

**NATIONAL RESEARCH COUNCIL/INSTITUTE OF MEDICINE
BOARD ON CHILDREN, YOUTH, AND FAMILIES
COMMITTEE ON ADOLESCENT HEALTH AND DEVELOPMENT**
Frontiers of Research on Adolescent Decision Making—
Contributions from the Biological, Behavioral, and Social Sciences

The Relevance of Models of Adolescent Decision Making to the Analysis of
Positive Development Processes and Pathways to Risk Prevention

Background Paper by

James Jaccard, PhD

Department of Psychology

Florida International University

Final Draft
November 30, 2004

Prepared for the Planning Meeting on
Adolescent Decision Making and Positive Youth Development:
Applying Research to Youth Programs and Prevention Strategies
April 2004

For further information contact:

Dr. James Jaccard
Professor of Psychology
Florida International University
Department of Psychology
11200 SW 8th St.
Miami, FL 33199
Phone: (305) 348-2000
Email: jjaccard@fiu.edu

INTRODUCTION

Adolescents make decisions every day. These decisions run the gamut from such mundane matters as the type of clothes to wear to decisions that can impact the entire course of the adolescent's life, such as the decision to ride home in a car with a friend who has been drinking alcohol or the decision not to attend college. Some of the decisions adolescents make are thoughtful in the sense that the adolescent carefully and systematically thinks through and evaluates all of the relevant decision options before making a choice. Other decisions are routine and done with little or no thought, such as turning the lights out as one is going to bed. Impulsive decisions also are made with little thought or reflection, as the adolescent decides to act on his or her first impulse or intuition.

Given how pervasive decisions are in the lives of adolescents, theories and research on adolescent decision making should be a fruitful area of analysis for those trying to develop policies and programs to help adolescents lead healthy, positive lifestyles and to avoid the negative consequences of problem behaviors. The linking of the knowledge base on decision making with the knowledge base on intervention design should yield benefits for both areas of endeavor. The present paper outlines such linkages. We begin by considering adolescent development more broadly and the general focus that intervention programs have adopted in their attempts to better the lives of adolescents. We then characterize current frameworks for analyzing adolescent decision making, emphasizing two major research traditions. In these latter sections, we explore implications and linkages to intervention design. Finally, we revisit the current knowledge base on adolescent decision making with an emphasis on the developmental trajectories of decision making.

Adolescent Development and the General Focus of Intervention Programs

Adolescent Diversity

Adolescents typically are identified by their chronological age, usually 11 to 19 years old. This time of life is further differentiated into subcategories, such as early adolescence (11 to 13 years of age), middle

adolescence (14-16 years of age), and late adolescence (17 to 19 years of age). Social scientists do not agree on the age range that defines adolescence or its subcategories and this is reflected by inconsistent use of the terms in the research literature. Indeed, some developmentalists eschew the use of chronological age as a marker of adolescence, preferring instead to think of adolescence as a state of transition between childhood and adulthood that has no clear age boundaries (Kagan & Coles, 1972; Lipsitz, 1977). Despite this, most agree that the world of adolescents is diverse and dynamic and that there are major developmental differences across the periods or stages of adolescence. The environment and developmental status of an 11 or 12 year old middle school student is so distinct from that of a 17 or 18 year old high school senior that it almost defies logic to think of them as being in the same group, “adolescence.” Our discussions of early, middle, and late adolescence will correspond roughly to the age ranges noted above, while fully recognizing that adolescence cannot be defined adequately in terms of simple chronological age categories. Accordingly, we occasionally venture outside of these age ranges to characterize trends in adolescent decision making.

Five Major Domains of Adolescent Development.

The field of developmental science has emphasized five major domains of adolescent development. *Physical development* focuses on the physical growth of the adolescent and includes such areas as physical maturation, physical stature, physical health, and nutrition. *Cognitive development*, focuses on the development of cognitive skills, including memory, reasoning, problem solving, creativity, and intellect. *Emotional development* focuses on the development of self esteem, positive self regard and the effective control and regulation of emotions. *Social development* emphasizes social relationships, friendship patterns, social interactions, interactions with siblings, social skills, communication skills and peer group dynamics. *Moral development* focuses on the acquisition and development of fundamental values for life as well as moral reasoning, moral knowledge, spirituality, and religious orientations.

