as probable or accurate for individual decision behavior. Therefore, modified theories of rational choice have developed that use the basic rational choice structure with assumptions that reflect actual individual behavior. The theory of limited rationality is a modified rational choice theory.
Theory of Limited Rationality

Most modern rational choice theories recognize the uncertainty surrounding future outcomes of present action and assume that individuals choose among alternatives based on the likelihood of various possible outcomes rather than expected outcomes (Schick, 1997; J.F. Yates, 1990a). Theories of limited rationality assume that individuals do not seek or use all of the relevant information available to them and thus, consider only a few alternatives, consider only some outcomes, and demonstrate inconsistent preferences as evidenced by choosing actions that are just good enough rather than the best actions (March, 1994; Schick, 1997).

Limited rationality theories assume that individuals intend to be rational, but are hindered by limited cognitive capabilities and or incomplete information (March, 1994; Schick, 1997). Within this framework actions may be less than rational in spite of individual intentions and efforts. To maintain rationality people try to accommodate for cognitive limitations through information simplification procedures. They look for information, but may only see what they expect to see and overlook unexpected things, reasoning in this situation is flawed from a logical perspective (March, 1994; Schick, 1997). People also construct information based on what they think might happen or reconstruct it based on what they believe happened in similar situations, reasoning in this case is flawed from a memory-based perspective (March, 1994; Schick, 1997).

Constructing Choice Decisions

Decisions involving choices are context sensitive, in that decision-makers elicit personal beliefs or judgments using three strategies for simplifying information, known
as editing, framing and heuristics (Slovic, Fischhoff, & Lichtenstein, 1984; A. Tversky & Kahneman, 1986). Through editing people elicit judgments by amending or simplifying problems using small numbers of cues and combining them in simple manners before beginning the choice process. Editing may occur at the alternative or consequence level (Kahneman & Tversky, 1984). Frames are paradigms belonging to individuals that guide the perspectives people form and the questions they ask to focus or simplify their analyses of decision scenarios. Frames are conscious and subconscious thoughts developed from prior experiences that direct attention to different alternatives and different preferences (Kahneman & Tversky, 1984; A. Tversky & Kahneman, 1986).

Heuristics are intuitive judgments or rules of thumb for solving problems. They are strategies rooted in memories that allow individuals to process information and form alternatives to logical thought or judgment (Fischhoff, 1988; Holyoak & Nisbett, 1988). Heuristics assume people are reasonably proficient at using their memories to tell them how frequently similar events have occurred in the past and they serve as a proxy for projecting future probabilities. Heuristics assume that people rely on how representative and available events are when comparing stimuli events with those in their memories (Tversky & Kahneman, 1982, 1986). The recall availability heuristic is an estimate of the probability or likelihood based upon the ease with which instances of associations are brought to mind, meaning that the more often an event has occurred in the past the easier it is to think of in the present (Tversky & Kahneman, 1982). Scenario availability heuristic assumes an event is judged likely to the extent that it is easy to bring to mind scenarios or sequences of actions that have lead to similar events in the past. For example
an adolescent might judge one symptom likely because it is a symptom that occurs frequently and is easy to recall or he may judge one particular symptom pattern (scenario availability) as more likely than another because it occurs every time he visits a particular friends home.

In summary, editing, framing, and heuristics are strategies that use past experiences to define problems, collect information, and evaluate dimensions when forming judgments in choice situations. Judgments in these situations are labeled likelihood judgments because they are probabilities reflective of personal beliefs or opinions formed by recalling memories and using reasoning capacities. The following section will discuss likelihood judgments.

Likelihood Judgments

In decision situations people must be able to recognize the need for a decision, identify the alternatives and possible consequences, form probability opinions or likelihood judgments about the consequences, and finally know what they hope to attain from the decision (Fischhoff & De Bruin, 1999). A fundamental tenet of decision-making is the principle of probabilistic dominance that states if one alternative dominates another, a decision maker should select the dominating option. One alternative is said to dominate another if it is just as good on all pertinent aspects and better on at least one aspect (Kahneman & Tversky, 1984). In this situation the alternative probabilistically dominates its competitor. A likelihood judgment is the outcome of the tenet of probabilistic dominance. A likelihood judgment is an opinion or belief based on
probabilities about how certain it is that various events will occur and it provides a measurement or assessment about how people think about uncertainty.

Likelihood statements can be conveyed through inference statements in the form of verbal reports, rankings, ratings, or probabilities (Yates 1990). Verbal reports are qualitative in nature and might include words such as 'I am convinced' or 'I expect'. Rankings pertaining to likelihood judgments are also qualitative and might include phrases such as 'your are more (equally or less) likely to get this than that'. Ratings imply relative chances of events using a somewhat restricted rating scale of words, numbers, or letters. Examples of ratings include scales such as a likert scale or a visual analogue scale. Probabilities or probability judgments for events are similar to ratings except they conform to a set of rules (see Appendix A for Rules of Probabilities).

Likelihood judgments are cognitive processes that allow individuals to estimate conclusions about things they cannot see, based on data they can see (Webster's, 1989). Judgments are formed from tangible data, which serve as cues to intangible events and circumstances (Connolly et al., 2000). The ability to make likelihood judgments is an ability in which people differ widely. Beyth-Marom and Fischhoff have shown that likelihood judgments tend to vary in correspondence with factors that affect abilities to recall relevant events (Beyth- Marom & Fischhoff, 1997).

In summary, choice decisions can be explained within the theories of decision-making discussed in this section. Figure 2 is a schematic of rational choices within the decision-theories. To make a choice decision people must be able to recognize the need, identify the alternatives and possible consequences, form opinions or likelihood
judgments about the consequences, and finally know what they hope to attain from the decision (Fischhoff & De Bruin, 1999). To form likelihood judgments people use their reasoning abilities to form opinions about the chances for unknown outcomes. The logical reasoning skills for making likelihood judgments include hypothetical deductive reasoning, scientific inductive reasoning, and reflective abstraction (Wadsworth, 1996a, 1996b). The following section describes symptom interpretation from a perspective of decision-making.

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<th>Personal Beliefs</th>
<th>Personal Desires</th>
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<td>Recognize need to make choice/decision</td>
<td>Identify Possible Alternatives, Consequences</td>
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*Figure 2. Rational choice theory. A schematic of rational choice theory within a decision theory framework to explain how personal beliefs and personal desires influence choices. Personal beliefs are equal to likelihood judgments or the probabilities of consequences to alternatives. Likelihood Judgments are formed from reasoning capacity, memories, and knowledge. Symptom Interpretation*

As with all other decisions, symptom self-management decisions are dependent on beliefs formed from past knowledge. Symptom knowledge, developed from past
episodic and semantic symptom experience, is used in symptom self-management
decisions for estimating the likelihood judgments of symptom action consequences and
for evaluating the desirability of the consequences. The Symptom Interpretation Model
(SIM) was used in this investigation as a framework for understanding how symptom
knowledge influences the likelihood judgments (probabilities) one forms about the
possible consequences of symptom management actions.

Symptoms are subjective evidences of diseases or changes in physical or mental
states as detected and perceived by individuals (K. N. Anderson & Glanze, 1998).
Accurate detection and perception requires peripheral sensory and cognitive capabilities
to distinguish the sensations (Fritz, McQuaid, Spirito, & Klein, 1996). Several authors
have described the phenomenon of symptom perception in children with asthma (Fritz et
al., 1996; Yoos, 1994). Two retrospective analyses of children who died from asthma
compared with those who did not die found that poor perception and a global disregard of
symptoms were variables that differentiated the two groups (Strunk, Mrazek, Fuhrmann,
& LaBrecque, 1985; Zach & Karner, 1989). Although this disregard of symptoms seems
to imply a process of symptom interpretation leading to no action or delayed action, no
studies were found that describe the construct of symptom interpretation in children or
adolescents. However, it seems that once distinguished, symptoms must be interpreted to
allow judgments for action or no action to occur in children, adolescents, and adults.

Symptom Interpretation Model

The SIM (Teel et al., 1997) represents a framework for understanding how
individuals interpret variations in symptoms from a subjective perspective. The SIM
assumes that individuals use cognitive processes to make judgments regarding symptoms and that they are in control of these processes (Figure 3).

\[
\begin{array}{|c|c|c|}
\hline
\text{INPUT} & \text{INTERPRETATION} & \text{OUTCOMES} \\
\hline
\text{Current Sensation} & \begin{align*}
\text{Memory of Past Symptoms} \\
\text{Comparison Judgments} \\
\text{Naming the symptom & What it means}
\end{align*} & \begin{align*}
\text{Do Something} \\
\text{Seek Care} \\
\text{Self Treat} \\
\text{Do Nothing}
\end{align*} \\
\hline
\end{array}
\]

Symptom Interpretation Model

\cite{Teel et al. 1997}

*Figure 3.* The symptom interpretation model as developed by Teel, meek, McNamara, and Watson in 1997.

The SIM model was derived in part from the research of Tversky and Kahneman \cite{Tversky & Kahneman, 1982}, who found that individuals use systematic patterns of judgment derived from heuristics. Heuristics as described earlier are problem solving or decision-making strategies rooted in memories that allow individuals to process information to identify alternatives and possible consequences \cite{Fischhoff, 1988, Holyoak & Nisbett, 1988}. Researchers have found that when estimating the likelihood of events...
people rely on how representative and available the events are when compared to those in their memories.

Representativeness suggests that when an event resembles another, it is thought to be likely. Availability suggests that if something easily comes to mind it is thought to be likely, and if it does not easily come to mind then it is thought to be rare (Kahneman & Tversky, 1984). These then suggest that people might overestimate the likelihood of outcomes in similar or dramatically memorable events and underestimate in new, never experienced, or more commonplace events (Slovic, Fischhoff, & Lichtenstein, 1980; Tversky & Kahneman, 1982). Consider for example two adolescents with equal reasoning abilities, one has experienced a recent hospitalization related to an acute asthma symptom episode whereas the asthma symptoms of the other adolescent have been under control for the past year without any acute or sub acute episodes. When faced with an asthma symptom self-management decision related to a sudden onset of symptoms such as wheezing, or a decision to avoid triggers that may cause an onset of wheezing, the two adolescents may reach very different likelihood judgments because their knowledge is very different

**Symptom Interpretation and Judgment**

The SIM identifies three distinct stages in the symptom interpretation process that include: input, interpretation, and outcome. During the input stage sensory disturbances or symptoms are recognized. During the interpretation stage the symptoms are named and meaning is attached to the symptoms by activating and evaluating stored symptom information. In the outcome stage a judgment is made to do something or do nothing
about the symptom (Teel et al., 1997). The more familiar individuals are with symptoms, the more biased they become related to personal representations. The most readily identifiable knowledge structures are called exemplar and prototype representations. Exemplars are most memorable representations and prototypes are usual or typical patterns of representations (Teel et al., 1997). According to SIM actions that follow the interpretation of symptoms impact future symptom experiences by adding to already existing knowledge structures. Figure 4 is a schematic of a blending of the SIM and the rational choice model to explain how decision theory, cognitive development and expected utility theory are related to symptom interpretation.

**Figure 4.** A schematic of the SIM and the rational choice model for symptom action choices
Piaget’s Theory of Cognitive Development

The cognitive capacity for making a rational choice is based upon knowledge development and reasoning ability. Researchers have defined reasoning as the cognitive ability to comprehend, infer, and think in an orderly or logical fashion (Connolly et al., 2000; Fischhoff, 1988; Schick, 1997; J.F. Yates, 1990a). As discussed earlier a rational decision is based upon reasoning and symptom self-management requires one to make rational choices based upon perceived or anticipated symptoms and relevant knowledge. This section presents cognitive development theory as it pertains to the adolescent capacity to make rational choices related to asthma symptom self-management.

A child is cognitively ready to make well-developed choices when and only when he has acquired the knowledge and developed the necessary cognitive structures for reasoning (Fischhoff, 1988, 1992; Piaget, 1972). Cognitive development occurs from birth to adulthood through self-regulated processes that allow for the construction of knowledge and the development of logic-based reasoning. Two factors that impact development of knowledge and reasoning are maturation and life experience (Jessor, 1991; Maggs et al., 1997). The interactions of both maturation and experience are necessary to guide a child’s course of development. However, childhood knowledge and reasoning abilities vary considerably since children do not mature at the same rate or have the same experiences, thus cognitive capacity is neither solely a result of maturation nor of learned experience (Beyth-Marom et al., 1993).

Cognitive development is the intellectual counterpart of human biological adaptation to the environment. As humans adapt biologically to their environments, they
adapt and organize intellectually through self-regulated processes of assimilation and accommodation (Piaget, 1972). Intellectual adaptation and organization begins at birth and occurs when there is an internal need or desire. As individuals develop the adaptation and organization processes become less related to sensory and motor behaviors and more related to mental representations.

Knowledge Development

Cognitive development as theorized by Piaget provided a framework for understanding the adolescent capacity for making choices. This section describes Piaget's theory that schemata are cognitive structures by which individuals intellectually adapt to and organize their environments. Schemata, according to Piaget, are psychological structures constructed through experiences and adapted or changed with mental development (Piaget, 1954, 1972, 1977). The schemata are labeled hypothetical constructs in Piaget's theory because they are unobservable and inferred to exist as processes within the nervous system. Children are born with few schemata and with development they become more prevalent and more differentiated. Over a lifetime schemata continually change and become more refined leading eventually to very complex networks of knowledge (Piaget, 1954, 1972, 1977).

According to Piaget's theory, as stimuli or events are perceived they are organized and classified into mental structures or schemata that have common characteristics. Initially individuals repeatedly try to classify stimuli in consistent ways that are reflective of the schemata in their head at a given time. Eventually schemata are determined by unique patterns of assimilation and accommodation. For this reason the
schemata of children reflect their own current levels of knowledge of the world and they
do not always accurately reflect reality (Piaget, 1954, 1972, 1977). Over time the
schemata of children begin to more closely approach reality as their levels of
understanding and knowledge of the world increase.

As noted earlier the processes responsible for the changes and differences in
schemata are known as assimilation and accommodation. Assimilation is the cognitive
process by which a person integrates new information from perceptual, motor, or
conceptual experiences into their existing schemata and their eventual reflective patterns
of behavior. Assimilation is a cognitive process of placing or classifying new stimuli into
existing schemata (Piaget, 1972). For example when a child experiences a new symptom
(see, hears, or feels a symptom sensation or stimuli), he sifts through his current
collection of schemata until he finds one that has the characteristics of the perceived
symptom. The new experience then becomes part of an existing schema. This process
does not change the schema but causes it to enlarge or grow.

Sometimes a child or person cannot assimilate the stimulus into existing schemata
because there is no schema into which it readily fits. The individual then creates a new
schema or modifies an existing one so the event or stimuli will fit. According to Piaget
this process is known as accommodation (Piaget, Elkind, & Flavell, 1969). Accommodation
is the reconfiguring of one or more schemata by creating new or
modifying old schemata in response to new stimuli. Once accommodation occurs the
person again tries to assimilate the stimulus. Because the intellectual structure has
changed the stimulus is readily assimilation. Assimilation is always the end product and
together with accommodation is responsible for an individual's intellectual adaptation to and organization of their environment.

Consider for example the adolescent with asthma who attends a school dance where a fog machine is used to create atmosphere. The adolescent has never been exposed to the fog so when he begins to cough and wheeze in response to the irritating odor, he may not recognize the fog as an asthma trigger. The adolescent may have difficulty assimilating the stimulus of the fog into his existing schemata. So he must create a new schema or modify an existing one. At this point the adolescent's intellectual structures change and the stimuli can then be readily assimilated and the adolescent is prepared for any future exposures or potential exposures to fog. Knowledge development occurs as individuals assimilate and accommodate their experiences.

The processes of assimilation and accommodation are triggered by states of disequilibrium that occur when events or stimuli are inconsistent with what the individual's schemata are able to predict at the moment. This is a state of internal conflict (cognitive conflict) that serves to motivate people to restructure their knowledge (Piaget et al., 1969). Piaget labeled this a state of imbalance between assimilation and accommodation and the motivation for seeking a balance (Piaget et al., 1969). Piaget theorized that a balance must exist between the processes of assimilation and accommodation in order for an individual to detect differences and similarities in stimuli.

Equilibrium is what Piaget labeled the state of balance between assimilation and accommodation and a necessary condition toward which people constantly strive. Equilibration is the self-regulatory process that allows external experiences (stimuli or
events) to be incorporated into the internal structures (schemata). Equilibration is the process of moving from disequilibrium to equilibrium by further assimilating and accommodating stimuli (Piaget, 1972). Equilibrium is the necessary condition, thus the person ultimately assimilates stimuli with or without accommodation. Although cognitive balance is reached when assimilation occurs, the equilibrium to any particular stimuli may be temporary as the schemata constantly undergo disequilibrium and change caused by each new stimulus (Piaget, 1972). For adolescents the processes of cognitive disequilibrium and equilibrium occur simultaneously with other dynamic processes of normal adolescence that may influence knowledge development. For adolescents with asthma, these influences may impact their symptom knowledge development to the point that the choices they make may seem irrational or lacking the logical reasoning of one who has adequate symptom experience.

**Logic-Based Reasoning**

The logical reasoning processes necessary for making choice decisions generally begin to develop between the ages of seven and eleven and during the stage identified by Piaget as concrete operations (Flavell, Miller, & Miller, 2002; Piaget, 1972, 1977). Concrete operational thought is limited to solving tangible concrete problems known in the present. The reasoning of concrete operations is content-bound or tied to an available experience. Reasoning about complex verbal problems involving propositions, hypothetical problems, or the future is difficult with only concrete thought (Piaget, 1972). In contrast the reasoning associated with formal operational thought is characterized by cognitive abilities to conceptualize or construct all outcome possibilities in a given
situation, formulate contrary-to-fact hypotheses in the same situation, and conceptualize and reason the thoughts of others (Piaget, 1972).

**Formal Operational Thought**

It is believed that formal operational thought emerges at the end of childhood and progresses through the stage of adolescence (Piaget, 1972). According to Piaget no new cognitive systems develop after formal operational thought, and thus mental structures established during adolescence will serve for the life span (Piaget, 1972). The adolescent who achieves formal operational thought can operate on the logic of a problem (form an argument) independent of its content and they are aware that logically derived conclusions have validity independent of factual truth (Piaget, 1972).

According to Piaget, the structural characteristics of formal operational thought include hypothetical deductive reasoning, scientific inductive reasoning, and reflective abstraction. Adolescents with hypothetical deductive reasoning can reason symbolically about hypothetical problems. Hypothetical deductive reasoning transcends perception and memory and deals with things that are not known directly (Piaget, 1972). This property allows adolescents to reach logical conclusions independent of the truth or falseness of hypothesized content in a problem or argument. Scientific-inductive reasoning allows adolescents to systematically draw conclusions based upon specific facts from several variables. The relationships between the variables in these situations are constructed through inductive reasoning and verified through experimentation (Piaget, 1972). Reflective abstraction is the mental mechanism through which logical-mathematical knowledge is constructed. Reflective abstraction is internal thought or
reflection on available knowledge that goes beyond the observable and results in a mental
reorganization and new knowledge (Piaget, 1972). The concepts of proportion and
probability develop during the stage of formal operations and with these abilities
adolescents become more capable of applying logic to all classes of problems, including
those that are hypothetical and abstract.

Piaget theorized that with the complete development of formal operational
thought one's cognitive capacity for reasoning reaches full maturity (Piaget, 1972, 1977).
From this point forward the quality of one's reasoning does not improve with respect to
logical operations, however, the content that motivates one's reasoning is expected to
improve with experience, causing improvements in the use of thought. For this reason
adolescent reasoning may not be as good as adults in any particular instance, but it may
be as logical or well thought out. This may help explain some of the differences between
adolescent and adult thought. Egocentric thought is a novel set of behaviors that is a
constant at the start of each stage of cognitive development and especially evident during
the development of formal operational thought (D. W. Elkind, 1967; Inhelder & Piaget,
1958).

Egocentric Thought

Egocentrism is a characteristic of thought associated with all newly acquired
cognitive structures and a by-product of mental development that distorts the initial use
Piaget, 1958). In each stage of cognitive development egocentrism is uniquely manifested
in some form. During the stage of adolescence egocentrism is manifested when the
individual tries to reduce all reasoning to what is logical (Piaget, 1972). However, the adolescent criterion for making judgments is based on the assumption that what is logical to the adolescent is always right in their minds and what is illogical is always wrong (Inhelder & Piaget, 1958).

According to Inhelder and Piaget (1958) adolescents possess an inability to differentiate between their world and the real world. They apply a criterion of what is logical to human actions with insufficient understanding that the world is not always ordered logically and its citizens are not always logical. Adolescents are emboldened with egocentric beliefs related to the omnipotence of logical thought. Thus although adolescents can think logically about the future and about hypothetical people and events, they do not understand that the world is not always as logically or rationally ordered as they think it should be. "Egocentrism found in adolescents is more than a simple desire to deviate, it is a manifestation of the phenomenon of lack of differentiation where the adolescent attributes an unlimited power to his own thoughts" (Inhelder & Piaget, 1958). This phenomenon might manifest itself in an adolescent with asthma by a conscious and willing exposure to triggers such as smoking by reasoning that it is pretty cool to smoke, and smoking does not always cause symptoms, thus this time smoking will be ok.

Adolescent egocentric thoughts and consequent behaviors are sometimes risky, however, they are also subjectively attractive and have been shown by researchers to fulfill certain essential functions related to exploring one's identity, coping with stresses, gaining acceptance by peer groups, and or opposing adult authority (J. A. Anderson & Olnhausen, 1999; Maggs et al., 1995; Maggs et al., 1997). The egocentric belief of
personal uniqueness can become a conviction of invulnerability and create potentially harmful situations where adolescents do not always make rational decisions, but rather take chances that involve risks (D. W. Elkind, 1967). In situations where adolescents with asthma face symptom self-management decisions that involve risk, they may experience difficulty understanding how risk behaviors can pose threats to their lives through increased trigger exposures and or treatment errors or delays.

Summary

Understanding how adolescents come to believe what they believe, or how they reach their judgments, requires consideration of the cognitive aspects of development. Asking what adolescents believe is the same as asking what knowledge adolescents have at that moment and what type of reasoning the adolescents are capable of at that moment. The likelihood judgments formed during adolescence are reflections of an adolescent’s cognitive development in that they reflect the adolescent’s past construction and organization of knowledge structures and reasoning capabilities.

Adolescents make judgments based on what they experience and infer. Not all adolescent beliefs are accurate, but with time they are based on larger sets of information that lead to greater understanding. Over time the adolescent’s personal beliefs change as their knowledge and reasoning abilities grow and develop. This may also be true for adolescents with asthma whose beliefs about symptoms and how to manage them will change over time as they develop new symptom knowledge and a mature reasoning capacity.
Thus, in this investigation Piaget’s theory of cognitive development provided a framework for explaining the symptom self-management judgments adolescents make in response to perceived or anticipated symptoms. Figure 5 is a schematic that explains adolescent cognitive influences on the likelihood judgments of symptom outcomes.

<table>
<thead>
<tr>
<th>STIMULI/EVENT</th>
<th>DEVELOPMENT</th>
<th>OUTCOME</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived or Anticipated</td>
<td>Past symptom Knowledge Structures</td>
<td>Symptom Likelihood</td>
</tr>
<tr>
<td>Symptoms</td>
<td>(Schemata)</td>
<td>Judgments</td>
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<tr>
<td></td>
<td>Reasoning Abilities</td>
<td></td>
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<tr>
<td></td>
<td>(Formal Operational Thought)</td>
<td></td>
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<tr>
<td></td>
<td>Reasoning Abilities</td>
<td>Cognitive Maturity</td>
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<tr>
<td></td>
<td>(Formal Operational Thought)</td>
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</tbody>
</table>

*Figure 5. Schematic of adolescent cognitive influences on symptom likelihood judgments*

**Adolescent Decisions Under Risk**

Decisions involving risk are choices with known probabilities for unknown outcomes. The most conventional approach to predicting choices made under risk is to assume the individual will choose the alternative that maximizes their expected value (von Neumann & Morgenstern, 1947; J.F. Yates, 1990a). The individual is then expected to choose the alternative that on average, would produce the best outcome, or the mean expected return, if the choice were to be made many times (Cohen, 1996; Connolly et al., 2000; Cramer & Spilker, 1998). An alternative in this situation is assessed not only by its expected value, or desired outcome, but also by the degree of uncertainty or risk.
involved, the probabilities assigned to the outcome. Risk then is a judgment in the form of a probability that relates to a chance for a loss from an unknown outcome. Researchers have identified risk judgments or risk estimations as factors that can affect risk taking behaviors in individuals making choices (Fischhoff, 1980, 1988; Fischhoff & De Bruin, 1999; Fischhoff, Watson, & Hope, 1984; Schick, 1997). The estimation or judgment involved has been shown to affect the risk actually taken. For example when risk is underestimated, choices reflect greater risk behavior than is intended, when overestimated, less risk behavior is reflected than is intended (Fischhoff & De Bruin, 1999; Slovic, 1998; J.F. Yates, 1990a; J. Frank Yates, 1990)

Risk Preference

As discussed previously, choices involving risk are influenced by judgments of chances for losses faced. Risk preference is defined as an assigned desirability or value placed on choosing an alternative that involves a chance for loss (Schick, 1997; J.F. Yates, 1990b). Risk preference reflects a reasoned choice if an individual rationally calculates and chooses between the given or self-constructed probabilities of a risk he thinks will serve him best. Within the framework of expected utility theory, risk preferences are viewed on a continuum between risk seeking and risk aversion with a clear central point of neutrality (von Neumann & Morgenstern, 1947; J.F. Yates, 1990b). The preference for choosing an alternative with a known or certain outcome over an alternative that has a chance for a higher or equal expectation is known as risk averse. The preference for rejecting an alternative with a known or certain outcome in favor of one with a chance that involves a loss is considered risk seeking. Having no preference
for an alternative that involves a chance for loss or gain is considered risk neutral (von Neumann & Morgenstern, 1947; J.F. Yates, 1990b).