There exist large bodies of research in each of these domains that spans the age range of adolescence. One way of thinking about adolescent development is in terms of a matrix that crosses the five areas of development with the different subcategories of adolescence, as in Figure 1. We refer to this as the *developmental matrix*. Each cell of the matrix defines active research areas in the social science literature.

For example, there is research designed to provide perspectives on physical growth and physical health during early adolescence, middle adolescence, and late adolescence. This matrix characterization, of course, does not do justice to the field, because a great deal of research focuses on multiple categories of the matrix and the interrelations between them. For example, there is a body of literature on the relationship between physical development and how this affects the emotional and social development of adolescents. Similarly, many researchers are interested in developmental progressions, namely how phenomena change from childhood to early adolescence, to middle adolescence and to late adolescence. Nevertheless, the developmental matrix represents a heuristic for thinking about major facets of adolescent development.

The developmental matrix captures the essence of one major approach to intervention design, namely interventions falling under the rubric of Positive Youth Development, (e.g., Catalano, Berglund, Ryan, Lonczak & Hawkins, 2002; Flay, 2002; Flay, Allred, & Ordway, 2001; Kirby, 1984). Positive Youth Development (PYD) interventions focus not on classic adolescent problem behaviors but instead promote features of development captured by the developmental matrix, such as social skills, moral competence, self efficacy, belief in the future, prosocial norms, bonding, resilience, spirituality, and general orientations toward life that serve the positive development of youth. Advocates of PYD programs argue that such efforts can reduce the incidence of adolescent problem behaviors because the core factors that underlie positive youth development also represent root causes of negative risk activities. The advantage of PYD programs is that they address fundamental common causes of multiple problem behaviors while at the same time impacting variables that promote positive youth development.

Research on adolescent decision making has potential for making contributions to PYD programs. As children learn and use the tools and skills for effective decision making, they should be able to make decisions that impact their physical development, their social development, their cognitive development, their emotional development, and their moral development in positive ways. The kinds of skills that are necessary to be a good decision maker and the kind of skills that are required to mature positively in the different developmental domains overlap.

Adolescent Problem Behaviors

A different approach to the design of adolescent interventions is to focus on adolescent problem behaviors. Although the list of such behaviors is lengthy, six of the more dominant categories in terms of existing research are presented in Figure 2, which represents the *problem behavior matrix*. The category of *sexual behavior* focuses on unintended pregnancy, the spread of sexually transmitted diseases (including HIV), and related issues surrounding reproduction and sexual activity, such as pregnancy resolution decisions. *Alcohol and drug use* focuses on factors contributing to the initiation and continuous use of alcohol and drugs, the development of alcohol abuse and drug abuse, and the effects of alcohol and drugs on development and effective functioning. *Tobacco use* focuses on adolescent smoking behavior and the use of smokeless tobacco products. *Delinquency* focuses on criminal behavior and juvenile delinquency. *Suicide and depression* focuses on suicidal tendencies and fundamental mood and affective disorders in youth. *Nutrition and eating disorders* focus on the eating habits of youth and their links to obesity and unhealthy outcomes, as well as disorders such as bulimia and anorexia. The different problem behaviors can be crossed with the subcategories of adolescence, yielding a matrix that typifies large bodies of research on problem behaviors, analogous to Figure 1. As with the developmental matrix, many studies focus on linkages between different cells of the matrix, including developmental progressions of problem behavior across early, middle and late adolescence as well as connections between multiple problem behaviors.

Intervention programs based on this model do not focus on adolescent development in general but instead on preventing or reducing the occurrence of a specific problem behavior. For example, there exist school based interventions aimed at preventing sexual risk taking (Jemmott & Jemmott, 2000; Jemmott, Jemmott, & Fong, 1998), preventing smoking (Sussman, Dent, Burton, Stacy, & Flay, 1995; Sussman, Dent, Stacy, Sun, Craig, Simon, Burton, & Flay, 1993), preventing drug use (Flay, 2000), and preventing alcohol use (Chou, Montgomery, Pentz, Rohrbach, Johnson, Flay, & MacKinnon, 1998). In contrast to the core philosophy of PYD programs, the assumption is that although the different problem behaviors share some common determinants, there also are unique influences that must be taken into account to effectively address the behavior. Support for this proposition is reflected by the fact that studies of multiple problem behaviors

observe an average correlation between behaviors of approximately 0.35. This suggests that the variance in problem behaviors is predominately unique rather than shared (see Guilamo-Ramos et al, 2004 for a relevant meta-analysis).

Research on adolescent decision making also should have implications for the design and implementation of problem behavior-specific interventions. Decision theories provide perspectives on how adolescents make decisions to engage in problem behaviors. To the extent that we understand the bases of such decisions, then more effective intervention design should be possible.

Adolescent Contexts

A final way of characterizing intervention efforts is not in terms of the type of outcome variable they focus on but rather in terms of the broad based contexts that define the general environment of adolescents. Intervention efforts either attempt to change these contexts on the assumption that such changes produce adolescent behavior change, or they embed an intervention within a context as a major mechanism of intervention delivery. Major contexts studied by developmentalists include (1) the *family context*, which focuses on parent-adolescent relationships, the impact of different family structures on the adolescent, including family size, the presence of same sex versus opposite sex siblings, single-parent versus two parent families, blended families, and the relevance of different family environments; (2), the *school context*, which focuses on the impact of school on adolescent development, including teacher-student relations, the general school environment, classroom and school structures, educational standards, and adolescent school performance as a whole; (3) the *community context*, which focuses on the impact of the neighborhood and community characteristics on adolescent development, including the role of community resources, community demographics, and community structure, (4) the *workplace context*, which focuses on the impact of work and the work environment on adolescent development; (5) the *media context*, which focuses on the impact of television, radio, magazines, newspapers, and computers on adolescent development; and (6) the *cultural context*, which focuses on the impact of the cultural environment on adolescent development, including issues related to ethnicity, diversity, multiculturalism, and gender. As with the development and problem behavior matrices, we can cross the different contexts with the different periods of adolescence,

yielding a matrix with cells that typify large bodies of research in the field of adolescence. Context-based interventions are aimed at influencing the contexts within which adolescents live on the assumption that changing these contexts impact either adolescent development, adolescent problem behaviors, or both.

Adolescent decision making is influenced by the context in which those decisions are made. Decision making variables thus represent key mediators by which contextual variables impact adolescent behavior and, by the same token, contextual variables moderate and shape the way decision making variables impact behavior.

The development matrix, the problem behavior matrix, and the context matrix convey a general but somewhat simplistic sense of the ways adolescent interventions have been approached. The multi-level nature of intervention efforts and theories of adolescent development is typified by efforts that integrate perspectives across the different matrices. For example, research that examines how the family context influences the social development of adolescents, which, in turn, influences drug use on the part of the adolescent represents features of all three matrices. It is within the context of these three matrices that we will discuss linkages between decision making research and intervention design.

Adolescent Decision Making: An Overview

Considerable research has been conducted on decision making. This research is multidisciplinary in character, spanning such disciplines as anthropology, economics, education, history, management sciences, marketing, mathematics, political science, psychology, and sociology, to name a few. A computerized search of PsychInfo, a major bibliographic data base, revealed 30,484 “hits” for the phrase “decision making.” When the additional search term of “adolescent” was added, the number of hits was 835, or about 2.7% of the originally identified documents. When the initial set of documents was restricted to the age group “adolescent” using population age restrictions, the number of hits was 2,292, or about 7.5% of the original set. These hits included a substantial number of studies on college students. Thus, although there is an impressive body of research on decision making in general, only a small fraction of these studies address adolescent decision making.