Researchers argue that if people are risk-averse, risk-taking must be rewarded and it is expected that risky choices will be accepted only if they have higher expected returns than those without risk (Fischhoff & De Bruin, 1999; Fischhoff & Gilovich, 1993; Fischhoff, Goitein, & Shapira, 1981). For example a risk averse adolescent with asthma who is highly reactive to smoke would only stay at a party where people were smoking if he viewed the reward of peer interaction at the party greater than the loss from the symptoms he might develop from the smoke exposure. Whereas a risk seeking adolescent with asthma might stay at the party just to take the chance with no real thought about weighing the possible rewards or losses that could result from the action. Usually there is a positive relation between the amount of risk in an investment and the return provided.

For some people a reasoned choice of risk may be dependent not on calculations of expected consequences but on fulfilling the demands of an identity (Fischhoff 1992 & Yates 1990). For example an adolescent may choose to remain at a party where other adolescents are smoking because of social pressures even when risking possible asthma symptoms from exposure to smoke. In rational choice theory this adolescent might be labeled risk-averse because the social gain is viewed greater than the symptom loss. They are assumed to prefer an alternative that will yield a given return with certainty to any alternative having the same expected value or some chance for higher or lower returns (Fischhoff 1999).
An increase in the degree of risk will decrease the value of a particular alternative for the risk averse individual, whereas an decrease in the degree of risk will increase the value of that same alternative for the risk seeking individual (A. Tversky & Fox, 1995). The degree of risk reflects a measure of the variation in potential outcomes. In a risk situation a choice is therefore a joint function of the individual’s mean expected value and the degree of risk over the outcomes conditional on the choice of a particular alternative (A. Tversky & Fox, 1995).

Take for example, an adolescent with asthma who is allergic to horses and who goes to visit a friend thirty minutes away from his home but leaves his rescue inhaler at home. While visiting he is invited to go horseback riding with a group of friends. The last time the adolescent was exposed to horses he had a severe acute episode of asthma symptoms. The adolescent is faced with a symptom management choice that contains a gamble involving exposure to triggers without rescue medications available. The choices for the adolescent are 1) not go riding and thus avoid trigger exposure, or 2) go riding, take a gamble that involves two possible unknown outcomes. The first possible outcome is that nothing will happen except he will have a good time with friends. The second possible outcome is that he will develop a severe asthma episode with no rescuer medication available. The probabilities for both are variable and the adolescent self-assigns his own probabilities based upon his past symptom experiences.

The risk averse adolescent in this situation might go riding if he views the probability for the second outcome as very low. The adolescent will consider his possible losses greater than his possible gains based on his thoughts about his past symptom
history and not having his inhaler. The risk averse adolescent will place higher value on
the sure outcome. The risk-seeking adolescent might also think about not having an
inhaler and his past symptom history, but he might go riding because he views the
probability for the first outcome as being very low. The risk-seeking adolescent will
consider possible gains greater than possible losses. He will place less value on the sure
outcome and will be more willing to take gambles because the increased risk actually
increases the value of the alternative. The risk itself is exciting for the adolescent.

There is skepticism about a generic trait of risk preference. Researchers do not
preclude the possibility that any one individual may have risk-seeking or risk-averse
tendencies that may be stable over-time, and that risk preference may vary among
individuals dependent upon contexts and individuals (Conway, 1992; Cramer & Spilker,
1998). Although risk preference is viewed by some as a trait established relatively early
in life and maintained in adulthood, it is also thought to be variable within situations
rather than stable (Conway, 1992; Cramer & Spilker, 1998). Fischhoff has shown that
outcomes may be affected by risk preference just as risk preference may be affected by
outcomes and that successes in risk situations may lead to more risk seeking whereas,
failures or expected failures may lead to more or less risk averse preference dependent on
whether the individual focus is on hope or fear in a situation (Fischhoff 1990). In
summary, different individuals have different risk preference, some are more risk averse
and others more risk seeking. Little is known about adolescents risk preference. The
following discusses risk preference within this context and the theory of expected utility.
Expected Utility Theory

Expected Utility theory can help explain inherent risk preference when one is taking chances with health status outcomes and it may have relevance for investigating adolescent asthma symptom management choices involving uncertain outcomes/gambles. The axioms and premises of the theory define what it means to make rational choices when faced with uncertainty or making choices between sure things and true gambles (Hellinger, 1989). Many consider expected utility theory (EUT) the 'gold standard' for modeling rational decision-making under risk or uncertainty (Hellinger, 1989; Rutten-van Molken, Bakker, van Doorslaer, & van der Linden, 1995; A. Tversky & Kahneman, 1981; von Neumann & Morgenstern, 1947).

The theory of decision-making under risk was first explained in 1738 by Daniel Bernoulli and later developed into the expected utility theorem by von Neumann and Morgenstern in 1944 (von Neumann & Morgenstern, 1947). EUT provides a method for revealing peoples' preferences by their choices in a single gamble or a series of gambles. The theory was developed to describe how people make risky choices involving money, but has evolved to describe how people make risky choices involving other outcomes including those related to health (Hellinger, 1989; Kahneman & Tversky, 1984; Rutten-van Molken et al., 1995; von Neumann & Morgenstern, 1947). In these circumstances utility measures are used to determine gains from treatment, explore possible courses of action, and measure morbidity and mortality (Hellinger, 1989).

Expected utility theory (EUT) is based on the underlying premise that people are neutral towards gambles and the decision-maker always chooses the alternative for which
the expected value is the maximum (expected utility) (von Neumann & Morgenstern, 1947; J. Frank Yates, 1990). Under that assumption the theory provides a basis for assigning a real number, known as a utility score, that reflects a decision-maker's: 1) preference order among alternatives, and 2) preference order among consequences. A utility score is a measure of the value or desirability of a consequence to a course of action that applies to decisions made under risk (under uncertainty with known probabilities). The assignment of value (the utility score) is dependent on the preference of the individual decision-maker and several methods exist for eliciting a utility score (J. Frank Yates, 1990). The best-known method is the indifference judgment technique.

Preferences between sure things are conceived of in the usual ordinal fashion, whereas, preference comparisons between gambles are presumed represented by the expected-utility model, to permit a separation between the utility of gambling and traditional risk attitudes. When people make choices according to their individual preferences they are maximizing their expected utility (Hellinger, 1989; von Neumann & Morgenstern, 1947). Utilities (utility scores) can be elicited through a standard reference gamble where a person provides a judgment as to the point where they become indifferent between a sure option (an alternative with a sure outcome) and a two-outcome gamble (Kahneman & Tversky, 1984; A. Tversky & Kahneman, 1986; von Neumann & Morgenstern, 1947; J. Frank Yates, 1990). A utility score represents the value an individual places on the sure or known outcome.

Although risk preferences have not been reported as they pertain to factors that may influence adolescent decision-making, age and gender have been reported as factors
that may influence choices made by adolescents. The following two sections describe age and gender as possible influences on risk behaviors. Further research is needed to examine the effects of these variables on symptom related risk behaviors and the preferences that drive the behaviors.

**Age**

It is generally asserted that there is an increasing or developing ability for logical and probabilistic reasoning that matures with age and culminates during adolescence (Piaget, 1972). However, the literature is unclear as to how this emerging ability relates to the risk preferences that influence judgments. Lewis (Lewis, 1981) has shown that with increased age, peer counselors recognize and consider potential risks and future consequences of decisions. Hollen reported positive correlations between increased age and quality decision-making and decreased risk-seeking in two groups of healthy adolescents (Hollen 1994). In a later study involving adolescent survivors of cancer, Hollen, Hobbie, and Finley again linked increased age, in adolescent cancer survivor subjects, to better decisions related to driving after drinking and riding with drivers who had been drinking (Hollen, Hobbie, & Finley, 1997). In a study involving healthy children age 5-15 years, Tonkin described increased age as a factor related to a child's increased ability to draw on causal understanding when placing blame for road incidents. These examples link increased age with judgments leading to decreased risk behavior (Tonkin 1987).

However, increased age has also been associated with poor judgments leading to increased risk-taking as evidenced by greater frequencies for 10 to 20 year olds to take
risks related to smoking, alcohol, and sex (Frey, 1997). For the older subjects in this study, the perceived risk from behaviors involving chance was higher for peers than for self. Neumark-Sztainer also linked increased age with increased risk behavior related to health compromising actions in adolescents (grades 6, 9, and 12) (Neumark-Sztainer et al., 1996). This investigation demonstrated a clear trend toward higher prevalence rates among older adolescents for most risk behaviors, with the greatest differences between 6th and 9th grades and ages 10 years to 14 years. In summary research findings related to age and judgments leading to risk behavior during the adolescent years are inconsistent. The relationship between age and risk taking behavior has been studied with varying results, however, the relationship between age and the risk preference that may influence risk behavior has not been examined. Findings from this investigation may help to address this inconsistency.

**Gender**

As with age, the literature has associated gender with unclear relationships between decisions to engage in risk behaviors involving sex, substance use, tobacco use, suicide, and physical health. O'Malley and Johnston reported males having greater prevalence for risks involving drinking and driving, while females demonstrate greater risk behaviors related to riding in cars with drivers who have been drinking (O'Malley & Johnston, 1999). Hollen (Hollen, 2000) identified gender as a predictor of risk taking behavior related to decisions involving smoking, alcohol, and drug use in a sample of cancer-surviving adolescents. Her study reported that although risk-taking behaviors increase with age for both genders, the rates are higher for males.
In contrast, Neumark-Sztainer (Neumark-Sztainer et al., 1996) reported that adolescent females demonstrated greater risk behavior related to unhealthy weight behaviors and suicide, whereas males reported a significantly higher prevalence of risk behavior related to unprotected sex and smoking. In this same study, risks involving tobacco and alcohol were small in grades 6 and 9, however, 12th grade males were more likely than 12th grade females to engage in risk taking related to alcohol consumption. Sarigiani et al reported that adolescent females and males were equally likely to engage in risks related to smoking, drinking and using drugs, but their motivations differed (Sarigiani, Ryan, & Petersen, 1999). Saewyc reported that among bisexual and homosexual adolescents, males were more likely to engage in risk behavior involving sex and alcohol use, with male prevalence for risk taking being greater (Saewyc, Bearinger, Heinz, Blum, & Resnick, 1998). In summary the influence of gender on adolescent risk behavior is unclear. Results from this investigation may provide additional understanding of the relationship between gender and risk preference as a factor that may influence choices adolescents make when faced with risks or gambles involving unknown outcomes with known probabilities that are related to asthma symptom self-management.

Measuring Risk Preference

The purpose of this investigation was to assess eight investigator-developed adolescent asthma symptom self-management that were developed and formatted to measure risk preference in a series of gambles among outcomes using the SGT. This section describes measuring risk preference with the SGT and identifies factors that may influence those measurements.
Standard Gamble Technique

The SGT is a method for measuring risk preference in a series of gambles among outcomes or with a single gamble. It is a paired comparison decision method where people are forced to choose between two alternatives. Decision-analysts often refer to the SGT as the criterion standard for utility assessment because it is based on the original EUT axioms proposed by von Neumann and Morgenstern (Lenert, Treadwell, & Schwartz, 1999; Mulley, 1989). When used with a series of gambles the method elicits risk preferences through a systematic process of forcing choices in hypothetical situations that involve gambles. The utility scores elicited through the method are real numbers that represent the values people place on known or sure outcomes. In situations that involve health related choice the known or sure outcome is most often the person current health state or situation. The numbers actually reflect a point in time in a choice process when a person becomes indifferent to choosing the alternative with the known outcome and the alternative with the gamble (the two unknown outcomes). It is the point when a person judges no difference between the consequence of the known outcome and the consequences of the two-unknown-outcomes.

Generally, the more undesirable a person considers their current or known health state, the greater their desire or preference to take gambles or chances (risk) to escape it. A person who rejects a known outcome in favor of a gamble of lower or equal expectation is exhibiting a risk-seeking preference. If risk seeking, then the indifference probability or utility score is decreased or lower, representing a decreased value in the known health state. If a person exhibits a preference for a known outcome over a gamble
with a higher or equal expectation, he or she is considered risk averse. If risk averse the indifference probability or utility score is higher, representing an increased value in the known health state (Kahneman & Tversky, 1984; Tversky & Kahneman, 1981).

Standard gambles with potential outcomes or consequences of perfect health and death are called basic reference gambles (Rutten-van Molken et al., 1995). The utility of perfect health is defined as one (1) and the utility of death is zero (0). In a basic reference gamble the utility of the health-state being valued is equal to the indifference probability between one (1) and zero (0). Generally the more undesirable the individual’s current health-state the lesser the value they place on it. With lesser value there is greater willingness to gamble with treatments or actions that may provide an escape from the health-state. A greater willingness to gamble is represented by a lower indifference probability (p), and a lower utility score (Rutten-van Molken et al., 1995). Reference points other than perfect health and death can be used as long as one point is more desirable and one is less desirable than the state being evaluated. Individuals may demonstrate risk averse, risk neutral, or risk seeking preferences.

To use the method a person is first asked to think about their current state of health or a hypothetical state of health and then consider whether they would prefer to remain in that state of health or take a chance with an imaginary state of health that is the result of some action or treatment. The individual is told that the action or treatment has the ability to immediately give them a more preferred or improved state of health or to cause an exacerbation of symptoms that might lead to death. Basically they are asked whether they would prefer the certainty of remaining in their current health situation or
the uncertainty of taking a gamble with an treatment that will result in either better health or severe illness/death (Juniper, Guyatt, Feeny, Griffith, & Ferrie, 1997). The technique is challenging but researchers (Beyth-Marom et al., 1993) have shown that teens have a higher capacity for cognitive performance than expected and providing them with the sophisticated information needed for decision-making increases their ability to choose.

The technique has been used successfully by Juniper et al (Juniper et al., 1997) to rate three scenarios of mild, moderate, and severe asthma and measure health related quality of life in children. Juniper’s study reported that the children ages 7 to 17 years, with asthma, and who tested at a 6th grade-reading skills were able to use the standard gamble technique with confidence. Children over 12 years produced the most confident scores. The current investigation builds upon these finding and adds understanding of factors that influence adolescent asthma symptom self-management choices. Juniper’s study did not focus on the risk preferences but rather on the children’s ability to use the technique.

Scenarios to Measure Risk Preferences

With approval from the Committee for Protection of Human Subjects a three-stage process was used to develop and establish preliminary content validity for the eight adolescent asthma symptom self-management scenarios used in this investigation with the SGT. In the first stage adolescent risk decision-making themes were described, symptom management domains identified, and preliminary interview scenario items developed. A modified comparative case study strategy was used to analyze the described thoughts of six adolescents (n=6), 2 male and 4 female, when making decisions
invoking risk (Cook, 2001). Hispanic (n=2), Asian (n=1), and Caucasian (n=3) adolescents from 14-18 years of age and who attended junior high and high schools were interviewed. Four themes were identified: a) knowledge of parents and friends; b) personal knowledge; c) personal desires; and d) internal (gut) feelings (see Appendix B for the Model of Adolescent Thoughts When Making Choices Involving Risk).

Identified in the literature were 2 adolescent asthma symptom self-management domains and 6 risk areas within the domains. The domains were prevention and treatment and the risk areas were: 1) not avoiding triggers, 2) not removing self from triggers, 3) not initiating early self-treatment, 4) not modifying activities with the onset of symptoms, 5) not using medications safely, and 6) not seeking help (Yoos & McMullen, 1999; Yoos et al., 1999). The themes, domains, and risk area were integrated into eight adolescent asthma symptom self-management scenarios.

During the second stage parent, nurse, and physician experts examined preliminary scenario content validity. Nine (n=9) adult experts (parents (n=5), nurses (n=3), and physician (n=1), were used to evaluate the scenarios. Participants rated the content of the individual scenarios by answering 3 ‘yes’ or ‘no’ formatted questions. If the participant answered yes to all three questions the scenario received a score of three (3). The adult content validity scores for the individual scenarios ranged from 1-3, with scenario mean scores ranging from 2.33 (median =2.33, mode = 2.33, SD = .527) to 2.59 (median = 3.00, mode = 3.00, SD = .493). The adult content validity score range for the composite of eight scenarios was 16-23 out of a possible 0-24 range. The overall mean for the composite was 2.53 (median = 2.70, multiple modes existed, SD = .356) total
score was 20.31 (median = 21.66, multiple modes existed, SD = 2.85). The proportion of adults that scored the scenarios content valid (>2.5) were 9 out of 9 (100%) and the proportion of scenarios that were scored content valid were 8 out of 8 (100%).

One additional question was asked related to the validity of anchoring the gambles in the scenarios with a possibility of perfect health and a possibility of death for use with the STG method. All of the adult experts agreed the gamble consequences should be formatted with a best health outcome (no asthma symptoms) and a worst possible health outcome (severe asthma symptoms that could lead to hospitalization and or death).

The scenario content validity was further assessed during the third stage by a small convenience sample of adolescents with asthma (n=3, 2 females, 1 male). The adolescents were 13-18 years of age; attended high school; and from Hispanic (n=2) and Caucasian (n=1) cultures. The adolescents were also asked to rate the content of the scenarios by answering 'yes' or 'no' to the same three questions. A 'yes' answer to all three questions equaled a total score of three (3). The adolescent content validity scores for the individual scenarios ranged from 2 –3, with scenario mean scores ranging from 2.44 (median =2.33, mode = 2.33, SD = .192) to 2.77 (median = 2.66, mode = 2.67, SD = .192). The adolescent content validity score range for the eight-scenario composite was 19-23 out of a possible 0-24 range. The overall mean for the composite was 2.66 (median = 2.75, multiple modes existed, SD = .220), the total mean score was 21.33 (median = 22.00, multiple modes existed, SD = 1.76). The proportion of adolescents that scored the scenarios content valid (>2.5) were 9 out of 9 (100%) and the proportion of scenarios that
were scored content valid were 8 out of 8 (100%). The adolescents were asked if they understood the anchors. There was agreement among all three adolescents that they understood the consequence anchors as representing the best health outcome (no asthma symptoms) and the worst health outcome (severe asthma symptoms that could lead to hospitalization and or death) for use with the SGT methodology.

The adolescents were also asked to tell the researcher about a time when they faced making an asthma self-management decision related to each symptom domain. Two prevention domains related to avoiding triggers were identified that included avoiding exercise triggers and avoiding allergy triggers. Two different treatment domains related to seeking help from parents, adults, or peers and seeking help from health care provider were identified. The adolescents described these four areas as being very different from the original two and better described the risks adolescents take related to symptom self-management. The final product was a model depicting the two domains and eight risk areas (see Appendix C for model of asthma symptom self-management domains involving risk).

The above process yielded a bank of sixteen (16) scenarios framed in the context of the eight adolescent asthma symptom self-management domains and formatted for use with the SGT method. There were two scenarios for each domain. The scenarios characterized three prevention domains related to avoiding allergy triggers, avoiding exercise triggers, and removing self from triggers prior to the onset of symptoms; and five treatment domains related to initiating early self-treatment, modifying activities, using medications safely, seeking help from parents, adults or peers, and seeking help
from health care providers in the presence of symptoms. The scenarios were formatted to allow a forced choice between an alternative with a known consequence and an alternative with a gamble containing two-unknown consequences.

**Conceptual Model**

A conceptual framework for examining asthma symptom self-management in adolescent evolved through a literature review of expected decision theory, a symptom interpretation model, Piaget's theory of cognitive development, and the expected utility theory (see Figure 6).

![Conceptual Model Diagram](image)

*Figure 6. Conceptual Model of Risk Preferences with Symptom Interpretation. A model for explaining the influence of risk preference on rational adolescent asthma symptom self-management choices.*

Decision theory and Piaget's theory of cognitive development explained choices based on personal beliefs and personal desires that are made within the limited reasoning capacities of adolescents. The SIM provided a focus for these theories relative to the first step in the symptom self-management process, specifically interpreting symptoms so that
likelihood judgments can be formed about the probabilities of possible consequences to symptom self-management decisions.

EUT provided the understanding of the individual preferences or values that motivate decisions involving risk. The conceptual framework guided the construction of a model for explaining how choices made between gambles containing pre-assigned probabilities for unknown outcomes may be influenced by risk preference.

Summary

Adolescent asthma symptom self-management decision behaviors are actions in response to symptoms. Symptom knowledge and cognitive maturity influence these actions. Frequently symptom self-management choices involve unknown consequences. Choices involving unknowns with known probabilities are defined as risks (March, 1994). Gambles are choice situations that involve uncertain outcomes with the possibility of gaining something.

Adolescents gamble with increased morbidity and mortality when they make symptom treatment or prevention choices that involve unknown outcomes such as exposures to triggers or delays in treatments (Yoos et al., 1999). The phenomenon of risk preference may help explain adolescent choices in the face of gambles. Choices involving risk are recognized as influencing adolescent lives. The preferences that motivate adolescents toward risks should be studied so that choices adolescents make in symptom self-management are understood. However, research linking risk preference to asthma symptom self-management during adolescence is non-existent.
The purpose of this investigation was to assess eight asthma symptom self-management scenarios using the standard gamble technique to measure risk preference. The investigation was guided by a framework developed from theories and models pertaining to rational decision making, symptom interpretation, cognitive development, and expected utility as they related to adolescent decision-making involving gamble. The investigation used the standard gamble forced choice methodology with scenarios that had gambles with given probabilities for possible consequences. Adolescents in the investigation were asked to choose alternatives with the most preferable probability for a consequence. This investigation provided foundational information about using the standard gamble technique (SGT) with asthma symptom self-management scenarios to measure risk preferences in a series of gambles among outcomes.
Chapter 3

METHODOLOGY

The methodologies for using the standard gamble technique (SGT) with eight investigator-developed adolescent asthma symptom self-management scenario to accomplish the aims of this investigation are outlined. The research design, sample criteria and setting, and procedures for safeguarding the rights of human subjects are presented. Procedures are presented for collecting demographic and symptom information, risk preferences or utility scores, content validity scores, and qualitative responses. A procedure for making choices using the standard gamble technique (SGT) is described. Data analysis procedures are outlined as they pertain to the research aims and research questions.

Research Design

A descriptive correlational design was used to: 1) estimate the internal consistency and content validity of eight investigator-developed scenarios; 2) estimate the magnitude, direction, and strength of relationships between risk preference, age, and gender; and 3) describe the adolescent responses to using the SGT for making adolescent asthma symptom management choices.

Sample Criteria and Setting

The settings for the investigation were individual homes, pediatric pulmonary clinic offices, libraries, and schools in the Southwestern United States. Private rooms at each site were used for meeting with parents, guardian, and adolescents. A convenience sample of adolescents with a diagnosis of asthma as confirmed by a parent or guardian
was recruited for this investigation. An adolescent was defined as a person who had reached his or her thirteenth (13) birthday and not reached his or her eighteenth (18) birthday. Asthma was defined as an obstructive pulmonary disease characterized by reversible airway obstruction, airway inflammation and increased airway reactivity or hyper-responsiveness (Kobzik & Schoen, 1994). Current national guidelines classify asthma as mild, moderate, or severe in intensity of symptom episodes and intermittent or persistent in frequency symptom episodes (NHLBI, 1997). During the interview the Adolescents were asked during the interview to identify their severity classification based on their symptom history.

Adolescents needed to read at the sixth grade level to participate in this investigation. A Minor Subject’s Assent Form was used to assess adolescent reading ability. The Simplified Measure of Gobbledygoop (SMOG) Readability Formula was used to verify the reading level of the assent form (McLaughlinC., 1969). Adolescents were excluded from the study if they lacked interest in participation. A sample size of 37 adolescents were recruited as determined by a priori sample size determination using r= .50 with a power =.90, and alpha .05 for a two-tailed test.

Subject Recruitment and Human Subjects Protection

Approval for the investigation was obtained from the Human Subjects Protection Committee of the University of Arizona (see Appendix D for human subjects approvals). Approvals were also obtained from the Scientific Review and Medical Executive Committees of a local children’s hospital to recruit adolescents from the pediatric pulmonary outpatient clinic and a community-based breathmobile project. Additional
approvals were obtained from three local school districts to recruit adolescents through school nurses (see Appendix E for recruitment letters and flyer).

Prior to participation, parents or guardians of adolescents with asthma were given explanations of the study by physicians or nurses and investigator. Interested parents or guardians were informed of the risks and benefits of the study and advised that they were free to withdraw their adolescent from the study at any time. The parent or guardian signed an informed consent and the adolescent signed a minor assent form (see Appendix F for informed consents). Adolescents were assigned subject numbers for use through the data analyses.

Data Collection

After obtaining informed consent four types of data were collected for this investigation. These data included demographic and symptom information; risk preferences or utilities; content validity scores and qualitative responses; and adolescent thoughts about using the SGT. This section explains data collection procedures related to these data. Procedures for analyzing the data are presented later in this chapter as they pertain to the research aims of the investigation. All data were collected from adolescent participants during face-to-face interviews. Data from parents and or health care providers were used only to confirm a diagnosis of asthma of potential adolescent participants. Because the investigation focused on adolescent symptom self-management, medical records were not reviewed to substantiate adolescent descriptions of asthma symptoms, disease severity, or medical management regimens.
Demographic and Symptom Information

Demographic information related to age, gender, and county of residence were collected from questions one (1) through three (3) on the General Demographic and Symptom Information Form (GDSIF) (see Appendix G for data collection forms). Asthma symptom information data related to severity classification, medication history, and episode history were collected from questions four (4) through eleven (11) on the GDSIF. The questions on the GDSIF were read to the adolescent by the researcher. The investigator recorded all answers.

Risk Preferences

Risk preferences or utility scores were measured using the standard gamble technique SGT and used to estimate the internal consistency reliability of the scenarios, and to estimate correlations between age and gender of the adolescents and the eight individual scenarios and the composite. The following research questions were answered using individual utility scores, total utility scores, and mean utility scores (1) What are the inter-item correlations of the utility scores of the individual scenarios? (2) What are the item-total correlations between the utility scores on the individual scenarios and the total utility scores for the eight scenarios? (7) What is the correlation between age and the individual item utility scores? (8) What is the correlation between gender and the individual item utility scores? (9) What is the correlation between age and the mean utility score? (10) What is the correlation between gender and the mean utility score?
Utility Scores

A utility score is an indifference probability (p) that reflects a decision-maker's preference order among alternatives and consequences in choice decisions involving gambles. In utility choice situations probabilities are assigned to possible consequences of alternatives and decision-makers choose alternatives based upon their preference for the consequence (Kahneman & Tversky, 1984; Tversky & Kahneman, 1986; von Neumann & Morgenstern, 1947; J. Frank Yates, 1990). In this investigation a utility score was the probability (p) at the point in time when the adolescent was no longer willing to choose an alternative with a gamble in one of eight asthma symptom self-management scenarios. Utility scores are real numbers between one (1) and zero (0). A utility score of one (1) was assigned if an adolescent only selected the gamble when the best possible unknown outcome (no asthma symptoms) had an assigned probability of 100% when judged against the 100% for the known outcome (current state of asthma symptoms). A utility score of zero (0) was assigned if an adolescent only selected the gamble when the worse possible unknown outcome (severe asthma symptoms) had an assigned probability of 100% when judged against the 100% for the known outcome (current state of asthma symptoms).

A utility score equaled the individual utility elicited for a single scenario. Eight individual utility scores were measured for each adolescent. A total utility score was computed for each adolescent that equaled was sum of the eight individual scenario utility scores. A mean utility was the computed average of the eight individual utility scores for each adolescent. A measurement model is shown to explain the process of
using the SGT to elicit utility scores with the eight asthma symptom self-management scenarios in this investigation (see Figure 7). The model is a schematic of the relationship between the variables and a guide for the process of presenting the eight hypothetical scenarios in a series of gambles where the consequences have assigned probabilities. The procedures are further outlined in this section.

**Figure 7.** A schematic model for guiding the process of measuring utility scores with SGT and hypothetical adolescent asthma symptom self-management scenarios

*Standard Gamble Technique for Measuring Utilities*

The SGT was used in this investigation as the method for choosing alternatives in eight asthma symptom self-management scenarios (see Table 1 for a sample scenario) (see Appendix H adolescent interview with scenarios). Each scenario presented a choice between two alternatives. One alternative contained a single known consequence and the other contained a two unknown consequence gamble. Adolescents were asked to make choices between alternatives using the SGT with a systematic process of varying the probabilities of the two consequences in a series of gambles or with a single gamble approach.
Table 1.

Sample Adolescent Asthma Symptom Self-Management Scenario for use with the SGT method for making choices involving a series of gambles

Your asthma is triggered by physical exercise. You are a member of a soccer team. You always take your medicine with you to the games but you leave it in your gym bag on the sidelines. The game is a fast moving game and is currently tied 2 to 2. The coach suddenly yells for you to get into the game right away. You know that if you tell the coach you have to first take time to use your inhaler, he will tell someone else to go into the game in place of you. You really want to play. What would you do in this situation?

Time #1

Choice #1 (Known Outcome) Tell the coach you must use your inhaler before playing (knowing for certain (100%) that you will not develop asthma symptoms, but you will not play in the game).

Choice #2 (Gamble with Two Unknown outcomes) Don't tell the coach and you go into the soccer game to play with a chance that
  a. you will not develop asthma symptoms (100%), and a chance
  b. you will develop severe asthma symptoms while playing (0%).

Time #2

Choice #1 (Known Outcome) Tell the coach you must use your inhaler before playing (knowing for certain (100%) that you will not develop asthma symptoms, but you will not play in the game).

Choice #2 (Gamble with Two Unknown Outcomes) Don't tell the coach and you go into the soccer game to play with a chance that
  a. you will not develop asthma symptoms (0%), and a chance
  b. you will develop severe asthma symptoms while playing (100%).

The scenarios were presented one at a time using a chance board to visualize the process of varying the probabilities in the two-consequence gamble. The enlarged chance board displayed the hypothetical situations, the alternatives, and the consequences for each scenario. The scenarios, alternatives, and consequences were written on cards and
attached to the chance board for the subject to visualize. The scenario and their corresponding alternative and consequence cards were read aloud to the adolescents. One alternative card in each scenario had a single undesirable consequence with an assigned fixed 100% probability for occurring. The probability for this consequence did not change so it was the known consequence. The second alternative card contained a gamble with two unknown consequences.

In the series of gambles approach probabilities were assigned to the consequences of the gamble in a systematic approach that used smaller cards with written percentages, ranging from zero percent (0%) to one hundred percent (100%) in 10% increments. The best possible consequence was assigned the probability (p) and the worst possible consequence assigned the corresponding (1-p) (see Figure 8 for a schematic of the SGT as presented on the chance board). The probabilities were varied systematically in a series of gambles beginning with 100% and decreased by 10% until the adolescent reached a point of indifference between the value of the best possible consequence in the gamble when compared to the known consequence. The point of indifference was the point when the adolescent was longer willing to choose the alternative with the gamble because the probability for the best possible consequence was no longer more desirable than the known consequence.
Stated Indifference Point

\[ p = 0.40 = \text{Utility score} \]

Alternative #1
Gamble Unknown Outcome

Gamble

Alternative #2
Certain / Known Outcome

\[ 1.0 = 100\% \]

Figure 8. A schematic of the standard gamble technique as presented with a chance board for choosing between alternatives in the asthma symptom self-management scenarios.

The outcome of this systematic method is the utility score or the probability \( (p) \) at the point of indifference. The individual utility scores \( (p) \) are between 0.10 and 1.0 and represent the risk preference for the domain and risk for the scenario presented. A practice session presented a non-asthma related choice scenario using the SGT with the chance board. The eight scenarios in the investigation were assigned numbers from one (1) to eight (8). Prior to the start of the interviews adolescents were asked to select a
number from one to eight. The eight scenarios were presented in order beginning with the number the adolescent selected.

In the series of gambles approach the probabilities are varied by 10% until the adolescent reaches a point in time when he or she no longer chooses the gamble. They no longer choose the gamble because they reach a point of no difference between the value of the best possible consequence and the value of the worst possible consequence when compared to the known with the given probabilities. The probability (p) at this point is the utility score and the adolescent’s risk preference. The utility scores calculated in this investigation from the SGT method were numbers between .01 and 1.

Utility scores were also elicited using the SGT with a single gamble approach. Five adolescents used the method with a single gamble process. Five subject numbers were randomly chosen prior to the start of the investigation out of a box containing 37 numbers. Subject numbers 16, 18, 29, 30, and 32 were identified. The adolescents with those subject numbers used the SGT with a single gamble. In the single gamble the adolescent was asked to assign a probability to the best possible outcome that represented the amount of risk or chance they were willing to take to get that outcome. The probability represented the point where they would no longer choose the alternative with the gamble and was their utility score for the scenario.

Content Validity

Content validity is defined as the determination of how representative or relevant the items of an instrument are to a domain of content. The determination of content validity is a two-stage development and judgment process (Lynn, 1986). The
development process for the asthma symptom scenarios was discussed in Chapter 2. The focus of this investigation was the judgment process. Since content validity is based on judgment, there are no completely objective methods for assuring adequate content coverage of an instrument. However, using experts to analyze items to see if they adequately represent the hypothetical content universe in the correct proportions has been used and described (Nunnally & Berstein, 1994b).

The judgment process in this investigation entailed an assertion by a specific number of experts that the individual items and the entire composite of items, sampled all the relevant or important domains and are appropriate for the intended purpose. Although the literature is unclear as to an exact number of experts needed and the proportion of the experts that must agree for content validity to be established, a minimum of five experts is said to provide a sufficient level of control for chance agreement (Lynn 1986). Thirty-six adolescents were used in this investigation assess the content validity of the eight adolescent symptom management scenarios. Adolescents with asthma were the experts in this investigation because they know the symptom self-management prevention and treatment risks they face. Acceptable proportions of agreement in the literature were between 78% and 100% (Lynn 1986). The proportion of adolescents that must agree in this investigation was set at 85%.

The most widely used quantification of content validity is the index of content validity (Lynn 1986). The index used in this investigation uses a 4-point ordinal rating scale suggested in the literature by Lynn (1986). The scenarios were rated 1 if irreverent and 4 if extremely relevant. Content validity ratings were used for two research questions
related to the domains and risk areas of the asthma symptom self-management scenarios.

Table 2 presents the scenario numbers, domains, and risk areas. Content validity scores were used to answer research questions: (3) to what extent do the scenarios reflect adolescent asthma symptom self-management domains, and (4) to what extent do the scenarios reflect adolescent asthma symptom self-management risks.

Table 2.

Adolescent Asthma Symptom Self-Management Scenario Domains and Risk Areas

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Domain</th>
<th>Risk Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Prevention</td>
<td>Avoiding triggers related to exercise</td>
</tr>
<tr>
<td>2</td>
<td>Treatment</td>
<td>Modifying activities with onset of symptoms</td>
</tr>
<tr>
<td>3</td>
<td>Prevention</td>
<td>Avoiding allergy triggers</td>
</tr>
<tr>
<td>4</td>
<td>Treatment</td>
<td>Seeking non-medical help from parents, adults, or peers</td>
</tr>
<tr>
<td>5</td>
<td>Prevention</td>
<td>Removing self from triggers prior to onset of symptoms</td>
</tr>
<tr>
<td>6</td>
<td>Treatment</td>
<td>Seeking medical care</td>
</tr>
<tr>
<td>7</td>
<td>Treatment</td>
<td>Safe use of medications after onset of symptoms</td>
</tr>
<tr>
<td>8</td>
<td>Treatment</td>
<td>Initiation of early treatment after onset of symptoms</td>
</tr>
</tbody>
</table>

In addition to quantitatively judging each item the adolescents were questioned to identify any domains or risk areas that may have been omitted from the individual scenarios or the composite. Adolescent responses to two open-ended questions were collected to answer the following research questions: (5) what other adolescent asthma
symptom self-management domains exist, and (6) what other adolescent asthma symptom risks exist. Following are the procedures for collecting both the quantitative and qualitative content validity data sets.

*Content Validity Rating Data*

Content validity data were collected after utility score data. The eight asthma symptom scenarios were read aloud a second time and adolescents were asked to respond to five questions (see Table 3) for each scenario. Content validity ratings were collected from questions ‘A’ and ‘B’ to assess the extent to which the content reflects the domains of asthma symptom prevention and treatment. Rating scores from questions ‘D’ and ‘E’ were collected to assess the extent to which the content reflects the risk areas within the domains. Question ‘C’ was asked to assess the written clarity of the scenarios, however, the data were not used in the analyses for content validity.

Table 3.

*Five Content Validity Index Interview Questions*

<table>
<thead>
<tr>
<th></th>
<th>Question</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Does this asthma symptom situation sound like one that a teenage might face?</td>
</tr>
<tr>
<td>B</td>
<td>Does this asthma situation pertain to (insert domain and risk area)?</td>
</tr>
<tr>
<td>C</td>
<td>Is this asthma situation written clearly?</td>
</tr>
<tr>
<td>D</td>
<td>Do the alternatives in this situation seem realistic for adolescents with asthma?</td>
</tr>
<tr>
<td>E</td>
<td>Do the consequences in this situation seem realistic for adolescents with asthma?</td>
</tr>
</tbody>
</table>
The content validity questions were read aloud to the adolescents one at a time. Adolescents answered each question with a numeric response that best suited his or her assessment of the scenario using a 4-point ordinal rating scale (see Table 4). The rating scale and responses were printed on a 5x7 card and given to the adolescent to use as a guide for answering the questions. The investigator recorded content validity rating scores for four questions for each of the eight scenarios.

Table 4

Four-Point Content Validity Rating Scale

<table>
<thead>
<tr>
<th>Number</th>
<th>Question</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>No, this item definitely does not apply to adolescent asthma symptom management choices.</td>
</tr>
<tr>
<td>2</td>
<td>No, this item would need major changes to reflect something an adolescent would face, or I do not know, I am unable to assess if this item applies to adolescent asthma symptom management.</td>
</tr>
<tr>
<td>3</td>
<td>Yes, this item is realistic for adolescent asthma symptom self-management but it needs to be changes slightly.</td>
</tr>
<tr>
<td>4</td>
<td>Yes, this most definitely reflects something an adolescent might face. This is an extremely realistic item.</td>
</tr>
</tbody>
</table>

Qualitative Content Validity Data

Qualitative data were collected as responses to open-ended interview questions to answer research questions 5 and 6. The adolescents were asked to talk about times when
they faced a choice or gamble related to the domains of asthma symptom prevention and treatment and about the risk area or category for each scenario. The questions were asked following the collection of both the utility data and the quantitative content validity data (See Table 5). Question 2 was changed with each scenario to correspond with the domain and risk area being assessed in each scenario.

Table 5.

*Open-ended Interview Questions for Scenario Content Validity*

<table>
<thead>
<tr>
<th>Number</th>
<th>Question</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Tell me about a time when you had to make a choice about preventing or treating your asthma symptoms?</td>
</tr>
<tr>
<td>2.</td>
<td>Tell me about a time when you were faced with a gamble related to <em>preventing asthma symptoms from exercise</em>? (ie: scenario 1, avoiding triggers related to exercise)</td>
</tr>
</tbody>
</table>

*Adolescent Thoughts About Standard Gamble Technique*

Qualitative data were collected through responses to open-ended interview questions to answer research questions (11) what do adolescents think about teenagers making choices using the SGT, and (12) what do adolescents think about the burdens related to using the SGT (refer to Table 6 for the two open-ended validity questions). The investigator recorded the adolescent responses. Additional questions were asked when clarification of a response or question was needed by the investigator or by the
adolescent. Facial expressions were carefully observed for signs of confusion or understanding.

Table 6.

Open-ended Interview Questions for Adolescent SGT Usefulness or Burden

<table>
<thead>
<tr>
<th>Number</th>
<th>Question</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1</td>
<td>Today I asked you to make hypothetical symptom management choices using a method called the standard gamble technique. Tell me what you think about teenagers using this method to make choices.</td>
</tr>
<tr>
<td>C2</td>
<td>Some people say the standard gamble method that we used today is simple and easy to understand, other people say that it is difficult and hard to understand. Tell me what you think about this method?</td>
</tr>
</tbody>
</table>

Data Analyses Procedures

The following section describes the data analyses procedures of the investigation. They are described as they relate to the demographic and symptom information, and the research aims and research questions of the investigation. For all statistical procedures a significance level was set at $p \leq .05$.

Demographic and Symptom Information

All demographic and symptom information were entered into SPSS12.0 and analyzed for descriptive statistics. Demographic information included age, gender, ethnicity, recruitment site, and county of residence. Symptom information included:
asthma severity; frequency of symptoms if medications were stopped and nighttime symptoms; asthma medication regimens; frequency of asthma symptom episodes as they relate to missed school, missed physical activities, social events, school nurse visits, doctor’s office visits, emergency room visits or hospital admissions; symptoms and actions related to asthma episodes; and symptoms compared to one year ago. Descriptive statistics are reported through narratives and tables presenting the frequencies and percentages of the characteristics.

Aim 1

Aim 1 was to estimate the internal consistency reliability and content validity of eight adolescent asthma symptom self-management scenarios. Data analyses for this aim are presented in the following sections.

Reliability

The following research questions were answered pertaining to the internal consistency reliability of the scenarios: (1) what are the inter-item correlations of the utility scores of the individual scenarios, and (2) what are the item-total correlations between the utility scores on the individual scenarios and the total utility scores for the eight scenarios. Utility data in the form of individual and total utility scores from adolescents (n=31) who made asthma symptom management choices using the SGT with a series of gambles were used to answer the research questions. Individual scenario utility scores and total composite utility scores were entered into SPSS 12.0 statistical package for analyses. Data were analyzed for normality using the one-sample Kolmogorov-Smirnov (K-S) and the Shapiro-Wilk test. The internal consistency of the items was
tested using Cronbach’s alpha. Because the utility score data were non-normally
distributed the item-to-total correlations were computed for the 8 scenarios using the non-
parametric Kendall’s tau correlation. The normality testing results are reported in
Chapter 4.

Content Validity

Content validity data from the adolescents (n=36) who completed the interviews
and successfully used the SGT with either the single gamble or the series of gambles
were used to answer the research questions. The content validity research questions
asked: (3) to what extent do the scenarios reflect adolescent asthma symptom self-
management domains, (4) to what extent do the scenarios reflect adolescent asthma
symptom self-management risks, (5) what other adolescent asthma symptom self-
management domains exist, and (6) what other adolescent asthma symptom self-
management risks exist. Content validity rating data from questions ‘A’ and ‘B’ for the
domain and questions ‘D’ and ‘E’ for the risk area of each scenario, were entered into
SPSS 12.0 statistical package for analyses (see the content validity questions on page 91
in this chapter). Descriptive statistics of the content validity scores and content validity
indexes are reported through narratives and tables presenting the mean, standard
deviation, mode, and median for the individual scenarios and the composite of eight
scenarios. The following is an in-depth description of the methods.

To answer research question 3 about the extent to which the scenarios reflect
adolescent asthma symptom self-management domains, a content validity index (CVI)
was calculated as the proportion of adolescents who rated the individual scenarios as
content valid and the proportion of total scenarios judged content valid. Content valid is defined as a mean score equal to or greater than 3 using the 4-point rating scale described under data collection. Individual and eight-scenario composite content validity scores were used to compute the proportions used for the content validity indexes.

Eight individual scenario content validity scores for the domains were computed from the composite of the ratings for questions ‘A’ and ‘B’ for each adolescent. The ratings for each scenario could range from 2 (if each question was rated a 1) to 8 (if each question was rated a 4). A rating of 6 was needed to receive a mean rating equal to 3. The eight-scenario composite ratings could range from a low of 16 (if each question was rated a 1 times eight scenarios) to a high of 64 (if each question was rated a 4 times 2 questions, times eight scenarios). A composite rating of 48 was needed to compute to a mean composite score equal to or greater than 3. Refer to Table 7 for the formulas for computing the content validity scores for the individual scenarios and eight scenario composites; and for computing the content validity proportions or indexes.

To answer research question 4 about the extent to which the scenarios reflect adolescent asthma symptom self-management risk areas, a content validity index (CVI) was calculated as the proportion of adolescents who rated the individual scenarios as content valid and the proportion of eight-scenario composite that were rated as content valid. Content valid as defined above was a mean score equal to or greater than 3 using the 4-point rating scale seen in the data collection section of this chapter.
### Table 7.

**Formulas for Computing Content Validity Scores and Content Validity Indexes for Individual Scenarios and Eight-Scenario Composites**

<table>
<thead>
<tr>
<th>Formula</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individual scenario content validity scores (mean score)</td>
<td>$\frac{A + B}{2}$ (#of questions)</td>
</tr>
<tr>
<td>Individual Scenario Content Validity Index</td>
<td>$\frac{# \text{ of adolescents who rate the scenario} \geq 3}{\text{Total number of adolescents (n=36)}} = %$</td>
</tr>
<tr>
<td>Eight-scenario composite content validity score (mean score)</td>
<td>$(1A+1B)+(2A+2B)+(3A+3B)+(4A+4B)+(5A+5B)+(6A+6B)+(7A+7B)+(8A+8B)$ $\frac{16}{16}$ (total number of questions)</td>
</tr>
<tr>
<td>Eight-scenario Composite Content Validity Index</td>
<td>$\frac{# \text{ of composites scored} \geq 3}{\text{Total number of composites (n=36)}} = %$</td>
</tr>
</tbody>
</table>

Note. A = 'A' question rating, B = 'B' question rating

The content validity scores for the risk areas were computed from the ratings assigned to questions 'D' and 'E' for each scenario as seen earlier in this chapter. The eight individual scenario mean content validity scores were computed from the composite of the ratings for questions 'D' and 'E' for each adolescent. Following the same format as used for assessing the domains, the content validity scores for each scenario could range from 2 to 8 with a minimal individual scenario rating of 6 needed for a mean score equal to or greater than 3. The eight-scenario composite ratings could range from 16 to 64.
with a rating of 48 needed for a mean score equal to or greater than 3. The formulas outlined in Table 7 above were also used to compute the risk area content validity scores and indexes by substituting questions ‘A’ and ‘B’ with questions ‘D’ and ‘E’. As mentioned earlier in the data collection section, data from question ‘C’ were not used in the analyses for content validity.

To answer research questions 5 and 6 responses to two open-ended questions were asked as they related to each scenario. Table 5 in the data collection section presents the questions asked. All adolescent qualitative responses to the questions were entered into an excel data base and organized by question and subject number. An analysis of the data was conducted using a modified case study strategy where the data from each adolescent was examined line by line to identify words or phrases that convey emerging themes or patterns across the sample (Yin 1989). The themes were used to identify other possible adolescent asthma symptom self-management domains and or risk areas. The data are presented in narratives for each scenario as they relate to the domains and risk areas.

Aim 2

Aim 2 was to estimate the relationship between measured risk preferences and adolescent age and gender. Data analyses are presented in the following sections as they pertain to the following research questions: (7) what is the correlation between age and the individual item utility scores, (8) what is the correlation between gender and the individual item utility scores, (9) what is the correlation between age and the mean utility score, and (10) what is the correlation between gender and the mean utility score.
Individual and mean utility score data from adolescents (n=31) who used the SGT with a series of gambles were used to answer the research questions. The utility scores were entered into SPSS 12.0 statistical package for analyses. Data were analyzed for normality using the one-sample Kolmogorov-Smirnov (K-S) test. Results were presented in narratives and tables for each research question.

Age

The correlations between age and individual utility scores, and age and mean utility scores were examined using the Kendall’s tau correlation. Statistically significant correlations are reported in terms of strength (r), nature, and magnitude (r^2). The strength of the relationship between the variables was directly indicated by the absolute value of the (r), the higher the absolute value of the correlation, the stronger the relationship. The sign of the correlation indicated the nature of the relationship. A positive sign or a correlation without a sign indicated that the high values on age were associated with high utility values or greater risk aversion. A negative sign indicated that high values on one of the variables were associated with low scores on the other variable. The magnitudes of the correlations were expressed in terms of r^2 and represent the proportion of variance in age that is associated with the utility scores. Meaning it represents the proportion of variance that is shared by (explained by) the two variables (Polit, 1996).

Gender

The relationships between gender and the individual utility scores, and gender and the mean utility scores were examined using the Kendall’s tau point-biserial correlations.
Aim 3

Aim 3 was to describe adolescent thoughts related to using the SGT as a decision-making methodology. Two open-ended questions were used to answer the following research questions: (11) what do adolescents think about teenagers making choices using the SGT, and (12) what do adolescents think about the burdens related to using the SGT. The two open-ended questions are presented in the data collection section of this chapter. Adolescent qualitative responses to the questions were entered into an excel data base and organized by question and subject number. An analysis of the data was conducted using a modified case study strategy where the data from each adolescent was examined line by line to identify words or phrases that convey emerging themes or patterns across the sample (Yin 1989). The themes were used to answer the research questions related to adolescent thoughts about using the SGT method for making choices. Table 8 presents a summary of all data analyses procedures.

Summary

A descriptive correlational design was used to estimate the internal consistency reliability and content validity of eight asthma symptom self-management scenarios and investigate the magnitude, direction, and strength of the relationships between risk preference, age, and gender of adolescents with asthma. Criteria for adolescents’ inclusion were outlined. The procedures for safeguarding the rights of human subjects were presented. Data collection procedures were presented. Methods for measuring risk preferences or utilities with the standard gamble technique (SGT) and content validity
ratings were outlined. Methods for analyses of data are presented as they pertain to the aims and research questions of the investigation.