Adolescents often are thought to be poor decision makers relative to adults. However, few studies have explicitly compared adult decision making processes with those of adolescents and studies that have done so

yield mixed results (e.g., Quadrel, Fischhoff & Davis, 1993; Byrnes, 2002; Jacobs & Klaczynski, 2002; Klaczynski, 2001; Halpern-Flesher & Cauffman, 2001; Cauffman & Steinberg, 2000; Ganzel, 1999). It has been amply documented that many adults are subject to bias and suboptimal decision strategies (Hastie & Dawes, 2001) and there is no reason to think that many of these biases are not operative during adolescence as well. But the research base documenting this is sparse. The same state of affairs exists when comparing the decision processes of early adolescents, middle adolescents, and late adolescents, a topic we return to later. To be sure, there is a plethora of studies documenting information processing changes across childhood and adolescence, suggesting that as adolescents mature they are better able to think abstractly, to think hypothetically, to think about thinking itself, to think relatively rather than absolutely, and to be more multidimensional in their thinking (Adams & Berzonsky, 2003). However, the number of studies that have explicitly explored the emergence during adolescence of decision biases and tendencies as identified in the formal field of decision making is few (e.g., Klaczynski, 2001a, 2001b; Ormond, 1991).

Research on decision making has evolved from two broad traditions. First, there is a research base that has its roots in cognitive science, economics, and cognitive and mathematical psychology. It represents what we refer to as the traditional approach to decision making. Second, there is a research base that derives from social psychology, sociology and developmental science that applies social, psychological, and developmental constructs to the analysis of decision making. Although there are exceptions, the researchers within these areas tend to work independent of one another, focusing on somewhat different issues and different theoretical frameworks in their analysis of adolescent decision making. In the next sections, we outline the basics of both approaches. We develop implications of the approaches for intervention design along the way and highlight these at the conclusion of each section.

Social-Psychological Approaches to Adolescent Decision Making

An Overarching Framework

Several years ago, officials at the National Institute of Mental Health (NIMH) noted that hundreds of funded studies on health-related behaviors continually relied on a small set of influential theories in social, developmental, and health psychology. These theories were the Theory of Reasoned Action as developed by

Fishbein and Ajzen (1975; Ajzen & Fishbein, 1981), Bandura's social learning theory (Bandura, 1975, 1986), various versions of the Health Belief Model (Janz & Becker, 1984; Rosenstock, Strecher, & Becker, 1988), self regulation theories (Kanfer, 1996), and Triandis' (1972) theory of subjective culture. NIMH sponsored a workshop in which the primary architects of each theory (Fishbein, Bandura, Becker, Kanfer, and Triandis) met for intensive interactions over the course of a week in order to develop a common theoretical framework that integrated the core constructs of each approach (Fishbein, Triandis, Kanfer, Becker, Middlestadt, & Eichler, 2001; Fishbein, personal communication). The theorists were unable to generate a unified theory that was acceptable to all participants. Although there were strong disagreements about how variables should be conceptualized and operationalized and what the causal relationships among the variables should be, a general framework did emerge that the theorists agreed represented important classes of variables that a comprehensive theory should include. We present this general framework here, with modifications of our own to clarify the conceptual categories and to make the linkages with adolescent decision making apparent.

The core variables were organized into two sequences. The first sequence focused on the immediate determinants of behavior. One central variable in this sequence was that of *behavioral intention*. The basic proposition is simple: If you want to predict if someone is going to perform a behavior, simply ask the person if s/he intends to do so. If the response is "yes," then the person probably will perform the behavior and if the response is "no," the person probably will not perform the behavior. The concept of behavioral intention is closely linked to that of a behavioral decision: If a person decides s/he will perform a behavior, then s/he probably will perform the behavior and if the person decides s/he will not perform a behavior, then s/he probably will not perform it. Thus, a behavioral intention is analogous to a behavioral decision.