Table 8.

Data Analysis Summary

<table>
<thead>
<tr>
<th>Question</th>
<th>Data Collection</th>
<th>Data Type</th>
<th>Data Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 &amp; 2</td>
<td>SGT Method</td>
<td>Utility Scores (.10, 1.0)</td>
<td>Inter-item Cronbach’s alpha Item-total Correlations</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Individual, Total, Mean</td>
<td></td>
</tr>
<tr>
<td>3 &amp; 4</td>
<td>Content Validity Rating Scale</td>
<td>4-point ordinal scale</td>
<td>Descriptive Statistics (M, Median, Mode, SD, f) Content Validity Indexes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 = not valid to 4 = valid</td>
<td></td>
</tr>
<tr>
<td>5 &amp; 6</td>
<td>Face-to-face Interview</td>
<td>Open-ended questions</td>
<td>Modified Case Study Strategy</td>
</tr>
<tr>
<td>7-10</td>
<td>SGT GDSIF</td>
<td>Utility Scores (.10-1.0)</td>
<td>Bivariate Statistics Kendall’s tau Correlations</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Individual, Total, M Age</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>DOB = Months (156 mo - 204 mo)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Gender 0 = m, 1 = f</td>
<td></td>
</tr>
<tr>
<td>11-12</td>
<td>Face-to-face Interview</td>
<td>Open-ended Questions</td>
<td>Modified Case Study Strategy</td>
</tr>
</tbody>
</table>
Chapter 4

RESULTS OF DATA ANALYSIS

Introduction

The purpose of this investigation was to assess eight investigator-developed adolescent asthma symptom self-management scenarios for use with the standard gamble technique (SGT). The scenarios were developed and formatted to measure risk preference using the SGT. The specific aims of the investigation were to: 1) estimate the internal consistency reliability and content validity of the investigator-developed scenarios; 2) determine the relationship between measured risk preferences, age, and gender; and 3) describe adolescent responses to using the SGT as a decision-making methodology. The results of the data analysis are presented. The investigation sample is described and the findings for each research question are reported.

Description of the Sample

Thirty-seven adolescents with asthma were face-to-face interviewed for this research investigation. Of the 37 adolescents 31 (83%) used the SGT with a series of gambles, 5 (14%) used the SGT with a single gamble technique, and 1 (3%) was unable to use the SGT with either method. Data from the adolescent who was unable to use the SGT are not presented in these results.

Demographic, symptom, and content validity data are described in the following sections of this chapter for the 36 adolescents who were able to use the SGT. Risk preference or utility data are described and analyzed for the 31 adolescents who used the SGT with the series of gambles. Because utility data were collected differently from the 5
adolescents who used the SGT with a single gamble approach the data were not used to answer the research questions that involved utilities. The adolescent interview times ranged from 33 minutes to 64 minutes with mean of 48.38 minutes (SD 7.10 minutes).

Demographic Data

Demographic data were recorded on the General Demographic and Symptom Information Form (GDSIF) by the researcher and transferred into the SPSS 12.0 program for analyses. Demographic data from the 36 adolescents with asthma who used the SGT are presented in this section. The 36 adolescents ranged in age from 13 years (yr) to 17 yr 11 months, with a mean of 15 yr 2 months (SD= 1 yr 6 months). Age was computed into months from the date of the interview to the reported date of birth (see Table 9 for frequencies and percentages of adolescents in years and actual months). There were 20 male (56%) and 16 female (44%) adolescents in the sample. Fourteen were Hispanic (39%), 14 were Caucasian (39%), and 8 were African American (22%). Thirteen adolescents (36%) were recruited from schools, 14 (39%) were recruited from a hospital based pulmonary clinic, and 9 (25%) were recruited from a community based Breathmobile project.

Symptom Data

Adolescents (n=36) in this investigation described the severity of their asthma as mild intermittent (n=5, 14%), mild persistent (n=8, 22%), moderate persistent (n=16, 44%), and severe persistent (n=7, 20%). Of the 36 adolescents only 33 (92%) took daily asthma medications alone or in combination with other asthma medications. The frequencies and percentages of adolescents who took no daily medications, single daily
medications, or combinations of daily asthma medications are reported in Table 10. Of the 33 adolescents who took daily medications, 20 (61%) took inhaled corticosteroids (ICS), 13 (39%) took leukotrienes, 6 (18%) took antihistamines, all 33 (100%) took beta\(^2\) agonists rescue medications, and 6 (18%) took ICS and long-acting beta\(^2\) agonist combination medications. Asthma rescue medications were described as albuterol multi dose inhalers (MDI) or xopenex small volume nebulizer treatments (SVN).

Table 9.

*Frequencies and Percentages of Adolescents in Years and Actual Months (n=36)*

<table>
<thead>
<tr>
<th>Years</th>
<th>Actual Months</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thirteen Years</td>
<td>156-167</td>
<td>8</td>
<td>22</td>
</tr>
<tr>
<td>Fourteen Years</td>
<td>168-179</td>
<td>9</td>
<td>25</td>
</tr>
<tr>
<td>Fifteen Years</td>
<td>180-191</td>
<td>8</td>
<td>22</td>
</tr>
<tr>
<td>Sixteen Years</td>
<td>192-203</td>
<td>5</td>
<td>14</td>
</tr>
<tr>
<td>Seventeen Years</td>
<td>204-215</td>
<td>6</td>
<td>17</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>36</strong></td>
<td></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

When asked how often they would have asthma symptoms if they stopped all of their asthma medications 12 (33%) reported 'less than two times a week', 9 (25%) reported 'more than two times a week but not everyday', 10 (28%) reported 'everyday but not continuous', and 5 (14%) reported 'continuous asthma symptoms'. Nighttime asthma symptoms were described by the 36 adolescents as occurring 'less than 2 times a
Of the 36 adolescents interviewed, 13 (36%) missed school days due to asthma symptoms and the average school days missed among the 13 adolescents were 2.29 days (SD= 6.85). Table 11 presents frequencies and percentages of missed school days and
physical activities, and school nurse visits. Of the 13 adolescents who missed school
days, 2 (15%) missed 30 school days and were educated at home because of continual
asthma symptoms or immune system concerns.

Of the 36 adolescents interviewed, 15 (42%) missed physical activity events due
to asthma symptoms during the past month. Three of the 15 adolescents (20%) missed 30
events because they were exempt from physical education activities due to asthma
symptoms. Twelve (33%) out of 36 adolescents visited the school nurse for asthma
symptoms during the month prior to the interview. Nineteen (53%) out of 36 adolescents
described scheduled medical office visits, 7 (19%) described unscheduled medical office
visits, 4 (11%) described emergency room (ER) visits, and 1 (3%) described an
admission to the hospital for asthma symptoms during the past month (see Table 12).

Adolescent Asthma Episodes

Thirty-one (86%) of the 36 adolescents experienced asthma symptom episodes
during the past month. Single symptom descriptors and combinations of symptom
descriptors were used to report symptoms experienced during their episodes. The
symptom descriptors used by the adolescents were wheezing (n= 19, 61%), chest pain
(n=3, 10%), chest tightness n=10, 32%), cough (n=25, 81%), feeling tired (n=1, 3%),
feeling sweaty (n=1, 3%), feeling hard to breathe (n=, 13%), feeling a heavy chest (n=6,
19%), and feeling short of breath (n= 3, 10%). See Table 13 for frequencies and
percentages of adolescents who described single and grouped symptoms during episodes.
Table 11.

Frequencies and Percentages of Missed School Days, Missed Physical Activities, and School Nurse Visits From Asthma Symptoms (n=36)

<table>
<thead>
<tr>
<th></th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Missed School Days</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 days</td>
<td>23</td>
<td>63</td>
</tr>
<tr>
<td>1-2 days</td>
<td>5</td>
<td>14</td>
</tr>
<tr>
<td>3-5 days</td>
<td>6</td>
<td>17</td>
</tr>
<tr>
<td>30 days</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>Total</td>
<td>36</td>
<td>100</td>
</tr>
<tr>
<td><strong>Missed Physical Activity Events</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 events</td>
<td>21</td>
<td>58</td>
</tr>
<tr>
<td>1 events</td>
<td>10</td>
<td>28</td>
</tr>
<tr>
<td>4 events</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>8 events</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>30 events</td>
<td>3</td>
<td>8</td>
</tr>
<tr>
<td>Total</td>
<td>36</td>
<td>100</td>
</tr>
<tr>
<td><strong>School Nurse Visits</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 visits</td>
<td>24</td>
<td>66</td>
</tr>
<tr>
<td>1 visit</td>
<td>10</td>
<td>28</td>
</tr>
<tr>
<td>2 visits</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>5 visits</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>36</td>
<td>100</td>
</tr>
</tbody>
</table>
Table 12

*Frequencies and Percentages of Medical Office Visits, Emergency Room Visits, and Hospital Admissions Due to Asthma Symptoms*

<table>
<thead>
<tr>
<th></th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Scheduled Medical Office Visit</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 times</td>
<td>17</td>
<td>47</td>
</tr>
<tr>
<td>1 times</td>
<td>18</td>
<td>50</td>
</tr>
<tr>
<td>2 times</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>36</td>
<td>100</td>
</tr>
<tr>
<td><strong>Unscheduled Medical Office Visit</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 times</td>
<td>29</td>
<td>81</td>
</tr>
<tr>
<td>1 times</td>
<td>6</td>
<td>16</td>
</tr>
<tr>
<td>3 times</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>36</td>
<td>100</td>
</tr>
<tr>
<td><strong>Emergency Room Visits</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 times</td>
<td>32</td>
<td>89</td>
</tr>
<tr>
<td>1 times</td>
<td>3</td>
<td>8</td>
</tr>
<tr>
<td>2 times</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>36</td>
<td>100</td>
</tr>
<tr>
<td><strong>Hospital Admissions</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 times</td>
<td>35</td>
<td>97</td>
</tr>
<tr>
<td>5 times</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>36</td>
<td>100</td>
</tr>
</tbody>
</table>
Table 13.

**Frequencies and Percentages of Adolescents with Single and Grouped Symptoms During Asthma Episodes** (*n*=31)

<table>
<thead>
<tr>
<th>Symptom Descriptors</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Single Symptom Descriptors</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wheeze</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Cough</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td><strong>Two Symptom Descriptors</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wheeze and chest tightness</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>Wheeze and cough</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>Wheeze and sweaty</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Chest Pain and cough</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Chest Tightness and cough</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>Chest Tightness and heavy chest</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Cough and hard to breathe</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Cough and heavy chest</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>Cough and shortness of breath</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>Tired and hard to breathe</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td><strong>Three Symptom Descriptors</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wheeze, chest pain, and cough</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>Wheeze, chest tightness, cough</td>
<td>3</td>
<td>9</td>
</tr>
<tr>
<td>Wheeze, cough, and hard to breathe</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Wheeze, cough, and heavy chest</td>
<td>3</td>
<td>9</td>
</tr>
<tr>
<td>Wheeze, chest pain, and cough</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td><strong>Four Symptom Descriptors</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wheeze, chest tightness, cough, and hard to breathe</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Wheeze, chest tightness, cough, and short of breath</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>31</td>
<td>100</td>
</tr>
</tbody>
</table>
The 31 adolescents who experienced asthma episodes were asked to describe the length of time from onset to end of symptoms. They reported times ranging from 10 minutes to 1 week with a mean time of 32.02 hours, a median time of 1.25 hours, and a mode of .50 hours. Table 14 presents the frequencies and percentages of adolescents who had episodes during the past month with length of time from onset to end of symptoms.

Adolescents (n=31) described actions initiated for asthma episodes. Twenty-four of the 31 adolescents (77%) described single actions initiated for asthma episodes that included using a SVN with a beta agonist (n=13, 54%), using a MDI beta agonist (n=9, 38%), relaxing (n=1, 4%), or drinking a warm liquid (n=1, 4%). Seven out of the 31 adolescents (23%) described combinations of actions that included using relaxation techniques with their MDI beta agonist (n=3, 42%) inhalers, using relaxation with beta agonist (n=2, 29%) SVN treatments, or using both MDI and SVN treatments (n=2, 29%).

Of the 31 adolescents who experienced asthma episodes, 14 (45%) described symptom episode actions guided by written asthma action plans from physicians (n=5, 36%), nurses (n=2, 14%), or other clinic personnel (n=7, 50%). Sixteen of the 31 adolescents (51%) described seeking help when managing symptoms during an asthma episode from adults that included parents (n=14, 86%), a physician (n=1, 7%), and a school nurse (n=1, 7%).

Adolescents were asked to rate the frequency of their symptoms at the time of the interview compared to one year ago. Thirty-six reported symptoms that were ‘less frequent’ (n=17, 47%), ‘about the same’ (n=13, 36%) or ‘more frequent’ (n=6, 17%).
Table 14.

Frequencies and Percentages of Adolescent Symptom Time Lengths During Episodes
\((n=31)\)

<table>
<thead>
<tr>
<th>Symptom Time</th>
<th>f</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 minutes (.16 hour)</td>
<td>5</td>
<td>17</td>
</tr>
<tr>
<td>20 minutes (.32 hour)</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>30 minutes (.50 hour)</td>
<td>4</td>
<td>13</td>
</tr>
<tr>
<td>1 hour</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>1 hour 30 minutes (1.5 hours)</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>2 hours</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>2 hour 30 minutes (2.5 hours)</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>3 hours</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>4 hours</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>24 hours (1 day)</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>36 hours (1.5 days)</td>
<td>3</td>
<td>9</td>
</tr>
<tr>
<td>48 hours (2 days)</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>60 hours (2.5 days)</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>96 hours (4 days)</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>108 hours (4.5 days)</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>168 hours (7 days)</td>
<td>3</td>
<td>9</td>
</tr>
<tr>
<td>Total</td>
<td>31</td>
<td>100</td>
</tr>
</tbody>
</table>

Findings by Aims and Related Research Questions

This section presents the findings as they relate to the aims and research questions for the study. As outlined earlier in this chapter utility data collected from 31 adolescents who used the SGT with a series of gambles were used to answer the research questions in
aim 1 and aim 2. Utility data were analyzed for normality using the one-sample Kolmogorov-Smirnov (K-S) and Shapiro-Wilk tests. Content validity data and qualitative responses collected from 36 adolescents who used the SGT with either method were used to answer research questions in aim 1 and aim 3.

The individual scenario utility scores, total utility scores, mean utility scores, and age data sets were examined for normality using the Kolmogorov-Smirnov (K-S) and Shapiro-Wilk tests. The results showed all were non-normally distributed. The K-S tests for the individual utility scores were statistically significant. The K-S for the total utility score and the mean utility score data were not statistically significant, however, the Shapiro-Wilk test for the data were statistically significant indicating non-normal distributions. The K-S test for age was not statistically significant, however, the Shapiro-Wilk test for age was statistically significant indicating a non-normal distribution. Tables 15 and 16 present the K-S and Shapiro-Wilk test results. Statistical significance in these tests is indicative of significant deviations in scores from the normal distribution. It is noteworthy that the utility score deviation is greater for some individual scenarios and this is consistent with higher significance values of the variable on the K-S test. For example scenarios 2, 5, 7, and 8 have the highest significance values and when the means, medians, modes, standard deviations, and skewness for these scores are examined the deviations are apparent.

Table 17 presents evidence of the deviations in the variables and the non-normal distributions by presenting the means, medians, modes, standard deviations, and skewness for utility scores and age in months. The utility scores for this investigation
were probabilities (p) with the potential for 0 to 1.0 scores. The means, medians, modes, and standard deviations of the utility scores are reported in Table 17 and as shown are negatively skewed with individual mean scores ranging from .741 to .929, median scores ranging from .800 to 1.00, modes all at 1.00, and standard deviations ranging from .118 to .300. The majority of scores were in the higher values indicative of risk aversion.

Age in months as shown in Table 17 was positively skewed with (70%) of all adolescent ages falling below 184 months (15 years, 4 months). The mean age was 180 months (15 years), median age 178 (14 years, 9 month), multiple modes were seen with the lowest reported at 159 (13 years, 4 months), and a standard deviation of 16.84 months. Since the utility score and age data were non-normally distributed, non-parametric tests were used with the utility scores to answer the research questions in aims 1 and 3. The significance level was set at \( p \leq .05 \) for all statistical procedures.
Table 15.

*Kolmogorov-Smirnov Test of Normality for Individual Scenario Utility Scores*

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Statistic</th>
<th>df</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scenario 1</td>
<td>.194</td>
<td>31</td>
<td>.004</td>
</tr>
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<td>Scenario 2</td>
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<td>.000</td>
</tr>
<tr>
<td>Scenario 3</td>
<td>.162</td>
<td>31</td>
<td>.037</td>
</tr>
<tr>
<td>Scenario 4</td>
<td>.167</td>
<td>31</td>
<td>.028</td>
</tr>
<tr>
<td>Scenario 5</td>
<td>.213</td>
<td>31</td>
<td>.001</td>
</tr>
<tr>
<td>Scenario 6</td>
<td>.195</td>
<td>31</td>
<td>.004</td>
</tr>
<tr>
<td>Scenario 7</td>
<td>.218</td>
<td>31</td>
<td>.001</td>
</tr>
<tr>
<td>Scenario 8</td>
<td>.216</td>
<td>31</td>
<td>.001</td>
</tr>
</tbody>
</table>

Table 16.

*Kolmogorov-Smirnov and Shapiro-Wilk Test of Normality for Total Utility Scores, Mean Scenario Utility Scores, Age in Months*

<table>
<thead>
<tr>
<th></th>
<th>Kolmogorov-Smirnov</th>
<th>Shapiro-Wilk</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Statistic</td>
<td>df</td>
</tr>
<tr>
<td>Total Utility Scores</td>
<td>.133</td>
<td>31</td>
</tr>
<tr>
<td>Mean Utility Scores</td>
<td>.133</td>
<td>31</td>
</tr>
<tr>
<td>Age in Months</td>
<td>.122</td>
<td>31</td>
</tr>
</tbody>
</table>
Table 17.

**Means, Medians, Modes, Standard Deviations, and Skewness for Individual Scenario**

**Utility Scores, Age, Total Utility Scores, and Mean Utility Scores \( (n=31) \)**

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Means</th>
<th>Median</th>
<th>Mode</th>
<th>SD</th>
<th>Skewness</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>.741</td>
<td>.800</td>
<td>1.00</td>
<td>.282</td>
<td>-1.11</td>
</tr>
<tr>
<td>2</td>
<td>.929</td>
<td>1.00</td>
<td>1.00</td>
<td>.118</td>
<td>-1.50</td>
</tr>
<tr>
<td>3</td>
<td>.764</td>
<td>.800</td>
<td>1.00</td>
<td>.207</td>
<td>-.488</td>
</tr>
<tr>
<td>4</td>
<td>.780</td>
<td>.800</td>
<td>1.00</td>
<td>.216</td>
<td>-.890</td>
</tr>
<tr>
<td>5</td>
<td>.787</td>
<td>.900</td>
<td>1.00</td>
<td>.268</td>
<td>-1.41</td>
</tr>
<tr>
<td>6</td>
<td>.745</td>
<td>.800</td>
<td>1.00</td>
<td>.265</td>
<td>-.980</td>
</tr>
<tr>
<td>7</td>
<td>.748</td>
<td>.900</td>
<td>1.00</td>
<td>.300</td>
<td>-.955</td>
</tr>
<tr>
<td>8</td>
<td>.780</td>
<td>.900</td>
<td>1.00</td>
<td>.275</td>
<td>-1.368</td>
</tr>
<tr>
<td>Age in Months</td>
<td>180</td>
<td>178</td>
<td>159*</td>
<td>16.84</td>
<td>.575</td>
</tr>
<tr>
<td>Total Utility Scores</td>
<td>6.27</td>
<td>6.5</td>
<td>6.00</td>
<td>1.103</td>
<td>-1.242</td>
</tr>
<tr>
<td>Mean Utility Scores</td>
<td>.784</td>
<td>.813</td>
<td>.75*</td>
<td>.137</td>
<td>-1.242</td>
</tr>
</tbody>
</table>

*Note. 8 = multiple modes exist, the smallest value is shown.*
Aim 1

Aim 1 was to estimate the internal consistency reliability and content validity of eight adolescent asthma symptom self-management scenarios.

Research Question 1: Internal Consistency Reliability

What are the inter-item correlations of the utility scores of the individual scenarios?

The internal consistency of the scenarios in the composite was tested using Cronbach's alpha. Since the asthma symptom self-management composite was developed to measure utilities using the eight items or scenarios and the alpha was based on the individual utility scores of these eight items. Alpha for the composite of asthma symptom self-management scenarios was .68 and the standardized alpha was .70. The alpha suggests the scenarios are complementary to each other and that 70% of the variability in the utility scores are representative of true individual differences between the adolescents. The inter-item correlations of the utility scores are reported in Table 18 and they resulted from using the SPSS 12.0 program to compute alpha. The correlations are Pearson's correlations and should be interpreted with caution since the utility data are non-normally distributed as previously described. There were eight significant inter-item correlations ranging from the lowest correlation between scenario 8 and scenario 2 with an $r = .375$ ($p = .038$), to the highest correlation between scenario 6 and scenario 2 with an $r = .559$ ($p = .001$). Five of the significant correlations were between treatment domains. Significant treatment domain correlations identified between: scenarios 2 and 6 ($r = .559$, $p = .001$); scenarios 2 and 8 ($r = .375$, $p = .038$); scenarios 6 and 4 ($r = .427$, $p = .017$); scenarios 6
Table 18.

*Pearson's Inter-item Correlations, Means, and Standard Deviations for Individual Scenario Utility Scores (n=31)*

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Avoids Exercise</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>2 Modifies Activities</td>
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<td>.330</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td>.929</td>
<td>.119</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 Avoids Allergy</td>
<td>.379*</td>
<td>.246</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
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<td>.182</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 Seeks Help</td>
<td>.259</td>
<td>.217</td>
<td>.177</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.781</td>
<td>.217</td>
</tr>
<tr>
<td>Pearson Correlation</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>.160</td>
<td>.242</td>
<td>.341</td>
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<td></td>
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<tr>
<td>5 Remove From Triggers</td>
<td>.021</td>
<td>.232</td>
<td>.009</td>
<td>-.096</td>
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<td></td>
<td></td>
<td>.787</td>
<td>.268</td>
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<td>Pearson Correlation</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>.912</td>
<td>.209</td>
<td>.960</td>
<td>.606</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 Seek Medical Care</td>
<td>.280</td>
<td>.559*</td>
<td>.290</td>
<td>.427*</td>
<td>-.024</td>
<td></td>
<td></td>
<td>.745</td>
<td>.266</td>
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<td>Pearson Correlation</td>
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<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
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<td>.001</td>
<td>.113</td>
<td>.017</td>
<td>.897</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7 Safe Use Meds</td>
<td>.101</td>
<td>.202</td>
<td>-.089</td>
<td>.066</td>
<td>.157</td>
<td>.451*</td>
<td></td>
<td>.748</td>
<td>.301</td>
</tr>
<tr>
<td>Pearson Correlation</td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>.590</td>
<td>.277</td>
<td>.634</td>
<td>.724</td>
<td>.400</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8 Treat Symptoms</td>
<td>.410*</td>
<td>.375*</td>
<td>.215</td>
<td>.201</td>
<td>.453*</td>
<td>.501*</td>
<td></td>
<td>.781</td>
<td>.275</td>
</tr>
<tr>
<td>Pearson Correlation</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>.022</td>
<td>.038</td>
<td>.244</td>
<td>.279</td>
<td>.010</td>
<td>.004</td>
<td>.309</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. *p<0.05, 2-tailed.
and 7 ($r = .451, p = .011$); and scenarios 6 and 8 ($r = .501, p = .004$). Two significant correlations were found between treatment and prevention domains that included the correlations between scenarios 8 and 1 ($r = .410, p = .022$) and scenarios 8 and 5 ($r = .453, p = .010$). One significant correlation was found between two prevention domain scenarios it was the correlation between scenarios 1 and 3 ($r = .379, p = .036$).

*Research Question 2*

What are the item-total correlations between the utility scores on the individual scenarios and the total utility scores?

To measure the relationship between each scenario and the composite of the scenarios, Kendall's tau correlations were used to estimate item-total correlations between the eight individual utility scores and the total utility scores for the composite of the eight individual scenarios. Table 19 presents the correlations between the individual utility scores and the total utility scores. Seven of the 8 correlations were statistically significant and positive. The strongest correlation was found between scenario 8 and the total utility score ($r = .653, p = .000$). Scenario 6 and the total utility score also had a highly significant correlation with a lower $r$ value ($r = .470, p = .000$). The weakest significant correlation was between scenario 3 and the total score ($r = .267, p = .048$). There was only one non-significant correlation and that was between scenario 5 and the total utility score ($r = .246, p = .072$).
Table 19.

*Kendall’s tau Correlations Between Individual Utility Scores and Total Utility Scores (n=31)*

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Utility</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kendall tau</td>
<td>.361*</td>
<td>.381*</td>
<td>.267*</td>
<td>.431*</td>
<td>.246</td>
<td>.470*</td>
<td>.396*</td>
<td>.653*</td>
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<tr>
<td>Sig.</td>
<td>.008</td>
<td>.008</td>
<td>.048</td>
<td>.001</td>
<td>.072</td>
<td>.000</td>
<td>.004</td>
<td>.000</td>
</tr>
<tr>
<td>$r^2$</td>
<td>.130</td>
<td>.145</td>
<td>.071</td>
<td>.185</td>
<td>.060</td>
<td>.220</td>
<td>.156</td>
<td>.426</td>
</tr>
</tbody>
</table>

*Note. * *p*<0.05, 2-tailed.

*Research Question 3*

To what extent do the scenarios reflect adolescent asthma symptom self-management domains?

To determine the extent to which the scenarios reflect adolescent asthma symptom self-management domains, analyses of the composite of content validity questions A and B for each scenario, and analyses of the composites of questions A and B for the eight-scenario composites were done. The content validity score and index computation formulas were presented in the preceding chapter in the data analyses section. The analyses determined the proportion of adolescent experts (n=36) who rated the individual scenarios as content valid and the proportion of eight-scenario composites rated content valid with regard to the domains of prevention and treatment.
Question 'A' asked if the symptom scenario was like one an adolescent might face and question 'B' asked if the hypothetical situation pertained to the domain identified by the scenario. A mean rating of the composite of both questions was computed for each scenario and for the eight-scenario composite. A rating of '3' agreed that the scenarios and or the eight-scenario composites were 'realistic for adolescent asthma symptom self-management but needed slight changes'. A rating of '4' agreed that the scenarios and or the eight-scenario composites definitely reflected something an adolescent might face and was 'extremely realistic'. Domains are identified in Chapter 3 on page 90.

Data were collected from the 36 adolescents who were able to use the SGT with the asthma symptom scenarios. The mean scores for the individual scenarios and the eight-scenario composites are presented in Table 20. The proportions of adolescents who rated the individual scenarios as content valid and the proportion of eight-scenario composites rated as content valid with regard to domains are presented in Table 21 and Table 22.

The analyses indicate that the proportion of adolescent experts that rated the scenarios and the eight-scenario composite as content valid was higher than the 85% set for this investigation with regard to the domains of prevention and treatment.
Table 20.

Means, Standard Deviations, Medians, and Modes for Adolescent Domain Content

Validity Ratings for Individual Scenarios and the Eight-Scenario Composite

<table>
<thead>
<tr>
<th>Scenario 1</th>
<th>M</th>
<th>SD</th>
<th>Median</th>
<th>Mode</th>
</tr>
</thead>
<tbody>
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<td></td>
<td>3.61</td>
<td>.416</td>
<td>3.50</td>
<td>4.00</td>
</tr>
<tr>
<td>Scenario 2</td>
<td>3.54</td>
<td>.453</td>
<td>3.50</td>
<td>4.00</td>
</tr>
<tr>
<td>Scenario 3</td>
<td>3.51</td>
<td>.485</td>
<td>3.50</td>
<td>4.00</td>
</tr>
<tr>
<td>Scenario 4</td>
<td>3.36</td>
<td>.556</td>
<td>3.50</td>
<td>3.00</td>
</tr>
<tr>
<td>Scenario 5</td>
<td>3.47</td>
<td>.520</td>
<td>3.50</td>
<td>4.00</td>
</tr>
<tr>
<td>Scenario 6</td>
<td>3.47</td>
<td>.477</td>
<td>3.50</td>
<td>3.00*</td>
</tr>
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<td>Scenario 7</td>
<td>3.40</td>
<td>.475</td>
<td>3.50</td>
<td>3.00</td>
</tr>
<tr>
<td>Scenario 8</td>
<td>3.29</td>
<td>.453</td>
<td>3.00</td>
<td>3.00</td>
</tr>
<tr>
<td>Eight-Scenario Composite</td>
<td>3.46</td>
<td>.255</td>
<td>3.43</td>
<td>3.61</td>
</tr>
</tbody>
</table>

Note. * = multiple modes exist the smallest value is reported.

Table 21.

Proportions and Percentages of Adolescents who Rated Individual Scenarios Content Valid for Domains (n=36)

<table>
<thead>
<tr>
<th>Scenario</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proportion Adolescents</td>
<td>36/36</td>
<td>34/36</td>
<td>35/36</td>
<td>32/36</td>
<td>34/36</td>
<td>35/36</td>
<td>34/36</td>
<td>33/63</td>
</tr>
<tr>
<td>%</td>
<td>100</td>
<td>94</td>
<td>97</td>
<td>88</td>
<td>94</td>
<td>97</td>
<td>94</td>
<td>92</td>
</tr>
</tbody>
</table>
Table 22.

Proportions and Percentages of Eight-Scenario Composites Rated Content Valid for Domains ($n=36$)

<table>
<thead>
<tr>
<th>Proportion of Eight-Scenario Composites</th>
<th>34/36</th>
</tr>
</thead>
<tbody>
<tr>
<td>%</td>
<td>94</td>
</tr>
</tbody>
</table>

Research Question 4

To what extent do the scenarios reflect adolescent asthma symptom self-management risk areas?

To determine the extent to which the scenarios reflect adolescent asthma symptom self-management risk areas, analyses of the composite of content validity questions D and E for each scenario, and analyses of the composites of questions D and E for the eight-scenario composites were done. The computation formulas were presented in the preceding chapter. The analyses determined the proportions of adolescent experts ($n=36$) who rated the individual scenarios as content valid and of the eight-scenario composites rated content valid with regard to the risk areas within the domains of prevention and treatment.

Question ‘D’ asked if the alternatives in the hypothetical scenarios were realistic for adolescents with asthma, and question ‘E’ asked if the consequences in the scenario situations were realistic for adolescents with asthma. A mean rating of the composite of both questions was computed for each scenario and for the eight-scenario composites. A
rating of ‘3’ agreed that the scenarios and or the eight-scenario composites were realistic for adolescent asthma symptom self-management but needed slight changes. A rating of ‘4’ agreed that the scenarios and or the eight-scenario composites definitely reflected something an adolescent might face and were ‘extremely realistic’. The risk areas are identified in Chapter 3 on page 90.

Data were collected from the 36 adolescents who were able to use the SGT with the asthma symptom scenarios. The mean scores for the individual scenarios and the eight-scenario composites are presented in Table 23. The proportions of adolescents who rated the individual scenarios as content valid and the proportion of eight-scenario composites rated as content valid with regard to the risk areas are presented in Table 24 and Table 25.

The analyses indicate that the proportion of adolescent experts that rated the scenarios and the eight-scenario composites as content valid were higher than the 85% set for the assessing the risk areas within the domains of prevention and treatment.
Table 23.

*Means, Standard Deviations, Medians, and Modes for Adolescent Risk Area Content*

*Validity Ratings for Individual Scenarios and the Eight-Scenario Composite*

<table>
<thead>
<tr>
<th>Scenario</th>
<th>M</th>
<th>SD</th>
<th>Median</th>
<th>Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scenario 1</td>
<td>3.54</td>
<td>.565</td>
<td>4.00</td>
<td>4.00</td>
</tr>
<tr>
<td>Scenario 2</td>
<td>3.42</td>
<td>.604</td>
<td>3.50</td>
<td>4.00</td>
</tr>
<tr>
<td>Scenario 3</td>
<td>3.51</td>
<td>.579</td>
<td>3.75</td>
<td>4.00</td>
</tr>
<tr>
<td>Scenario 4</td>
<td>3.41</td>
<td>.642</td>
<td>3.50</td>
<td>4.00</td>
</tr>
<tr>
<td>Scenario 5</td>
<td>3.42</td>
<td>.541</td>
<td>3.25</td>
<td>3.00*</td>
</tr>
<tr>
<td>Scenario 6</td>
<td>3.42</td>
<td>.592</td>
<td>3.25</td>
<td>3.00*</td>
</tr>
<tr>
<td>Scenario 7</td>
<td>3.38</td>
<td>.578</td>
<td>3.50</td>
<td>3.00</td>
</tr>
<tr>
<td>Scenario 8</td>
<td>3.39</td>
<td>.656</td>
<td>3.25</td>
<td>4.00</td>
</tr>
<tr>
<td>Eight-Scenario Composite</td>
<td>3.44</td>
<td>.317</td>
<td>3.44</td>
<td>3.06</td>
</tr>
</tbody>
</table>

*Note.* * = multiple modes exist the smallest value is reported.

Table 24.

*Proportions and Percentages of Adolescents who Rated Individual Scenarios Content Valid for Risk Areas (n=36)*

<table>
<thead>
<tr>
<th>Scenario</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proportion Adolescents</td>
<td>34/36</td>
<td>33/36</td>
<td>34/36</td>
<td>31/36</td>
<td>33/36</td>
<td>34/36</td>
<td>33/36</td>
<td>33/63</td>
</tr>
<tr>
<td>%</td>
<td>94</td>
<td>92</td>
<td>94</td>
<td>86</td>
<td>92</td>
<td>94</td>
<td>92</td>
<td>92</td>
</tr>
</tbody>
</table>
Table 25.

Proportions and Percentages of Eight-Scenario Composites Rated Content Valid for the Risk Areas Within the Domains (n=36)

<table>
<thead>
<tr>
<th>Proportion of Eight-Scenario Composites</th>
<th>34/36</th>
</tr>
</thead>
<tbody>
<tr>
<td>%</td>
<td>94</td>
</tr>
</tbody>
</table>

Research Question 5

What other adolescent asthma symptom self-management domains exist?

Adolescents (n=36) were asked to tell the researcher about a time when they had to make a choice about preventing or treating their asthma symptoms. Preventing was described by the researcher as making a choice prior to the onset of symptoms. Treating was described as making a choice after the onset of asthma symptoms. The question was asked for each of the eight scenarios and followed the collection of utility and content validity data. The researcher recorded adolescent responses to the open-ended question for each scenario. Additional questions were asked for clarification of responses. There were no pre-identified expected responses. Responses were entered into an excel database for analyses. See open-ended question number 1 presented in Chapter 3 on page 93.

Scenario 1: Preventing asthma symptoms by avoiding exercise triggers

The adolescents described prevention choices related to exercise solely as they pertain to using rescue inhalers (short acting beta² agonists) prior to exercising when they participate in organized sports, physical education (PE), play activities, and social events.
The organized sports included soccer, baseball, football, wrestling, softball, and dance. The play activities included riding a skateboard, playing back yard basketball, riding a bike, and working out at a gym. The social events included school dances and a swimming party and a family-hiking event. They described using rescue inhalers as pre-treatment to exercise when they had no symptoms and when they had symptoms. For some ‘exercise was not a trigger unless they were ill with a cold’. They described exercise as a trigger only when they “ran very hard or very long”. Of those involved in organized sports some described using their inhalers so they could play “100%” or at peak level ‘for the coach’ and ‘the team’, rather than their own well-being.

Scenario 2: Treating asthma by modifying activities with the onset of symptoms

Adolescents described treatment choices related modifying both social and physical activities with the onset of symptoms from various triggers. They described leaving their houses, friend’s houses, relative’s houses, parties, and restaurants because they coughed or wheezed from exposure to smoke, cleaning products, and swimming pool chemicals. They described modifying physical activities related to participating in organized team or individual sports, attending school dances, and horseback riding with friends. Some adolescents described interrupting their activities just long enough to treat while others described stopping the activities completely. Some stopped the activity with the onset of symptoms while others described waiting to see ‘how the symptoms progressed with time’.
Scenario 3: Preventing symptoms by avoiding allergy triggers

Adolescents described prevention choices related to avoiding allergy triggers prior to the onset of symptoms as including food, animal, pollen, dust, and chemical fume triggers. Food allergies included corn, peanuts, chocolate and watermelon; the animal allergies included cats, dogs, and horses; and chemical fume triggers included cleaning products and swimming pool chemicals. The adolescents described preventing asthma symptoms related to food and animal allergens as choosing to avoid foods that cause asthma symptoms or eating smaller amounts; and they avoided animals by ‘not visiting’ the houses of friends and family members who have animals, ‘not sleeping with animals’, and ‘not riding horses’. The adolescents described preventing symptoms related to pollen, dust and chemical fumes by ‘not going’ on hayrides, ‘not playing’ in the grass, not swimming immediately after chemicals are added to their home pools or the pools of friends; and by ‘not visiting’ grand mom on her cleaning day.

Scenario 4: Treating symptoms by seeking non-medical help

The adolescents described treatment choices related to seeking help from parents, adults, or peers that included ‘asking’ mom, dad, moms of friends, teachers, school nurses, scout and church leaders, and peers/friends for assistance in a variety of situations. All of the situations described were related to replacing lost, empty or forgotten inhalers. The situations pertained to ‘obtaining inhalers’ prior to the onset of symptoms or after the onset of symptoms. A primary theme in the responses of the adolescents across age groups was ‘mom’s help’. Adolescents described ‘mom’ as the person who replaced the forgotten or lost inhalers, or who packed inhalers for travel and
had extra inhalers available when the adolescent ran out. The adolescents described considering what mom would want them to do when compared to what they wanted to do in a situation. The described thinking if mom would be ‘angry’ with their actions. If mom had asthma the adolescents described listening to her more often because she ‘knew about asthma’ and ‘knew who would help them’ when she was not around.

Adults such as school nurses, coaches, teachers, leaders, and relatives were described as helping adolescents obtain inhalers in situations when ‘mom was not available’. Friends were described as helping adolescents in ‘situations where mom’s help might conflict with the desires or preferences of the adolescents. One described a situation related an adolescent who used a friend’s inhaler so he would not have to leave a football game because his inhaler was empty and he had already developed symptoms from yelling.

Scenario 5: Preventing symptoms by removing self from triggers

The adolescents described prevention choices related to removing oneself from triggers prior to the onset of symptoms as related to leaving grand mom’s house because of fumes from her cleaning supplies, leaving a party because a friend had a dog, and going inside during lunch break on a windy day. The adolescents delineated two ways to get away from a trigger. One was for them to move and the other was to ask another person to move. One adolescent told of a situation where a friend came to visit who was wearing strong cologne. To prevent the adolescent from developing symptoms from the odor, the adolescent’s mother made the friend go home to shower and change clothes before returning to spend the night. Several adolescents described ‘colds as triggers’ for
their asthma symptoms and described facing choices about moving away from a person or ‘not kissing a person with a cold’. They described these choices as hard to make.

*Scenario 6: Treating asthma symptoms by seeking medical care*

The adolescents described treatment choices related to seeking help from medical providers when experiencing symptoms. They described making choices about attending social events, discussing asthma symptoms with friends and peers, and scheduling regular meetings with physician. They described not making choices because their physician lived next door and because mom makes all decisions related to physician visits.

*Scenario 7: Treating asthma symptoms by safely using medications*

All thirty-six adolescents were able to express thoughts related to making choices involving using asthma medications safely to treat their symptoms. Twenty (56%) responded that they have used or would use another person’s inhaler if they knew the name of the medication was the same, 10 (28%) would not use someone else’s medications and 6 (16%) might use another person’s inhaler in certain circumstances. These circumstances included using an inhaler that belonged to a close friend, being far from home or not able to get own inhaler, asking an adults for permission, providing his own spacer and mouthpiece, and in a playing in a game where there was ‘no time to leave’ or stop playing.

*Scenario 8: Initiating early treatment of asthma symptoms*

The adolescents described treatment choices related to initiating early self-treatment with the onset of symptoms that included thinking ahead so they go to social events prepared with rescue medications, choosing to not visit a friend’s house because
the friend has two cats, calling parents to bring replacement medications when inhaler is empty, leaving a good movie to use rescue medications, and not waiting longer than 15 minutes to start medications.

Research Question 6

What other adolescent asthma symptom self-management risks exist?

The adolescents were asked to tell the researcher about times time when they were faced with a gamble or chance situations related to preventing or treating symptoms in each of the scenario risk areas.

Scenario 1: Preventing asthma symptoms by avoiding exercise triggers

Adolescents described gamble situations related to participating in activities without first using a rescue inhaler (short acting beta^2 agonists). The activities described by the adolescents included participating in sports, backyard activities, and social events. The activities described included football, basketball, bike riding, dancing, volleyball, and soccer. They described frequently playing sports without pre-treating because they do not want to let the coach or other teammates down; risk the game by not playing; take time out of the game; or miss the experience. They also described not pre-treating because they were lazy, in a hurry, didn’t think about it, did not have an inhaler, and played before without problems.

Scenario 2: Treating asthma by modifying activities with the onset of symptoms

Adolescents expressed thoughts related to taking chances involving modifying activities related to the onset of symptoms. The adolescents described taking chances that involved remaining with friends and family members who were smoking, playing a sport
without an inhaler, staying at a school dance, remaining in the presence of a cat at a friend’s house or own cat in bed, and continuing to work out after the onset of asthma symptoms. The adolescents gave reasons for taking chances that included: not wanting to miss a special event or game or hurt someone’s feelings; not having a consistent history of symptom responses in a similar situations (sometimes symptoms got worse and sometimes they went away); and not having rescue medications available to use. A pattern of comments related to ‘wait and see’ was common.

**Scenario 3: Preventing symptoms by avoiding allergy triggers**

Adolescents described thoughts related to taking a chance that involved avoiding triggers related to allergies prior to the onset of symptoms that included eating foods they were allergic to because they were hungry, they might get a headache without food, and they were crazy about chocolate ice cream. They described occasionally cuddling with a cat in bed because she loves the cat, going to a friend’s house knowing the friend has a cat, riding a bike outside on a windy day, playing in the backyard after dad cut the lawn, and playing football in the grass. They gave reasons for taking the chances that included being hungry, wanting to be with friends, and lacking a consistent history of symptoms related to the allergens.

**Scenario 4: Treating symptoms by seeking non-medical help**

Adolescents expressed thoughts about taking chances with their asthma treatment by not seeking help from parents, adults, or peers in several contexts that included not asking parents for help to secure needed medications, not asking teachers to help in controlling allergens in classrooms, not informing coaches of asthma medication needs.
prior to practice or game situations, not informing relatives of possible allergens in their homes, and not informing friends of asthma triggers and symptoms. The reasons given for taking these chances included anticipating parental actions that might interfere with adolescent desires to participate in important events, anticipating possible teacher resistance, anticipating possible decrease in athletic playing time, hurting relatives feelings, and possible lack of understanding from friends.

**Scenario 5: Preventing symptoms by removing self from triggers**

Adolescents were able to express thoughts related to taking chances that involved removing self from triggers prior to the onset of symptoms. They described chances related to remaining in an environment that contained irritating odors that included smoke and cleaning supply odors such as chlorine, people with “colds” (viral infections), and animals. The adolescents described taking chances to remain in the environments because they did not yet have symptoms and they wanted to ‘wait and see’ what would happen; they did not want to hurt the feelings of a friend or relative; they loved animals; the party or event was too good to miss, and they could not isolate themselves from all germs.

**Scenario 6: Treating asthma symptoms by seeking medical care**

Adolescents were able to express thoughts related to taking chances that involved not seeking help from medical providers when experiencing symptoms. The adolescents described categories of situations that included playing sports, attending social events that were important or one of a kind like a concert, taking trips with friends or with school, not telling mom, not wanting to take time, and thinking they can fix it as situations where they were willing to take chances related to not seeking medical help for their symptoms.
The primary reasons described for taking these chances included thoughts that their doctor and or parent would restrict their activities until symptoms were better. Some described parents and medical providers as ‘helpers’ and others described them as ‘controllers’ because they did not ‘understand’.

Scenario 7: Treating asthma symptoms by safely using medications

Adolescents were able to express thoughts related to taking chances that involved using medications safely to treat symptoms. The adolescents described taking chances with other people’s inhalers when they felt symptomatic and too far from own medicine, when they were too lazy to walk to the school nurse’s office, and when their inhaler is empty and they are wheezing. In some of these chances the color of the canister was not something they thought about, and the adolescent was not sure if the name of the medication was the same. The adolescents described a teacher, a school nurse, and a coach who told them to use a friend’s inhaler when they did not have one.

Scenario 8: Initiating early treatment of asthma symptoms

The adolescents described chance situations related to initiating early self-treatment with the onset of symptoms that included allergy, social interests, and exercise. The situations described delaying treatment of symptoms when horseback riding with friends because she did have her medications with her and did not want to end the ride early, deciding to ‘wait and see’ if symptoms go away because she was at a concert without her inhaler, and continuing to exercise at the gym after the onset of symptoms because her inhaler is in the locker room. Several adolescents described a ‘wait and see’
attitude of chance when at an athletic or social event of importance without their rescue inhalers and unable to find a friend’s inhaler to borrow.

Aim 2

Aim 2 was to estimate the relationship between measured risk preferences and adolescent age and gender. Results are presented as they pertain to the research questions. As presented earlier the K-S and the Shipro-Wilk tests determined the individual utility scores, mean utility scores, and age data were non-normally distributed, thus, non-parametric Kendall’s tau correlations were used to answer questions 7 and 9 related to these variables. The Kendall’s tau Point Biserial Correlations test was used to answer research questions 8 and 10 related to correlations between utility scores and gender. Statistically significant correlations are reported in terms of strength (r), nature, and magnitude (r²). The strength of the relationship was indicated by the absolute value of the (r), with the higher absolute value showing the stronger relationship. The sign of the correlation indicated the nature of the relationship. A correlation without a sign is a positive correlation and indicated that the high values on one variable were associated with high values on the other variable. A negative sign indicated that high values on one were associated with low scores on the other. The magnitudes of the correlations were expressed in terms of r² and represented the proportion of variance in the variable that was associated with the other variable. It represented the proportion of variance that is shared by (explained by) the two variables.
Research Question 7

What is the correlation between age and the individual item utility scores?

As explained earlier the utility scores were not normally distributed so the relationship between age in months and the individual item utility scores were determined by a Kendall’s tau correlation analysis. Data from 31 adolescents who used the SGT with a series of gambles were used. Correlations between age and the individual utility scores are presented in Table 26. Only one weak negative statistically significant correlation was found between scenario 6 (seeks medical care) and age (r = - .263, p = .05, r^2 = .07). The r^2 for this correlation indicates that only 7% of the variability in the utility scores may be shared or explained by age.

Table 26.

Kendall’s tau Correlations Between Age and Individual Scenario Utility Scores (n=31)

<table>
<thead>
<tr>
<th>Scenarios</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age in Months</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kendall’s tau</td>
<td>-.104</td>
<td>-.226</td>
<td>.066</td>
<td>-.014</td>
<td>-.059</td>
<td>-.263*</td>
<td>-.114</td>
<td>-.180</td>
</tr>
<tr>
<td>Sig, (two-tailed)</td>
<td>.443</td>
<td>.117</td>
<td>.627</td>
<td>.917</td>
<td>.669</td>
<td>.050</td>
<td>.404</td>
<td>.186</td>
</tr>
<tr>
<td>r^2</td>
<td>.010</td>
<td>.051</td>
<td>.004</td>
<td>.000</td>
<td>.003</td>
<td>.069</td>
<td>.012</td>
<td>.032</td>
</tr>
</tbody>
</table>

*Note. p ≤0.05, 2-tailed*
Research Question 8

What is the correlation by gender and the individual item utility scores?

A Kendall’s tau point biserial correlation was used to determine the relationship between adolescent gender and individual utility scores. The point-biserial correlations were used because gender is a dichotomous variable. The correlations are presented in Table 27. There were no statistically significant correlations found between gender and the individual utility scores.

Table 27.
Kendall's tau Point-Biserial Correlations Between Gender and Individual Scenario Utility Scores (n=31)

<table>
<thead>
<tr>
<th>Scenarios</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kendall tau $r_{pb}$</td>
<td>-.141</td>
<td>-.331</td>
<td>.114</td>
<td>-.056</td>
<td>-.037</td>
<td>-.194</td>
<td>-.208</td>
<td>-.207</td>
</tr>
<tr>
<td>Sig, (two-tailed)</td>
<td>.383</td>
<td>.055</td>
<td>.479</td>
<td>.730</td>
<td>.820</td>
<td>.226</td>
<td>.200</td>
<td>.203</td>
</tr>
<tr>
<td>$r^2$</td>
<td>.019</td>
<td>.010</td>
<td>.012</td>
<td>.003</td>
<td>.001</td>
<td>.037</td>
<td>.043</td>
<td>.042</td>
</tr>
</tbody>
</table>

*Note. p <0.05, 2-tailed*
Research Question 9

What is the correlation by age and the mean utility score?

To determine the relationship between age in months and the mean utility scores of adolescents using the SGT with a series of gambles (n=31), a Kendall’s tau correlations non-parametric test was done. There were no statistically significant relationship found between age in months and the mean utility scores. The results are presented in Table 28.

Table 28.

*Kendall’s tau Correlations Between Adolescent Age in Months and Mean Utility Scores (n=31)*

<table>
<thead>
<tr>
<th>Mean Utility Score</th>
<th>Kendall’s tau</th>
<th>Sig. (2-tailed)</th>
<th>( r^2 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>-.164</td>
<td>.201</td>
<td>.026</td>
</tr>
</tbody>
</table>

Note.  \( p < 0.05, \) 2-tailed

Research Question 10

What is the correlation by gender and the mean utility score?

Kendall’s tau point-biserial correlation was used to determine the relationship between gender and the mean utility scores of adolescents (n=31) using the SGT with a series of gambles. There were no statistically significant relationships found between gender and the mean utility scores. The results are presented in Table 29.
Table 29.

**Point-Biserial Correlations Between Adolescent Gender and Mean Utility Scores (n=31)**

<table>
<thead>
<tr>
<th>Gender</th>
<th>Mean Utility Score</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Kendall's tau $r_{ph}$</td>
</tr>
<tr>
<td></td>
<td>Sig.</td>
</tr>
<tr>
<td></td>
<td>$r^2$</td>
</tr>
</tbody>
</table>

*Note. p <0.05, 2-tailed*

**Aim 3**

Aim 3 was to describe adolescent thoughts related to using the SGT as a decision-making methodology. As described in the preceding chapter, two open-ended questions were used to answer the research questions. Qualitative responses from 36 adolescents who used the SGT in the investigation were entered into an excel database and analyzed using a modified case study strategy as previously described. The results are described in the following sections as they relate to the research questions.

**Research Question 11**

What do adolescents think about teenagers making choices using the SGT?

Thirty-six adolescents were asked about their thoughts related teenagers making choices using the SGT. Findings indicated that 22 adolescents (62%) thought other adolescents could use the method, 5 adolescents (14%) thought others could not use the method, 6 adolescents (16%) responded with a maybe, and 3 (8%) offered no opinion. Of the 17 who answered yes, 3 (18%) were the adolescents who used the SGT with the
single gamble approach and 14 (82%) were adolescents who used the SGT with a series of gambles. The most common concern expressed by adolescents was the time it took to make a choice. Fifteen (42%) of the 36 adolescents thought the method was ‘not practical’ for fast or everyday choices like those in the asthma symptom management scenarios. Six (17%) adolescents thought the SGT was a method for possible use with ‘hard choices’ or ‘decisions that it required more thinking’. Four (11%) adolescents thought that the method was confusing at first but that the non-asthma example helped them to understand the method.

Earlier learning related to ‘percentages’ was a frequent thought expressed by adolescents as a reason why other adolescents might be able to use or not use the SGT. Other thoughts expressed about adolescents using the SGT included: ‘kids could use this, but I’m not sure if they would use it’, the ‘method was a fun method for this project’, ‘if I can do it then other kids can do it’, ‘kids wouldn’t take time to write out their choices and consequences’, ‘I had a teacher who once did something like this in class’ and ‘it was OK, something I never saw before’.

**Research Question 12**

What do adolescents think about the burdens related to using the SGT?

Thirty-six adolescents were asked what they thought about the burdens related to using the SGT to make choices in risk situations. Twenty-seven adolescents (75%) thought the method was simple or easy to understand, 4 (11%) thought the method was hard or difficult to understand, and 5 (14%) gave no opinion about what they thought of the method. Responses from 4 of the 5 adolescents (80%) who used the SGT with a
single gamble indicated the method was not difficult to understand and that it was 'sort of fun' to do. Of the 31 who used the SGT with a series of gambles, 23 (74%) thought the method was simple or easy for them to use.

Three common themes related to 'time', 'percentages', and 'thinking challenges' emerged in the responses. Fifteen adolescents (42%) thought the method was took too much time and was not practical to use in everyday situations. Ten adolescents (28%) expressed thoughts related to 'percentages' that included "I do not think in percentage", "it was easy because I know percentages", "percentages were taught early in school", "it was interesting to be forced to think in percentages", "I liked the percentages shown on the board", and "my mom says I should always think before doing something, but I don’t think she means using percentages". The thoughts related to 'thinking challenges' varied and included "a little confusing at first but I think I got it", "not difficult but I just needed to concentrate and think", "had to think carefully about each situation", "a good way to make kids think", and "fun to think it out". Seven (19%) of the adolescents expressed thoughts that the chance board made the process more understandable and "easier to think out because the choices and consequences were visible with percentages".

Summary of Results

In summary, the purpose of the investigation was to assess eight adolescent asthma symptom self-management scenarios or use with the SGT decision-making method. Thirty-six adolescents were able to use the SGT to make choices in eight hypothetical situations involving a series of gambles (n=31) and a single gamble (n=5). One adolescent was unable to make choices using the method and data from this
adolescent were not used to answer the research questions. Demographic and symptom information data are described for the 36 adolescents who used the SGT with the asthma symptom self-management scenarios.

The utility scores elicited from the adolescents who used the SGT with the series of gambles approach were used in the data analyses. The utilities were not normally distributed and thus non-parametric testing was used for most of the statistical procedures involving the utility scores. Individual scenario utility scores and total utility scores were used estimate the internal consistency reliability the eight-scenario composite. The Cronbach’s alpha was reported.

Content validity ratings, indexes and qualitative responses from 36 adolescent experts related to the content relevance of the domains and risk areas represented by the scenarios and the eight-scenario composite were presented. Correlations between age, gender, and the utility scores measured by the SGT were described. Adolescent thoughts related to teenagers using the SGT method were summarized.
CHAPTER 5

CONCLUSIONS

Introduction

This investigation assessed eight adolescent asthma symptom self-management scenarios with the standard gamble technique (SGT) to: 1) estimate the internal consistency reliability and content validity of the scenarios; 2) determine the relationship between the measured risk preferences or utilities, age, and gender; and 3) describe adolescent responses to using the SGT as a decision-making methodology. Conclusions from the investigation are discussed as they pertain to the limitations of the investigation, the aims and research questions of the investigation, and the symptom information gathered from the adolescents. Implications for nursing practice are discussed and suggestions made for future research are also presented.

Study Limitations

The limitations of this investigation are presented prior to discussions about the aims and research questions to establish a context for interpreting the results reported. Data from the investigation should be interpreted with caution because of several possible limitations that include a small sample size, non-normal distributions of utility and age data, response bias, and Piaget's theory of cognitive development as a framework for chronically ill populations.

Sample Size

As outlined in the methodology chapter, an a priori sample size calculation with an effect size of $r = .50$, a power of .90, and an alpha of .05 for a two tailed test
determined that 37 adolescents were needed to assess the eight asthma symptom scenarios using the standard gamble technique (SGT). Of the 37 adolescents interviewed, 1 adolescent (3%) was unable to use the standard gamble technique (SGT), 5 adolescents (13%) were randomly chosen to use the SGT with the single gamble approach, and 31 (84%) adolescents used the SGT with a series of gambles approach.

To assure like data were analyzed, only those from the 31 adolescents, who used the SGT with the series of gambles were used for statistical analyses involving utility scores. Using utility data from only 31 adolescents created a concern when looking for the a priori effect size ($r = .50$) since a sample of 31 using an alpha of .05 for a two-tailed test had a power of .84 rather than .90. Because only 2 significant inter-item correlations and 1 item-total correlation were at the $r = .50$ level, the statistical power for analyses using these data would not be .84 but rather a power closer to .39 with a medium effect size of $r = .30$. With the criterion of $r = .30$, there were 8 out of 8 (100%) inter-item correlations and 6 out of 7 (86%) item-total correlations with a statistical power of .39 to detect statistically significant relationships. However, correlations between age, gender, and utility scores did not meet even this lower criterion.

A larger sample size would increase the statistical power to detect true statistically significant relationships between the scenario item utility scores, between the item and total utility scores, and between age, gender and the utilities to provide a sounder basis for reporting any results. Further discussions related to the correlations as they pertain to the research questions are presented in the following sections.
Normality of Data

The second limitation was the non-normal distributions of the utilities and age data sets as described in the preceding chapter. A descriptive correlational design, where all measurements were taken at one point in time, was used in this investigation to describe the existence or absence of relationships between the utilities, age, and gender data sets and answer several research questions. Since the assumption concerning normality could not be met in the data from the investigation, the analyses for relationships between the variables were performed using the Kendall’s tau non-parametric correlations test. The following data are presented as evidence of the non-normal data distributions and reasons for cautiously interpreting the analyses for the research questions.

Utility scores are outcomes of the standard gamble method and are probabilities (p) at a point of indifference in a choice involving a gamble that measure between 0 and 1.0. to represent the risk preference for a scenario. The means, medians, modes, and standard deviations of the utilities scores for this investigation are reported earlier, and as shown are negatively skewed with individual mean scores ranging from .741 to .929, median scores ranging from .800 to 1.00, modes all at 1.00, and standard deviations ranging from .118 to .300. The majority of scores were in the higher values indicative of risk aversion.

There are several possible explanations for the utility scores gathered in this investigation. The first is that the adolescents may have actually reported utilities that are consistent with their preferences and thus the adolescents were a very risk averse group.
A second possibility is a Hawthorn effect, implying that the adolescents knew they were in a study and their responses may be distorted by their desires to not appear as a risk-takers for themselves or for the investigator. Since there are no studies in the literature related to adolescent risk preferences measured using the standard gamble technique it is difficult to tease out and explain these results.

Age in months was positively skewed with (70%) of all adolescent ages falling below 184 months (15 years, 4 months). The mean age was 180 months (15 years), median age 178 (14 years, 9 month), multiple modes were seen with the lowest reported at 159 (13 years, 4 months), and a standard deviation of 16.84 months. One reason for the possible non-normal distribution of ages in months was that a convenience sample of adolescents was used for the study. Adolescents were recruited from 2 high schools, 2 junior high schools, a hospital-based pulmonary clinic, and a community-based asthma clinic for this investigation. The adolescents were interviewed as the referrals were received with no effort to screen for age except to meet the age inclusion criteria of adolescents between 13 years and 17 years 11 months. A future study might include a more systematic method for recruiting adolescents to include a better distribution of adolescents across the age inclusion criteria.

Response Bias

Attempts to eliminate response biases were made by randomly selecting the order of the scenarios, using one-on-one interviews adolescents to assure confidentiality of responses, and using the same interviewer for all adolescents. However, the utility scores measured in this investigation may have been influenced or biased by several other
factors. These may have included influences related to the context or frame of the scenario and or the tendency to give socially desirable or just satisfactory answers.

Framing refers to how questions are described or presented and the fact that people choose between alternatives depending on the descriptions or presentations. Kahneman and Tversky explain that people are risk averse when a gain is involved and risk taking in loss situations (1984). That is when offered the possibility of a gain people tend to take safer routes to be sure they gain something rather than the riskier alternative of perhaps gaining more, but possibly losing everything. In loss situations people tend to gamble on minimizing their losses rather than taking the certain or known situation where they will lose something. There is a possibility that the utility scores in this investigation were adolescent responses influenced by the framing of the scenarios.

The tendency to present a favorable image of oneself is known as social desirability bias. This bias refers to misrepresenting one’s attitudes by giving answers that are consistent with prevailing social mores. This is not a deliberate attempt to deceive, just a subconscious effort to put forth the best impression or to be seen as a good citizen, good student, or person. In the case of the adolescents in this study it could have been an effort to be seen as an adherent patient.

Another possible response bias factor in this investigation could be the tendency to give responses that are satisfactory but not optimal. Several ways for giving just satisfactory responses in this investigation is if the adolescent agreed with the first reasonable response he or she heard (a probability presented early in the varying process) or the most recent response (a response heard just at a point when they were tired of
talking about a scenario); or a set response given for all scenarios (a neutral response). This is a distorting influence in that satisfactory responses may not necessarily signify the most intense attitude or in the case of this investigation the true risk preferences for the adolescents interviewed (Steiner and Norman, 1999).

The following approaches should be considered to minimize the effects of these biases when the scenarios are used future research with adolescents. First, examine how the scenarios are framed (as a gain or as a loss) and analyze the data from the same perspective. Second, keep the scenarios simple and easy to understand so they are not overly demanding on the cognitive processes of the adolescents. When questions are simple, respondents tend to earnestly try to optimize their cognitive capacities to interpret and answer the questions using all relevant information in their memories. If the scenarios are too long or complex the respondents may view the scenarios as trivial or irrelevant and will complete the task without effort giving only what they think of as a socially desirable or satisfactory answer (Steiner and Norman, 1999). A third approach is to try to maintain the motivation of the respondents. Consider including only interested individuals, rather than a convenience sample so that the adolescents will complete the task giving optimal effort. A fourth approach is to ask for qualitative explanations for quantitative answers or as in the case of this investigation, ask for explanations for the utility scores measured. When respondents are asked to justify how they answer questions they tend to me more thoughtful in their overall responses (Steiner and Norman, 1999). The last approach is to give a priori consideration to the possible affect of cultural background and socioeconomic status on the risk preferences measured by the
scenarios. These factors were not studied in this investigation; however, in a larger study differences between the utility scores of adolescents in groups determined by these factors may give greater insight into the reliability and validity of the scenarios and the relationships between the variables.

Limitations of Model

A conceptual model was developed to explain how risk preference influences the symptom self-management decisions made by adolescents with asthma. A model evolved from theories of decision-making (Tversky & Kahneman, 1986), adolescent cognitive development (Piaget, 1972), and expected utility (von Neumann & Morgenstern, 1947). The theories were used to explain relationships between risk preference and the judgments adolescents make when facing choices involving gambles. The model incorporated the Symptom Interpretation Model (Teel et al., 1997) to explain how symptom knowledge relates to the processes of forming likelihood judgments in symptom management choices.

The theories explained the reasoning process that occurs from perception or anticipation of a symptom through choosing a symptom self-management alternative. The theories also explained how adolescents use prior symptom knowledge and cognitive abilities to identify self-management alternatives and consequences, form likelihood judgments about the consequences, and consider their preference for the alternative that offered them the most. A model was used to depict the influence of risk preference on the adolescent asthma symptom self-management scenario choices presented in the investigation. However, the framework is limited because it fails consider how the
cognitive development of children with asthma or any chronic illness may be affected by other factors such as family dynamics, cultural differences, socioeconomic conditions, and child characteristics unrelated to asthma. A framework that includes these other dimensions is more appropriate for describing or explaining how risk preference may influence the symptom self-management decisions made by adolescents with asthma. Further investigation into changes for the current framework is planned.

Minimizing all of these limitations in future studies involving risk preferences related to adolescent asthma symptom self-management choices will lead to greater understanding. The following sections discuss the research aims as they pertain to data used to answer the research questions in this investigation.

Statistical Data Analysis

Multiple comparisons were done of the utility data in this investigation; in the future some form of adjustment must be made in the analyses to avoid having a possible inflated Type I error rate associated with the results. To prevent this inflation, post hoc testing must be considered with the aim of decreasing the likelihood of making a Type I error when making multiple comparisons of the data. The Bonferroni correction is one possible post hoc test that can be used to adjust for multiple dependent variables by dividing the alpha by the number of comparisons. Instead of dealing with the problem of an inflated Type I error risk by adjusting the level of significance as is done in the Bonferroni, the Scheffé’s test can be used to make an adjustment in the size of the critical value used to determine whether there is an observed statistical difference between to means.
Aim One

This section discusses the estimations of internal consistency reliability and content validity of the scenarios. The inter-item and item-total correlations of the utility scores, content validity rating scores, and qualitative responses related to the scenario domains and risk areas are presented.

Internal Consistency Reliability

Reliability concerns the degree of dependability with which an instrument measures the attribute it was designed to measure. In this investigation the instrument was a composite of adolescent asthma symptom self-management scenarios. The composite was designed to measure risk preferences as they pertain to the asthma symptom management prevention and treatment risk areas identified in the literature (Cook, 2003; Yoos & McMullen, 1999; Yoos et al., 1999).

As described earlier in this chapter, the utilities elicited were not normally distributed and since a non-parametric equivalent for the Cronbach’s alpha does not exist, the reliability coefficients reported in the preceding chapter were Pearson’s correlations tested with non-normal data. The results suggest that the scenarios do relate to each other since there were significant inter-item correlations and the standardized alpha was .70, which is an acceptable estimate of reliability. The alpha suggests the scenarios are complementary to each other and that 70% of the variability in the utility scores are representative of true individual differences between adolescents (Nunnally & Berstein, 1994a; Polit & Hungler, 1991). However, alpha just minimally meets the standard in the literature and the finding also suggests that 30% of the variability may reflect random or
extraneous fluctuations. For these reasons further reliability studies should be done before the scenarios are used for testing the conceptual model of risk preferences with symptom interpretation discussed in Chapter 2.

An interesting finding was that out of the 8 significant correlations found, 5 (63%) were correlations between two treatment domains, 2 (25%) were between treatment and prevention domains, and 1 (12%) was between two prevention domains. These findings may be an effect of the larger number of treatment domains (5) to prevention domains (3) in the composite, or they may suggest that the domains are not clearly delineated or should be measured with different instruments. Additional reliability studies or factor analyses with a larger sample may help clarify these relationships and improve the internal consistency reliability of the scenarios as a composite.

As noted earlier the Kendall's tau was used to estimate the item-total correlations between the eight individual scenarios and the composite. Seven out of 8 item-total correlations were statistically significant. The significant correlations ranged from $r = .267 (p = .023, r^2 = .07)$ to $r = .653 (p = .000, r^2 = .43)$ with 6 correlations (85%) below the $r = .50$ set a priori for a power of .90. The correlations varied in strength but were statistically significant given the small $r$. There is evidence as reported by Polit and Hungler (1991) that social and psychological correlations are typically in the range of .10 to .40, and since risk preference is reported as attitudinal in nature, the correlations found may suggest stronger relationships than appear in this investigation. Further reliability studies with a larger sample may help to explain the item-total relationships. The following section discussed the content validity of the asthma symptom scenarios.
Content Validity

This investigation used the expert judgment process for determining content validity (Lynn 1986). Thirty-six adolescents with asthma assessed the content of 8 scenarios and the composite. The content validity ratings from the adolescents are reported in the preceding chapter. The ratings were used to compute the scores and indexes as they pertain to the extent to which the scenarios in the composite represent the universe of all questions that might be asked on the topic of adolescent asthma symptom self-management treatment or prevention choices involving risk. Content validity is based on judgment and there are no completely objective methods for assuring adequate content coverage of any instrument, using experts to analyze the items has been used and described (Nunnally & Berstein, 1994b). Adolescents with asthma were the experts in this investigation because they know better than parents, nurses, or physicians the symptom self-management prevention and treatment risks they face. Since asthma is characteristically described as variable in severity and intermittent in intensity of symptom episodes, the inclusion of this larger sample of experts who spanned these characteristics, may have provided greater depth of expert evidence for content validity.

The content validity indexes (CVI) were calculated from the individual ratings assigned by the adolescents. Content validity procedures and findings are reported in detail in the preceding chapters, but an important result was that the individual scenarios were all rated content valid with a narrow range of high scores. The lowest mean score was 3.29 with a standard deviation of .453, a median score of 3.00, and a mode of 3.00. The highest mean score was 3.61, with a standard deviation of .416, a median score of
3.50, and a mode of 4.00. Four of the scenarios had modes of 4.00, one other scenario had multiple modes one of which was 4.00, and the other three scenarios had modes of 3.00. Further support of content validity for the domains of the individual scenarios, was the proportion of adolescents who rated the scenarios content valid ranged from a low of 32 out of 36 (88%) for scenario 4 (treatment: seeking non-medical help from parents, adults or peers), to a high of 36 out of 36 (100%) for scenario 1 (prevention: avoiding triggers related to exercise).

Similar findings were identified for the risk areas. The lowest mean score was 3.38 with a standard deviation of .578, a median score of 3.50, and a mode of 3.00. The highest mean score was 3.54, with a standard deviation of .565, a median score of 4.00, and a mode of 4.00. Five of the scenarios had modes of 4.00, two had multiple modes one of which was 4.00, and the other had a mode of 3.00. The standard deviations in the risk area scores were larger and the proportion of adolescents who rated the scenario content valid ranged from a low of 31 out of 36 (86%) for scenario 4 (treatment: seeking non-medical help from parents, adults or peers), to a high of 34 out of 36 (94%) for scenarios 1 (prevention: avoiding triggers related to exercise), 3 (prevention: avoiding allergy triggers), and 6 (treatment: seeking medical care). The content validity indexes for the composites of the eight-scenarios for both domains and risk areas were 34 out of 36 or a 94%. This finding further supports the content validity of the scenarios as a composite and is larger than the proportion of 85% set for assessing the content validity of the composites.
An interesting finding was that although scenario 4 was rated as content valid it received the lowest score for both domains and risk areas. In the model that guided the development of the scenarios (referred to earlier in Appendix C) scenario 4 was identified as a sub-category of the asthma symptom treatment domain that assumes making choices for action after the onset of symptoms. Because scenario 4 received the lowest content validity scores in both the domains and the risk analyses, and because qualitative comments suggest that adolescents seek help from parents, adults, friends, coaches, and other non-medical people not only after the onset of symptoms but also prior to the onset of symptoms with regard to obtaining medications or creating trigger free environments, scenario 4 should be further assessed as possibly a risk category that should be modeled under both domains.

The qualitative content validity responses are described in the preceding chapter and no new domains or risk areas were clearly identified. However, several themes emerged that supported earlier identified themes about adolescent thoughts when making decisions involving risk (Cook, 2001). Findings from the 2001 study reported adolescents thought about ‘what their parents and friends might think or do’; ‘what they prefer or think is best for them’; and ‘what they know to be true’. Adolescent comments in this investigation provide support for these same themes as evidenced by descriptions that when faced with gambles in symptom situations adolescents ‘wait and see’ when symptoms are present or anticipated, because they ‘prefer’ being at social or physical events even when they ‘know’ the activity or environment might initiate or exacerbate severe asthma symptoms. A second theme was what they thought ‘mom’ would want
them to do or what ‘mom’ would do in the situation to treat or prevent their symptoms. The adolescents identified ‘mom’ as the greatest source of non-medical assistance. One possible reason for the dependence or focus on mom in this investigation was that 70% of the adolescents were under the age of 16 years and younger adolescents may just be more dependent. A second reason may be that 65% had moderate to severe asthma requiring medications about which mom may be more knowledgeable and thus more helpful when faced with a choice involving uncertainty related to symptom management.

Aim Two

This section discusses the implications related to the relationship between the utility scores and adolescent age and gender. The discussions are presented under the headings of age and gender.

Age

Statistical analyses related to the relationships between age and the individual and mean utility scores are reported in the preceding chapter. As explained earlier the data for the utilities and age were not normally distributed as evidenced by the Kolmogorov-Smirnov (K-S) and Shapiro-Wilk tests. The analyses between the data found only one statistically significant relationship between age and scenario 6 pertaining to self-managing asthma symptoms by seeking medical care for symptoms. The relationship was weak and negative ($r = -.263$, $p = .05$, $r^2 = .07$). With the sample size of 31 and this small $r$, the power would be close .25 or almost zero with an alpha of .05 using a 2-tailed test.
However, since the correlation was statistically significant a short discussion follows. Scenario 6 presented a hypothetical situation involving an adolescent experiencing asthma symptoms on the day of an important social event. The choices were to tell mom or not tell mom because mom would insist on seeing the doctor and the adolescent would miss the event. The finding suggests an inverse relationship between age and the utility scores in this scenario. An inverse relationship could mean one of two findings: 1) with increased age there was a decrease in the utility score (risk-seeking) or with increased utility scores (risk aversion) there was a decrease in age. The conceptual framework suggests that with cognitive maturity there is a greater capacity to reason and make rational choices in situations involving risk. However, it also suggests that adolescents make choices based not just based on their cognitive mature reasoning capacities but also on their preferences. A possible explanation is that the older adolescents in this investigation may be less influenced by mom and thus more willing to not involve her in their choices related to attending social events in the presence of symptoms. Older adolescents may also have more symptom experiences to guide their choices in gambles. There are no real conclusions that can be drawn from these data because the r is very small and age in months may explain only 7% of the variability in the utility scores related to seeking medical care with symptoms. Future studies using these scenarios may provide greater explanations.

As mentioned earlier there are no reported data in the literature about the relationship between age and risk preference, however there are studies reporting relationships between age and risk seeking behaviors and the decisions that precede the
behaviors. These reports are conflicting in that researchers have linked increased age with both decreased risk behaviors and better decision-making (Hollen 1994, Hollen, Hobbie et al 1997) and increased risk behavior and poor judgments (Neumark-Sztainer, Storey 1996; Frey 1997). Individually these studies demonstrated clear trends, however, collectively they are conflicting and provide no insight to better understanding the results from the data of this investigation. Several possible reasons have been explained in the limitations section of this chapter and include the small sample size and the lack of normality in the utility scores. A larger study may provide better understanding of the relationships.

**Gender**

Statistical analyses related to the relationships between gender and the individual and mean utility scores are reported in the preceding chapter. As explained earlier the data for the utilities were not normally distributed as evidenced by the Kolmogorov-Smirnov (K-S) and Shapiro-Wilk tests. The analyses identified no statistically significant relationships between gender and the utility scores using non-parametric point-biserial correlation tests. Possible reasons for finding no significant correlations may be related to the small sample size or the non-normal distributions of the utility data sets.

Although there is little clarity in the literature as to how gender relates to decisions to engage in risk behaviors several researchers have linked gender with decisions to engage in risk behaviors involving sex, substance use, and tobacco use. Males have been linked with greater risk prevalence for drinking and driving, while females for riding in cars with drinking drivers (O'Malley & Johnston, 1999). Male
gender was a predictor of risk taking behavior involving smoking, alcohol, and drug use in cancer survivors in a study by Hollen (2000). Adolescent females exhibited greater risk behavior with unhealthy weight activities and suicide, whereas, males a higher prevalence for unprotected sex and smoking (Neumark-Sztainer et al., 1996) Another study reported both genders as equally likely to engage in risks related to smoking, drinking and using drugs, but with different motivations (Sarigiani et al., 1999).

In summary, the literature is unclear about the influence of gender on adolescent risk behavior and there are no reports on the influence of the preferences that drive risk behaviors to guide the interpretation of these results. A better understanding of the relationship between gender and the risk preferences that drive the asthma symptom self-managements choices made by adolescents is needed. Although these data provide nothing to the current knowledge base related to risk behaviors, they provide a basis for designing future studies for understanding how risk preferences relate to risk behaviors reported in the literature and symptom self-management choices made by adolescents who have asthma.

Aim Three

This section discusses the adolescent thoughts related to using the SGT as a decision-making methodology. The preceding chapter described adolescent thoughts related to two open-ended questions about the utility and burden of using the SGT as a decision-making methodology with adolescents. The technique has been used successfully by Juniper et al (Juniper et al., 1997) to rate asthma scenarios and measure health related quality of life in children. Juniper reported that between 7 and 17 years,
with asthma, were able to use the standard gamble technique with confidence. In her study children over 12 years produced the most confident scores using the technique. The current investigation builds upon Juniper's finding and adds understanding from the adolescent perspective of factors that may influence the ability to use the SGT.

The 36 adolescents who used the SGT expressed a variety of thoughts related to teenagers making choices using the method but two primary themes emerged. The adolescents thought they possessed the mathematical skills to use the method, but it takes too long for everyday situations and it requires a more challenging thought process. They saw value in using the symptom scenarios with the chance board since it allowed them to visualize the alternatives and consequences with the assigned probabilities. The adolescents described two reasons for their success with the method that included the understanding of percentages and the investigator's use of the non-asthma example to explain the method.

During the interview process the investigator observed expressions of possible confusion, such as furrowed brows and or hesitations with answers, and also expressions of understanding, such as nodding of the head or smiles. These observations were critical to proposed procedures. When confusion was observed, a review of the process was offered and when understanding was observed the process continued as proposed.

Data from one adolescent were not used in the analyses because the adolescent was confused by the process of using the SGT and unable to make choices. The adolescent had an expression of confusion throughout the entire introduction to the method. Her confusion did not clear with the non-symptom example and she was unable
to answer simple questions to demonstrate understanding. In summary, based upon qualitative remarks from the adolescents in this investigation and the observations of the researcher the SGT is a methodology that can be used by adolescents in research involve decision-making.

Symptom Information.

The symptom information data gathered in this study were both informative and concerning. As suggested in the literature, symptom histories for one month prior to the interviews were assessed as the most reliable prototype and exemplar memories (Expert Panel 1997). Adolescents in this investigation were knowledgeable about their symptoms and treatment regimens. They were able to identify medication names, doses, and administration routines. The symptom descriptors used by the adolescents were terms frequently seen in the literature.

Several areas of concern existed with regard to the symptom management information described by the adolescents. First, was a theme of dependence on 'moms' to remember inhalers when leaving home, refilling prescription medications, and solving problems involving prevention or treatment of asthma symptoms when away from home. Since adolescents spend so many hours in school and other activities away from home, an over-dependence on mom has a potential for influencing asthma prevention or treatment outcomes if symptom management actions are delayed to confer with mom. A future study related to factors that influence the adolescent transition from dependent to
independent asthma symptom self-management may help to explain the possible over-
dependence seen in the adolescents in this investigation.

A second concern relates to the goal of asthma therapy for children to control and
management of symptoms that interfere with sleep, school, and play (Expert Panel,
1997). Adolescents in this investigation described asthma symptoms as reasons for
missing sleep, missing school days, and missing play events. As reported in the preceding
chapter, 44% of the 36 adolescents interviewed reported nighttime asthma symptoms
occurring more than twice, 42% missed school days, and 42% missed play activities
including both athletic and social events during the prior month. These results raise
several questions about and reasons for possible lack of asthma control in these
adolescents. One question related to whether the asthma symptoms in these adolescents
relate to treatment adherence or provider prescribing patterns. The answer is beyond the
scope of this investigation but warrants further investigation.

A final concern related to described symptom information was the number of
adolescents who reported managing asthma episodes without the guidance of a written
asthma action plan. Thirty-one adolescents (86%) experienced one or more asthma
symptom episodes during the month prior to the interview, of those 31 only 14 (45%)
reported using written plans to guide their symptom management actions. A written plan
was described to the adolescent as any piece of paper received from a provider with
instructions for monitoring asthma symptoms and taking action during an asthma
episode. Since written asthma action plans are core elements of asthma control and
management, the fact that 55% (17) of the adolescents in this sample were attempting to
manage their symptoms without a written plan is disturbing and warrants further investigation.

In summary, the symptom data in this investigation were not used to answer research questions, but they provided rich data for future research related to how adolescents manage asthma symptoms and what factors influence their symptom management choices. Two examples of possible future research include examining: the relationships between adolescent asthma symptom management actions and treatment adherence or provider prescribing patterns; and the effect of written asthma action plans on asthma symptom treatment or prevention actions.

Implications for Nursing Practice

This investigation has implications for nursing. This section describes them as they pertain to the findings related to the research questions. The investigation was conceptualized based on the need to better understand factors that influence the choices adolescents make when they are faced with symptom self-management situations involving gambles. To this end the purpose was to assess eight asthma symptom scenarios with the SGT for measuring the risk preferences that may influence symptom self-management choices made in the face of uncertainty.

The investigation was guided by a framework developed from theories and models pertaining to expected utility, rational decision making, symptom interpretation, and cognitive development as they pertained to adolescent symptom self-management decision-making involving gambles. The standard gamble forced choice method was used with hypothetical symptom scenarios that contained gambles with given
probabilities for possible consequences. Because adolescents in the investigation were able to use the SGT without difficulty as observed by the researcher and verified by adolescent comments, the investigation provided support for earlier reported findings about using the SGT with children. The current investigation builds upon these findings with evidence that adolescents can use the SGT with confidence when they understand the mathematical principles for percentages and are presented with appropriate examples for introducing the method. The investigation also provided foundational information about the practicality of using the SGT with asthma symptom self-management scenarios to measure risk preferences from the adolescent perspective.

The investigation provided preliminary internal consistency reliability and content validity estimates of the scenarios by examining the individual and composite utility scores and the described adolescent thoughts about the domains and risk areas of prevention and treatment related asthma symptom self-management. The results of the investigation may help other nurse researchers and health care providers begin to understand the phenomenon of risk preference as it relates to adolescent symptom management choices. Eventual understanding of risk preference as they relate to adolescent symptom self-management choices may help guide nurses in the development of interventions to improve asthma outcomes.

Future Research

The eight asthma symptom self-management scenarios tested in this investigation measured the attitudinal attribute of risk preference, which in the literature is labeled as both a state and a trait (Conway, 1992; Cramer & Spilker, 1998). Suggestions for future
research were presented in the discussions of the aims and research questions and are expanded in this section. Future research is dependent upon the conceptual clarity of risk preference prior to utilizing the scenarios in a larger study to examine the true effects of the variables suggested in the conceptual model of risk preferences with symptom interpretation discussed in Chapter 2. A conceptual analysis of risk preference should be conducted to develop clarity with regard to the attributes of risk preference as they pertain to adolescents who are making symptom self-management choices. With greater conceptual clarity, risk preference may be used more effectively; its strengths and limitations more effectively evaluated; and its variations introduced to enhance the contribution the concept may make to understanding how it effects adolescent asthma symptom self-management. Without this conceptual clarity understanding the true effects of age, gender, disease severity, past symptom experiences, and asthma knowledge on symptom choices is limited.

Other future research related to the findings from this investigation could include investigations into: how adolescent risk preferences related to symptom choices differ with age, gender, disease severity, past symptom experiences, and asthma knowledge; and how asthma symptom descriptors used by adolescents differ due asthma severity, exemplar or prototype symptom experiences, and the length of time since the initial diagnosis of asthma. Lastly, additional scenarios should be developed and further reliability and validity research conducted to examine the original composite with a comparable (parallel or alternate) form or examine stability over time with a test-retest design.
APPENDIXES
APPENDIX A

Rules of Probability
Rules for Probabilities with Adolescent Asthma Symptom Examples

Rules for Probabilities

1) probability (P) of event (A) = P(A) is between 0 and 1, that is 0 ≤ P(A) ≤ 1, in other words P(A) is a proportion that is sometimes expressed as a percentage. For example, if P (wheezing) = 0.75, the person believes there is a 75% chance of wheezing when exposed to a given trigger;

2) if P(A) = 0, the person believes there is no chance of event (A) occurring. In this case the person is certain there he or she will not exhibit the symptom of wheezing when exposed to a given trigger;

3) if P(A) = ½ the person believes that (wheezing) event (A) is just as likely to occur as to not occur. For example, P(wheezing) = 0.50 would mean the person thinks the chances of having developing wheezing and not developing wheezing on a given day are even or equal;

4) if P(A) = 1 the person is absolutely sure that event (A) will happen. The individual is 100% certain of developing wheezing there is no doubt in their mind; and

5) intermediate values of P(A) represent intermediate degrees of certainty in event (A) occurrence. The higher the stated value the more certain the person is that the event will occur (Yates 1990).

\[ P(A) = \frac{\Omega(A)}{1+\Omega(A)} \]

\[ P(A) = \frac{\Omega(\text{sun})}{1+\Omega(\text{no sun})} \]

\[ P' = \text{Probability judgment} \quad \Omega' = \text{Odds judgment} \]

Likelihood judgments can be expressed as odds judgments. Odds judgments are representative of the number of times the event is more likely to occur than not to occur. It is an individual’s opinion of the chances of the occurrence of an event, relative to the chances of the event not occurring.

\[ \Omega(A) = \frac{P(A)}{P(A')} \quad \Omega(A) = \frac{P(\text{sun})}{P(\text{no sun})} \]

(c) Complement includes all possibilities other than those contained in event

(Yates 1990)
APPENDIX B

Model of Adolescent Risk Thoughts
Model of Adolescent Thoughts When Making Choices Involving Risk

Parents & Friends
Knowledge and Preferences

Personal Knowledge

Internal "gut" feelings

Personal Desires Preferences

(Cook, 2001)
APPENDIX C

Model of Symptom Domains Involving Risks
Asthma Symptom Self-Management
Domains Involving Risk

Prevention
- Avoids Triggers
  - Allergy Triggers
- Removes Self From Triggers
  - Exercise Triggers

Treatment
- Initiates Early Self-treatment
- Uses Medications Safely
- Modifies Activities
- Parent Adult Peer
- Seeks Help
  - Clinical Provider

(Cook, 2003)
APPENDIX D

Human Subjects Approvals
27 August 2003

Susanne Cook, M.S., R.N.,
College of Nursing
P.O. Box 210203

RE: BSC 603.158 ADOLESCENT RISK PREFERENCE AND ASTHMA SYMPTOM SELF-MANAGEMENT: ASSESSING SYMPTOM MANAGEMENT SCENARIOS

Dear Ms. Cook:

We received your research proposal as cited above. The procedures to be followed in this study pose no more than minimal risk to participating subjects. Regulations issued by the U.S. Department of Health and Human Services [45 CFR Part 46.110(b)] authorize approval of this type project through the expedited review procedures, with the condition(s) that subjects' anonymity be maintained. Although full Committee review is not required, a brief summary of the project procedures is submitted to the Committee for their endorsement and/or comment, if any, after administrative approval is granted. This project is approved effective 27 August 2003 for a period of one year.

The Human Subjects Committee (Institutional Review Board) of the University of Arizona has a current assurance of compliance, number FWA00004218, which is on file with the Department of Health and Human Services and covers this activity.

Approval is granted with the understanding that no further changes or additions will be made either to the procedures followed or to the consent form(s) used (copies of which we have on file) without the knowledge and approval of the Human Subjects Committee and your College or Departmental Review Committee. Any research related physical or psychological harm to any subject must also be reported to each committee.

A university policy requires that all signed subject consent forms be kept in a permanent file in an area designated for that purpose by the Department Head or comparable authority. This will assure their accessibility in the event that university officials require the information and the principal investigator is unavailable for some reason.

Sincerely yours,

Theodore J. Glattke, Ph.D.
Chair
Social and Behavioral Sciences Human Subjects Committee

cc: Departmental/College Review Committee
19 September 2003

Susanne Cook, M.S., R.N.
Advisor: Ida Marie Moore, Ph.D.
College of Nursing
P.O. Box: 210203

RE: BSC 403.158 ADOLESCENT RISK PREFERENCE AND ASTHMA SYMPTOM SELF-MANAGEMENT: ASSESSING SYMPTOM MANAGEMENT SCENARIOS

Dear Ms. Cook:

We received your 16 September 2003 letter and revised recruitment documents. Permission is requested to expand the recruitment effort through direct personal contact with parents who learn about the study from friends, who then approach the investigator about having their child participate in the study, and by sending letters to school nurses locally informing them of the study and requesting their assistance in contacting parents of potential subjects. Site authorizations would be obtained from schools who express an interest in the study prior to posting flyers or contacting the parents of potential subjects. Approval for these changes is granted with an expiry date of 27 August 2004.

The Human Subjects Committee (Institutional Review Board) of the University of Arizona has a current assurance of compliance, FWA00004218, which is on file with the Department of Health and Human Services and covers this activity.

Approval is granted with the understanding that no further changes or additions will be made either to the procedures followed or to the consent form(s) used (copies of which we have on file) without the knowledge and approval of the Human Subjects Committee and your College or Departmental Review Committee. Any research related physical or psychological harm to any subject must also be reported to each committee.

A university policy requires that all signed subject consent forms be kept in a permanent file in an area designated for that purpose by the Department Head or comparable authority. This will assure their accessibility in the event that university officials require the information and the principal investigator is unavailable for some reason.

Sincerely yours,

Theodore J. Glatte, Ph.D.
Chair
Social and Behavioral Sciences Human Subjects Committee

TJG:pm

cc: Departmental/College Review Committee
The University of Arizona
1350 N. Vine Avenue
P. O. Box 245137
Tucson, AZ 85724-5137

Re: Susanne W. Cook, RN

To Whom It May Concern:

The purpose of this letter is to grant permission to Susanne Cook to contact nurses in the Mesa Public School District for purposes of research or interview in support of her degree.

As educators of children kindergarten through high school, we are keenly aware of the need for professionals to pursue advanced degrees.

If you have any questions, please call me at the above number or e-mail to namiller@mpsaz.org.

Sincerely,

Nadine Miller
Health Services Director
October 21, 2003

Susanne Cook, RN
Arizona Asthma Prevention Grant
1919 East Thomas Rd.
Phoenix, AZ 85016-7710


Dear Ms. Cook:

The PCH Medical Executive Committee, at its meeting on October 20, 2003, approved your study unanimously, as follows:

Protocol: Approved as presented
Informed Consent: Approved as presented
Supporting Documentation: Approved as presented

This research project was approved by the Medical Executive Committee based on a degree of risk and benefit to individual subjects as listed below:

- No more than minimal risk to participating subjects

Approval by the University of Arizona Institutional Review Board (IRB) must be granted before you can begin your study. It is your responsibility to forward your study to the IRB.

Please submit final IRB approved Protocol, Informed Consent and Assent to the Medical Staff Services office so they may be maintained in our records.

Sincerely,

Richard Leonard, MD
Chairman, PCH Medical Executive Committee

RL/j
October 15, 2003

Re: Susanne W. Cook, RN
Doctoral Candidate
University of Arizona
College of Nursing

To Whom it May Concern:

Maricopa County Regional School District has agreed to allow Susanne W. Cook, RN, to proceed with her research regarding Asthma in Adolescence.

Sincerely,

Kit C. Wood, Ph.D.
Superintendent

Kit C. Wood, Ph.D.
Superintendent
October 6, 2003

Susanne Cook, RN
Arizona Asthma Prevention Grant
1919 East Thomas Rd.
Phoenix, AZ 85016-7710


Dear Ms. Cook:

The PCH Scientific Review Committee, at its meeting on October 3, 2003, approved your study, unanimously, as follows:

Protocol: Approved as presented
Informed Consent & Assent: Approved as presented
Supporting Documentation: Approved as presented

This research project was approved by the Scientific Review Committee based on the degree of risk and benefit to individual subjects as listed below:

• No more than minimal risk to participating subjects

Approval by the PCH Medical Executive Committee must be granted before you can begin your study. Your study will be forwarded to the Medical Executive Committee by Medical Staff Services.

Please submit final IRB approved Protocol, Informed Consent and Assent to the Medical Staff Services office so they may be maintained in our records.

Sincerely,

Charles Bonstelle, MD
Chairman, PCH Scientific Review Committee

CB/1j
October 21, 2003

Susanne Cook, RN
Arizona Asthma Prevention Grant
1919 East Thomas Rd.
Phoenix, AZ 85016-7710


Dear Ms. Cook:

The PCH Medical Executive Committee, at its meeting on October 20, 2003, approved your study unanimously, as follows:

Protocol: Approved as presented
Informed Consent: Approved as presented
Supporting Documentation: Approved as presented

This research project was approved by the Medical Executive Committee based on a degree of risk and benefit to individual subjects as listed below:

• No more than minimal risk to participating subjects

Approval by the University of Arizona Institutional Review Board (IRB) must be granted before you can begin your study. It is your responsibility to forward your study to the IRB.

Please submit final IRB approved Protocol, Informed Consent and Assent to the Medical Staff Services office so they may be maintained in our records.

Sincerely,

Richard Leonard, MD
Chairman, PCH Medical Executive Committee

RLJ
October 17, 2003

To Whom It May Concern:

Suzanne Cook has permission to discuss and conduct her research in the Isaac School District.

This will encompass three schools and up to ten students. Parents will be contacted for permission to do the interviews. If you have questions, please contact me.

Sincerely

Carol Erickson

Carol Erickson Ed. D.
Assistant Superintendent for Curriculum and Instruction
Dear Health Care Provider,

I am a student at the University of Arizona College of Nursing in the dissertation phase of my doctoral education. The College of Nursing and the University of Arizona Human Subjects Protection Committee recently approved my research study and I am now in the process of recruiting adolescents with asthma, between the ages of 13 and 17 years. I will ask adolescents to participate in a 60-minute interview about making choices related to asthma symptom self-management. The purpose of the interview is to test eight everyday symptom scenarios from the perspective of adolescents who are already making asthma self-management choices. These adolescents will provide valuable information related to the realistic nature of the scenarios and a decision-making methodology known as the standard gamble technique.

There will be no cost to the adolescent or their parent for participating in this study. The interview will be scheduled at a time and place of convenience for both the parent and the adolescent. All information associated with the interview will be held in confidence and the adolescent's name will not be used in any publications.

I would like your assistance in recruiting adolescents for this study. In order to maintain confidentiality, I am asking you to first identify adolescents in your practice and second to ask them if they may call me to talk about the study. If making calls to the parents of your adolescent patients will create a burden on you or your staff's time I have enclosed several letters and stamped envelopes that may be mailed to parents. I have also enclosed a recruitment flyer and I am asking for it to be posted in your outer office and or given to parents of adolescents with asthma.

Thank you for taking time to read this letter. I hope that you can help me during this phase of my research. If you have additional questions please call me at my home (480) 830-0124 or on my cellular phone (480) 201-1498. I can also be reached by email at scook@nursing.arizona.edu. Additional questions related to this study may be directed to my dissertation committee chairperson, Ki Moore, RN, PhD @ (520) 626-6205 or the University of Arizona Human Subjects Committee Office @ (520) 626-6721.

Sincerely,

Susanne W. Cook, RN, PhD(c)
Doctoral Candidate
University of Arizona College of Nursing
Dear Parent or Guardian:

You are being invited to participate and voluntarily allow your teenager to participate in a 60-minute interview about making choices related to asthma symptom self-management during adolescence. The interview is part of a dissertation research project sponsored by the University of Arizona College of Nursing. The purpose of the interview is to test eight everyday scenarios from the point of view of teenagers with asthma who are already making symptom self-management choices. Input from your teenager will provide valuable information as to the realistic nature of the scenarios and a method for making choices.

There is no cost to you or your teenager for participating in this project. The interview can be scheduled at a time and place of convenience for both you and your teenager. All information associated with this interview will be held in confidence and your teenager's name will not be used in any publications.

Thank you for taking time to read this letter. If you are interested or if you have additional questions about the project please call me directly at 480-830-0124 or give your name and contact information to one of the clinic nurses and they will arrange for me to call you.

Sincerely,

Susanne W. Cook, RN
Doctoral Candidate
University of Arizona
College of Nursing
Dear School Nurse:

I am a student at the University of Arizona College of Nursing in the dissertation phase of my doctoral education. The College of Nursing and the University of Arizona Human Subjects Protection Committee recently approved my research study and I am now in the process of recruiting adolescents with asthma, between the ages of 13 and 17 years. I will ask adolescents to participate in a 60-minute interview about making choices related to asthma symptom self-management. The purpose of the interview is to test eight everyday symptom scenarios from the perspective of adolescents who are already making asthma self-management choices. These adolescents will provide valuable information related to the realistic nature of the scenarios and a decision-making methodology known as the standard gamble technique.

There will be no cost to the adolescent or their parent for participating in this study. The interviews will be scheduled at a time and place of convenience for both the parent and the adolescent. All information associated with the interview will be held in confidence and the adolescent’s identity will not be used in any publications.

I would like your assistance in recruiting adolescents for this study. In order to maintain confidentiality, I am asking you to first identify adolescents in your school and second to ask their parents if they will call them to talk about the study. If making calls to the parents of your adolescents will create a burden on your time I have enclosed several letters and stamped envelopes that may be mailed to parents. I have also enclosed a recruitment flyer and I am asking for it to be posted in your outer office and or given to parents of adolescents with asthma.

Thank you for taking time to read this letter. I hope that you can help me during this phase of my research. If you have additional questions please call me at my home (480) 839-0124 or on my cellular phone (480) 201-1498. I can also be reached by email at scook@nursing.arizona.edu. Additional questions related to this study may be directed to my dissertation committee chairperson, Ki Moore, RN, PhD @ (520) 626-6205 or the University of Arizona Human Subjects Committee Office @ (520) 626-6721.

Sincerely,

Susanne W. Cook, RN, PhD(c)
Doctoral Candidate
University of Arizona College of Nursing
November 2003

Dear Parent or Guardian:

You are being invited to participate and voluntarily allow your teenager to participate in a 60-minute interview about making choices related to asthma symptom self-management during adolescence. The interview is part of a dissertation research project sponsored by the University of Arizona College of Nursing. The purpose of the interview is to test eight everyday scenarios from the point of view of teenagers with asthma who are already making symptom self-management choices. Input from you or your teenager will provide valuable information as to the realistic nature of the scenarios and a method for making choices.

There is no cost to you or your teenager for participating in this project. The interview can be scheduled at a time and place of convenience for both you and your teenager. All information associated with this interview will be held in confidence and your teenager’s name will not be used in any publications.

Thank you for taking time to read this letter. If you are interested or if you have additional questions about the project please call me directly at #480-830-0124 or give your name and contact information to your school nurse or health aide and he or she will arrange for me to call you.

Sincerely,

Susanne W. Cook, RN
Doctoral Candidate
University of Arizona
College of Nursing

6219 East Star Valley Street
Mesa, AZ. 85215
ATTENTION PARENTS

Looking For Adolescents With Asthma

To Participate in a Dissertation Research Project about Making Everyday Asthma Symptom Self-Management Choices

Parents/Guardians of Interested Adolescents
Please Call Sue Cook for More Information @ 480-830-0124

Or Notify the Clinic Nurse or School Nurse and Sue Will Call You.

Thank You
Sue Cook, RN, PhD(c)
APPENDIX F

Informed Consents
SUBJECT CONSENT FORM
THE UNIVERSITY OF ARIZONA HEALTH SCIENCE CENTER

ADOLESCENT RISK PREFERENCE AND ASTHMA SYMPTOM SELF-MANAGEMENT: ASSESSING SYMPTOM MANAGEMENT SCENARIOS

I AM BEING ASKED TO READ THE FOLLOWING MATERIAL TO ENSURE THAT I AM INFORMED OF THE NATURE OF THIS PROJECT FOR ASSESSING ADOLESCENT SYMPTOM SCENARIOS AND CHOICES FOR THE ABOVE NAMED RESEARCH STUDY AND OF HOW MY CHILD WILL PARTICIPATE IN IT, IF I CONSENT FOR HIM OR HER TO DO SO. SIGNING THIS FORM WILL INDICATE THAT I HAVE BEEN SO INFORMED AND THAT I GIVE MY CONSENT. FEDERAL REGULATIONS REQUIRE WRITTEN INFORMED CONSENT PRIOR TO PARTICIPATION IN THIS RESEARCH PROJECT SO THAT I CAN KNOW THE NATURE AND RISKS OF MY CHILD'S PARTICIPATION AND CAN DECIDE TO PARTICIPATE OR NOT PARTICIPATE IN A FREE AND INFORMED MANNER.

PURPOSE

I am being invited to participate and to voluntarily allow my child to participate in an interview to assess eight potential asthma symptom scenarios for use with a method for making choices known as the standard gamble technique. The interview scenarios relate to asthma symptom self-management choices made during adolescence. The purpose of the interview is to assess the scenarios and the standard gamble technique from the perspective of adolescents who are already making symptom choices related to asthma. Input from these adolescents will provide valuable information as to the realistic nature of the eight symptom scenarios and the standard gamble method presented in the research project.

SELECTION CRITERIA

My child was selected to participate in this discussion because he or she is between the ages of 13 and 17 years, is able to read and understand English, and has a medical diagnosis of asthma. Approximately forty (40) adolescents will be enrolled in this project.

PROCEDURE

If I agree to allow my child to participate, my child will participate in a 60-minute audio-taped interview related to eight potential interview scenarios about asthma symptom self-management during adolescence. In this interview my child will be asked to make a hypothetical choice in each scenario and rate each scenario based upon its realistic nature. The principal investigator for the above named research project will conduct the interview at a time and location of convenience for my child and me. My child will be given the opportunity to interview separately from me. My child may stop the interview at any time.

RISKS

There are no known risks associated with this assessment interview.

BENEFITS

There are no direct benefits associated with this assessment interview. However, the interview will provide valuable information as to the realistic nature of the symptom self-management content presented in the interview scenarios and of the use of the standard gamble technique for making choices from the adolescent perspective.
CONFIDENTIALITY

All information associated with this project will be held in confidence and only Susanne Cook, RN, PhD(c), Principal Investigator, and Dissertation Co-Chairpersons Ki Moore, RN, PhD and Julie Erickson, RN, PhD will have access to the information. My child will be assigned a number, and the number will be on all documents rather than his or her name. Only Susanne Cook will know the identity of my child. The results of this project may be published at a later date, however my child's name will not be used in any publication. All audiotapes and transcripts will be kept in a locked cabinet in room #224 at the University of Arizona College of Nursing.

PARTICIPATION COSTS AND SUBJECT COMPENSATION

There will be no cost for my child to participate in this project. For participating in the interview, my child will receive a $15.00 gift certificate to a bookstore.

CONTACT

I can obtain further information from Susanne Cook, RN, PhD(c) at (480) 201-1498. If I have questions about my rights as an assessment interview participant, I may call the Human Subjects Committee office at 626-6721.

AUTHORIZATION

BEFORE GIVING MY CONSENT BY SIGNING THIS FORM, THE METHODS, INCONVENIENCES, RISKS, AND BENEFITS HAVE BEEN EXPLAINED TO ME AND MY QUESTIONS HAVE BEEN ANSWERED. I MAY ASK QUESTIONS AT ANY TIME AND I AM FREE TO WITHDRAW MY CHIL FROM THE ASSESSMENT INTERVIEW AT ANY TIME WITHOUT CAUSING BAD FEELINGS. THIS CONSENT FORM WILL BE FILED IN AN AREA DESIGNATED BY THE HUMAN SUBJECTS COMMITTEE WITH ACCESS RESTRICTED TO THE PRINCIPAL INVESTIGATOR, SUSANNE COOK, RN, PhD(c), OR AUTHORIZED REPRESENTATIVE OF THE COLLEGE OF NURSING. I DO NOT GIVE UP ANY OF MY LEGAL RIGHTS OR THOSE OF MY CHILD BY SIGNING THIS FORM. A COPY OF THIS SIGNED CONSENT FORM WILL BE GIVEN TO ME.

______________________________
Child's Name

______________________________
Parent/Legal Guardian Date

INVESTIGATOR

I have carefully explained to the parents/guardians and adolescents the nature of the above project. I hereby certify that to the best of my knowledge the person who is signing this consent form understands clearly the nature, demands, benefits and risks involved in his/her participation and his/her signature is legally valid. A medical problem or language or educational barrier has not precluded this understanding.

______________________________
Signature of Investigator Date

Susanne Cook, RN, PhD(c).
MINOR SUBJECT'S ASSENT FORM
THE UNIVERSITY OF ARIZONA HEALTH SCIENCE CENTER

ADOLESCENT RISK PREFERENCE AND ASTHMA SYMPTOM SELF-MANAGEMENT: ASSESSING SYMPTOM MANAGEMENT SCENARIOS

Your mother/father or legal guardian has told me it was OK for you to participate in this interview project. You are being asked to voluntarily answer interview questions about asthma symptom self-management choices during adolescence. If you say yes, you will participate in a 60-minute audio taped interview about eight everyday symptom self-management scenarios you may have faced with your asthma. You will be asked to rate each scenario and make a hypothetical choice in each scenario. There are no right or wrong answers to the questions or choices in the interview. You may stop being part of the interview at any time. In this dissertation project I will be interviewing approximately 40 adolescents who have asthma. Would you like to participate?

Subject's Name

________________________________________________________________________

Subject's Signature  Date

________________________________________________________________________

Investigator's Signature  Date
Susanne Cook, RN, PhD(c).
(520) 626-3280 or (602) 502-1146
APPENDIX G

Data Collection Forms
ADOLESCENT RISK PREFERENCE AND ASTHMA SYMPTOM SELF-MANAGEMENT: ASSESSING SYMPTOM MANAGEMENT SCENARIOS

INDIVIDUAL SCORING WORKSHEET

PART I: Demographic and Symptom Information Form

Please answer each question to the best of your ability. Just ask if you need me to clarify or explain anything.

PART II: Directions for the Standard Gamble Technique

Read Interview Script

PART III: Directions for the Content Validity Index Scoring

I will ask you to answer the following questions for each scenario.

A. Does this asthma symptom scenario sound like one an adolescent might face?
B. Does this asthma scenario pertain to __________________________ (scenario domain)?
C. Is this asthma scenario written clearly?
D. Are the choices in this scenario reasonable?
E. Are the outcomes in this scenario reasonable?

Please use this answer scale with questions A-E for each scenario.

1. Not at all, this item is not something an adolescent might face.
2. No, this item would need major changes to reflect something an adolescent might face or I do not know is it is something an adolescent might face.
3. Yes, this item is something an adolescent might face but it needs to be changes slightly.
4. Yes most definitely, this for sure reflects something an adolescent might face.
PART IV Open-ended Questions

A. Tell me about a time when you had to make a choice about preventing/treating asthma symptoms?

B. Tell me about a time when you were faced with a gamble related to preventing/treating asthma symptoms from exercise? (Risk: Change risk with each scenario)

C. Questions about SGT

1. Today I asked you to make hypothetical symptom management choices using a method called the standard gamble technique. Tell me what you think about teenagers using this method to make choices.

2. Some people say the standard gamble method that we used today is simple and easy to understand, other people say that it is difficult and hard to understand. Tell me what you think about this method?
SCENARIO #1: avoiding triggers (EIB)

Point of Indifference ____________________________
Utility Score ____________________________

A. Does this asthma symptom situation sound like one that a teenager might face? Score ________

B. Does this asthma situation pertain to avoiding triggers related to exercise? Score ________

C. Is this asthma symptom management situation is written clearly? Score ________

D. Are the alternatives or choices in this situation reasonable? Score ________

E. Are the consequences in this situation reasonable? Score ________

1.1. Tell me about a time when you had to make a choice about preventing asthma symptoms? (Domain: Prevention)

1.2 Tell me about a time when you were faced with a gamble related to preventing asthma symptoms from exercise? (Risk: Avoiding triggers related to exercise)

Interviewer Observations:
SCENARIO #2: modifying activities with onset of symptoms

Point of Indifference ________________

Utility Score _______________________

A. Does this asthma symptom situation sound like one that a teenage might face? Score _______

B. Does this asthma management situation pertaining to modifying activities related to symptoms? Score _______

C. Is this asthma symptom management situation is written clearly. Score _______

D. Are the alternatives or choices in this situation reasonable? Score _______

E. Are the consequences in this situation reasonable? Score _______

2.1 Tell me about a time when you had to make a choice about treating asthma symptoms? (Domain: Treatment)

2.2 Tell me about a time when you were faced with a gamble related to modifying your activities after your symptoms began? (Risk: modifying activities with onset of symptoms)

Interviewer Observations:
SCENARIO #3: avoiding triggers (Allergies)

A. Does this asthma symptom situation sound like one that a teenage might face? Score

B. Does this asthma management situation pertaining to avoiding triggers related to allergies? Score

C. Is this asthma symptom management situation is written clearly. Score

D. Are the alternatives or choices in this situation reasonable? Score

E. Are the consequences in this situation reasonable? Score

3.1. Tell me about a time when you had to make a choice about preventing asthma symptoms? (Domain: Prevention)

3.2. Tell me about a time when you were faced with a gamble related to preventing asthma symptoms from allergies? (Risk: Avoiding triggers related to allergies)

Interviewer Observations:
Adolescent # ________________________________  Date ________________________________

SCENARIO #4: seeking non-medical help from parents, adults, peers

Point of Indifference ________________________________

Utility Score ________________________________

A. Does this asthma symptom situation sound like one that a teenage might face?  

Score __________

B. Does this asthma management situation pertaining to seeking non-medical help from parents, adults, peers?  

Score __________

C. Is this asthma symptom management situation is written clearly.  

Score __________

D. Are the alternatives or choices in this situation reasonable?  

Score __________

E. Are the consequences in this situation reasonable?  

Score __________

4.2 Tell me about a time when you had to make a choice about treating asthma symptoms. (Domain: Treatment)

4.1 Tell me about a time when you were faced with a gamble related to seeking help from parents, adults, peers for your symptoms. (Risk: Seeking non-medical help from parents, adults, peers)

Interviewer Observations:
SCENARIO #5: removing self from triggers prior to onset of symptoms

Point of Indifference

Utility Score

A. Does this asthma symptom situation sound like one that a teenage might face? Score

B. Does this asthma management situation pertaining to removing self from triggers prior to onset of symptoms? Score

C. Is this asthma symptom management situation is written clearly. Score

D. Are the alternatives or choices in this situation reasonable? Score

E. Are the consequences in this situation reasonable? Score

5.1 Tell me about a time when you had to make a choice about preventing asthma symptoms? (Domain: Prevention)

5.2 Tell me about a time when you were faced with a gamble related to preventing asthma symptoms by removing yourself from your triggers before your symptoms began. (Risk: Removing self from triggers prior to onset)

Interviewer Observations:
SCENARIO #6: seeking medical care

A. Does this asthma symptom situation sound like one that a teenage might face? Score____
B. Does this asthma management situation pertaining to seeking medical care? Score____
C. Is this asthma symptom management situation is written clearly. Score____
D. Are the alternatives or choices in this situation reasonable? Score____
E. Are the consequences in this situation reasonable? Score____

6.1. Tell me about a time when you had to make a choice about treating your asthma symptoms. (Domain: Treatment)

6.2. Tell me about a time when you were faced with a gamble related to seeking medical help to treat your asthma symptoms. (Risk: Seeking medical care)

Interviewer Observations:
SCENARIO #7: safe use of medications after the onset of symptoms

Point of Indifference ____________________________

Utility Score __________________________________

A. Does this asthma symptom situation sound like one that a teenage might face? Score ______

B. Does this asthma management situation pertaining to safe use of medication after the onset of symptoms? Score ______

C. Is this asthma symptom management situation is written clearly? Score ______

D. Are the alternatives or choices in this situation reasonable? Score ______

E. Are the consequences in this situation reasonable? Score ______

7.1. Tell me about a time when you had to make a choice about treating asthma symptoms. (Domain: Treatment)

7.2. Tell me about a time when you were faced with a gamble related to treating your asthma symptoms by safely using medications. (Risk: Safe use of medications)

Interviewer Observations:
Adolescent #: ____________________________ Date: ____________________________

SCENARIO #8: initiate early treatment after the onset of symptom

Point of Indifference __________________________

Utility Score __________________________

A. Does this asthma symptom situation sound like one that a teenage might face? Score ______

B. Does this asthma management situation pertaining to initiating early treatment after the onset of symptoms? Score ______

C. Is this asthma symptom management situation is written clearly? Score ______

D. Are the alternatives or choices in this situation reasonable? Score ______

E. Are the consequences in this situation reasonable? Score ______

8.1. Tell me about a time when you had to make a choice about treating asthma symptoms. (Domain: Treatment)

8.2. Tell me about a time when you were faced with a gamble related to starting treatment as soon as your symptoms began. (Risk: initiate early treatment after the onset of symptom)

Interviewer Observations:
Final Two Questions:

C1. Today I asked you to make hypothetical symptom management choices using a method called the standard gamble technique. Please tell me what you think about teenagers using this method to make choices.

C2. Some people say the standard gamble method that we used today is simple and easy to understand, other people say that it is difficult and hard to understand. Tell me what you think about this method.
Adolescent # ___________  Date ___________

ADOLESCENT RISK PREFERENCE AND ASTHMA SYMPTOM SELF-MANAGEMENT: ASSESSING SYMPTOM MANAGEMENT SCENARIOS

GENERAL DEMOGRAPHIC AND SYMPTOM INFORMATION FORM

1. Date of Birth ______________________

2. Gender ______________________

3. County of Residence: Maricopa ______________________

4. Asthma is classified as: mild intermittent, mild persistent, moderate persistent, and severe persistent based upon the intensity and frequency of asthma symptom episodes. Although these terms may not be familiar to you, how would you classify your asthma? ______________________

5. If you stopped all of your medication how often would you have asthma symptoms?
   - All the time (Continuous)
   - Every day but not all day long
   - More than 2 times a week but less than every day
   - Less than 2 times per week

6. How often do you have night time asthma symptoms:
   - 4, 5, or 6 times a week
   - 1, 2, or 3 times a week
   - 2, 3, or 4 times a month
   - Less than 2 times a month

7. Do you take asthma medications every day? Yes _________ No _________
   If yes, tell me about them: Medications (name, dose) ______________________

8. On average how often do you use asthma rescue medications?
   - Less than three times a week
   - Less than five times a week
   - Every day
Adolescent # ____________________________ Date ____________________________

9. How many times during the past month have you:
   a. missed school because of your asthma __________
   b. missed a physical activity because of your asthma __________
   c. missed a social event because of your asthma __________
   d. reported to the school nurse because of your asthma __________
   e. visited the doctor’s office for a scheduled visit because of your asthma __________
   f. visited the doctor’s office for an unscheduled visit because of your asthma __________
   g. visited the emergency room because of your asthma __________
   h. been admitted to the hospital because of your asthma __________

10. During the past month have you experienced an asthma episode?
    Yes _____ No _____
    a. What symptoms did you experience? ________________________________
    b. How long did your symptoms last? ________________________________
    c. What asthma action did you initiate?
       ________________________________
    d. Were your actions guided by a written asthma action plan?
       Yes _____ No _____
       If yes, who gave you the action plan? ________________________________
    e. Did you seek help with managing your symptoms? Yes _____ No _____
       If Yes, who helped you ________________________________

11. How would you rate the frequency of your symptoms now compared to one year ago?
    Less Frequent    About the Same    More Frequent
APPENDIX H

Interview Script for Asthma Symptom Scenarios
ADOLESCENT RISK PREFERENCE AND ASTHMA SYMPTOM SELF-MANAGEMENT: ASSESSING SYMPTOM MANAGEMENT SCENARIOS

Adolescent Discussion Script

Introduction (dialogue)

Hi, my name is Sue Cook and I am a doctoral student at the University of Arizona, College of Nursing. My research area of interest is adolescent asthma symptom self-management decision-making.

The following asthma symptom self-management scenarios were developed from informal discussions with nurses in clinics and schools, young adults with asthma, parents of children with asthma, and my personal past experiences as a nurse and a parent of an adolescent with asthma. I am now seeking information from the real experts, the adolescents who have asthma. As an adolescent with asthma you have knowledge that will help me and eventually help other adolescents who have to make choices involving unknown outcomes that relate to their asthma symptoms.

Directions (dialogue)

I will record your comments to be sure I have not missed anything important. We will read each scenario together and then I will ask you questions about the scenario. There are no right or wrong answers to the questions or to the choices you make related to the scenarios. This is not a test about what you would do in any of these scenarios. The scenarios are just situations that involving choices with unknown outcomes that adolescents with asthma might have to face in their everyday lives. I am trying to evaluate the scenarios to see if they are realistic and if they are written clearly. The scenarios will be presented to you as situations where you are forced to make a choice between two different alternatives for action. You will be asked to choose between the two alternatives. One alternative will have an outcome that is certain. That means you will know the outcome of choosing that alternative. The other alternative will have two possible outcomes and you will not know for sure what the outcome would be if you chose that alternative. However, you will be given estimates of the chances that you will face with each unknown outcome.

Let me give you an example of a situation that is not related to asthma but is related to making a choice between two alternatives when you do not know for sure all of the outcomes. This may not be a situation you have faced but it is one where you or any other teenager might be able to estimate the chances they could face. Imagine you are at a party with friends. Your parents dropped you off at the party on their way to a movie. Your parents are returning to pick you up at 10:30 PM. At 9:30 PM several of your good friends announce that they are going to leave the party to drive to another party. They ask you to go along with them. You really want to go with your friends but you have no way to call your parents for permission. You are now faced with a choice that has two alternatives: 1) stay at the party or 2) go with your friends. If you choose alternative #1 and stay at the party you know for sure (with 100% certainty) that you will be there when your parents arrive to pick you up but you also know that you will not have fun because
If your friends have left. If you choose alternative #2 and you leave the party you are taking a chance because you are not sure of the consequences or outcomes of this action. The consequences will be different for each person but they might include both positive and negative ones. For example, a positive consequence might be that you have a great time with your friends and your parents are not upset that you left the first party. A negative one might be that you do not have a good time and your parents are very upset with you because you were not where you were supposed to be at 10:30 when they arrived. This is a choice an adolescent might face and as he or she tries to choose between alternative 1 and alternative 2. Adolescents might think about the possible consequences by weighing the possibilities or assigning a percent to each. For example an adolescent might think there is a 10% chance that his or her parents will get angry or maybe another adolescent might think that there is an 80% chance that they will get angry. This is one method that people, including adolescents, might use to make choices by considering their chances for certain outcomes. Do you understand what I am saying?

If no, then I will explain it again. If yes, I will go forward.

In this study you will be asked to choose alternatives in eight scenarios that relate to asthma symptom management. Each scenario will each have two alternatives from which you can choose. One alternative will have a consequence that is for sure or 100% certain just like in the example related to staying at the party. The second alternative will have two possible consequences or outcomes with pre-assigned percentages or weights. Again using the example related to the party, if I assign a 10% chance to one of the outcomes (ie that your parents would get angry) then the other outcome would have a 90% chance (ie your parents would not get angry). These would always add up to 100% between the two unknown outcomes. During this interview I will ask you to choose between an alternative that has a sure outcome (100%) and an alternative with a gamble (it has two outcomes with pre-assigned percentages). You will be asked to choose based upon what you believe you would do in that scenario with those assigned percentages. During the interview I will change the percentages and I will ask you to make several choices with each scenario. I will use this chance board for presenting the asthma scenarios and changing the percentages. Do you think you understand all that I have said?

If no, I will explain the process again.

Do you have any questions?

Answer any questions that are asked.

OK... Let's get started.
Scenario 1 Domain (Prevention: Avoiding triggers) Exercise

Your asthma is triggered by physical exercise. You are a member of a soccer team. You always take your medicine with you to the games but you leave it in your gym bag on the sidelines. The game is a fast moving game and is currently tied 2 to 2. The coach suddenly yells for you to get into the game right away. You know that if you tell the coach you have to first take time to use your inhaler, he will tell someone else to go into the game in place of you. You really want to play. What would you do in this situation?

Choice 1 Tell the coach you must use your inhaler before playing. You know for certain (100%) that you will not develop asthma symptoms, but you will not play in the game.

Choice 2 Don't tell the coach and you go into the soccer game to play with a (X%) chance (a) that you will not develop asthma symptoms, and a (1-X%) chance (b) that you will develop severe asthma symptoms while playing.

Scenario 2 Domain (Treatment: Modifying activities with onset of symptoms) Smoke

Your asthma is triggered by exposure to smoke. You are out with friends riding in a car having a great time. Your friends begin to smoke in the car. You begin to wheeze and you use your inhaler but you still feel some chest tightness. You know that if you ask your friend to stop smoking they will get frustrated with you, you have two choices. What would you do in this situation you do?

Choice #1 Ask your friend to stop smoking or let you out of the car (knowing for certain that your friends will get angry, but you will not develop asthma symptoms).

Choice #2 Don't ask your friends to stop smoking and remain in the car with a chance that (a) you will not develop additional asthma symptoms from the smoke and you will have a good time, and a chance that (b) your will develop severe asthma symptoms from the smoke.
Scenario #3. Domain (Prevention: Avoiding triggers) *Food Allergies*

You are invited to a sleep over party at a friend’s house. It is about 8:00 PM and everyone is having fun. You didn’t eat dinner before you came to the party and you are very hungry. Your friend’s mom has made pizza for a late dinner. You are very allergic to cheese and tomatoes and there is nothing else to eat, you have two choices. What would you do in this situation?

**Choice #1** Go without eating dinner and look forward to the breakfast meal (knowing for certain that you will not develop asthma symptoms, but you will be hungry.

**Choice #2** Eat the pizza with a chance that (a) you will not develop asthma symptoms, and a chance that (b) your will develop severe asthma symptoms.

Scenario 4 Domain (Treatment: Seeks non-medical help from parents, adults, peers) *Cold Air*

You have been invited to go on a three-day winter trip to the mountains about 6 hours away from home (to ski, hike, or camp). You are excited. You have been to the mountains in the past and you know that cold air and high altitudes are triggers for your asthma symptoms. In all of your excitement you forget to pack your rescue inhaler. You realize that it is missing after you arrive at the lodge and just before everyone is about to leave for the first day’s activities, you have two choices. What would you do in this situation?

**Choice #1** Remain at the lodge to call your parents and arrange for obtaining another inhaler. (you know for certain that you will not develop asthma symptoms and will not get to ski that day).

**Choice #2** Go on the day’s activities anyway and plan to call your parents at the end of the day with a chance that (a) you will not develop asthma symptoms, and a chance that (b) you will develop severe asthma symptoms while up on the mountain.
Scenario 5 Domain (Prevention: Removes self from triggers) *Fumes*

You are sitting in history class near a person who is very popular and a new friend. He or she is talking with you about an exciting event that is coming up real soon. After a few minutes you realize that he or she is wearing perfume/aftershave. You know you are very allergic to odors like this. You have two choices. What would you do in this situation?

Choice #1 Ask the teacher if you can sit in another seat (knowing for sure that you will not develop asthma symptoms, but you will not be able to talk with your friend and you will have to explain why you changed seats).

Choice #2 Remain where you are sitting in with a chance that (a) you will not develop asthma symptoms, and a chance that (b) you will develop severe asthma symptoms from continued exposure to the perfume.

Scenario 6 Domain (Treatment: Seeking Medical Care) *Viral Illness*

You have been asked to go to the Homecoming Dance. You have a ‘cold’ and you wake up wheezing and not feeling well on the day of the dance. You increase your medication as outlined on your asthma action plan but as the time for the dance draws near you are really not feeling well. You know that if you tell your mom how you feel she will insist that you see your physician during their evening hours, you have two choices. What do you do in this situation?

Choice #1 Tell your mom you are ill. (knowing that you will receive the medical attention you need but you will not be seen and treated in time to attend the dance).

Choice #2 Don’t tell your mom and go to the dance with a chance that (a) your symptoms will not worsen and you will have a good time at the dance, and a chance that (b) you will develop severe asthma symptoms at the dance.

Scenario 7 Domain (Treatment: Safe use of medications) *Laughing/Exercise*
You go with friends to the mall. You must be home in two hours. You are having a
great time laughing and fooling around when you begin to wheeze. You discover that you
forgot your rescue inhaler. You sit down and try to relax but after a few minutes you
know that you need your medication. Your house is just a few minutes from the mall but
you do not want to leave your friends and go home. A friend offers you his inhaler. The
color of his inhaler looks the same as yours but there is no medication name on the
canister, you are faced with two choices. What would you do in this situation?

Choice #1 Go home to use your own inhaler (knowing for sure that your symptoms
will be relieved because it is your reliever medication)

Choice #2 Stay at the mall and use your friend’s inhaler with a chance that (a) your
friend’s inhaler will relieve your symptoms because it is the same medication,
and a chance that (b) you will develop severe asthma symptoms because it is the
wrong medication.

Scenario 8. Domain (Treatment: Initiate early self-treatment) Allergy/Animals

You are allergic to dogs. Your friend has a dog and you are invited to a party at
his house. You go to the party and for the first few hours you are feeling fine and having
a really great time. Suddenly you begin to cough and wheeze. You begin to use your
inhaler and realize that after one puff it is empty. You live about 15 minutes from the
party and know that if you leave to get a new inhaler, you will miss the rest of the party
because it will end before you can return, you have two choices. What would you do in
this situation?

Choice #1 Leave the party to go home for your needed medications (knowing for
certain that your symptoms will be relieved, but you will not be able to return to
the party)

Choice #2 Stay at the party with a chance that (a) your symptoms will go away and
a chance that (b) your symptoms will get worse and you will become very ill.

The same procedure as noted after scenario 1a will be used to measure the utility
score and to answer the interview questions.
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