The theorists recognized that people do not always do what they intend to do. Sometimes people intend to do something but do not follow through on it and sometimes people do things they did not intend to do. Many factors influence the extent to which a behavioral intention (BI) measured at one point in time will forecast future behavior (B) at a later point in time. One such factor is the time interval between the measurement of the behavioral intention and the observation of behavior. In general, if one assesses a behavioral intention very close in time to the behavior that is to be performed, one will be more accurate at

predicting behavior, everything else being equal. Asking adolescents if they are going to attend a workshop one month from now will not be as predictive as asking them the same question a half hour before the workshop. Obviously, it is not the passage of time per se that impacts the BI-B relationship. Rather, something must transpire during that time interval to affect behavioral performance. For example, perhaps adolescents are exposed to new information that result in them changing their behavioral intentions, rendering the originally measured intention irrelevant.

Performing a behavior often requires knowledge, skills, and abilities. In order to use a condom correctly, an adolescent must have knowledge about how to do so. Without such knowledge, it is unlikely he will use the condom correctly. To prevent a person from forcing or pressuring the adolescent to do something, the adolescent must have appropriate refusal skills.

Sometimes performance of a behavior is dependent on other people or events. An adolescent may intend to go to Harvard for college, but if he or she is not accepted for admission by Harvard, the behavior will not occur. There may exist environmental constraints that make it impossible for the individual to perform the behavior even though behavioral intent is present. An adolescent who finds himself without a condom available can't use it even though he intended to.

Sometimes we intend to do something, but out of force of habit, do something else. A person may intend to drive a new route to work but finds herself inexplicably driving the same old route she has driven every day for the past year. An adolescent may intend to stop smoking cigarettes but finds himself lighting one up while walking home from school, simply out of force of habit.

Some behaviors are complex and require a great deal of preparation or "substeps" before the behavior can be performed. For example, to use birth control pills, an adolescent must make an appointment at a clinic, she must go to the clinic, she must obtain a prescription from a doctor, she must get the prescription filled, and then she must take the pills home and remember to take them. If the probability of accomplishing a given step in this action sequence is low, then the probability of behavioral performance is low, even given strong initial intent to perform the behavior.

Sometimes we simply forget to do things we intend to do. Sometimes an adolescent will mislead us and tell us s/he intends to do something when, in fact, s/he has no intention of doing it all.

In sum, if we assume a truthful report of behavioral intent, a behavioral intention or behavioral decision will most likely to translate into behavior if (1) there is a short time interval between the measurement of intention and observation of behavior and (2) if the behavior is under the volitional control of the individual. Figure 3 presents a representation of most of these moderating influences on the extent to which behavioral intentions or behavioral decisions translate into behavior. These variables constitute the first core sequence of variables emphasized by the five theorists.

The implications of this analysis are important for interventions designed to influence adolescent behavior. Often interventions try to convince an adolescent to perform or not perform a behavior. However, it is possible that the adolescent already has made the decision to behave in a way that is consistent with the message promoted by the program. Failure to perform the behavior may not be because of the lack of intent to do so. Rather, there may be one or more factors that prevent adolescents from translating those intentions into behavior. In such cases, the focus of the intervention should be on determining and addressing these factors rather than trying to convince the adolescent to do something s/he already has decided to do. For further discussion of the behavioral intention-behavior relationship, see Ajzen and Fishbein (1981) and Jaccard (1975).

The second aspect of the framework focuses on the determinants of behavioral intention or factors that impact an adolescent's decision to perform a behavior. According to the theory, there are five classes of variables that serve as the immediate psychological determinants of a decision to perform a behavior and these are illustrated in Figure 4. We discuss each in turn.

Behavioral Beliefs or Expectancies. Adolescents perceive certain advantages and disadvantages of performing a behavior. A given perceived advantage or disadvantage has two components. First, there is an *expectancy*, which refers to how likely the adolescent thinks it is that performing the behavior will, in fact, lead to the advantage or disadvantage in question. For example, an adolescent might perceive that having sex with her boyfriend will strengthen their relationship. The expectancy in this case, also called a *behavioral*

belief, is the subjective probability on the part of the adolescent that having sex with her boyfriend will, in fact, strengthen their relationship. The second component is an *outcome evaluation*. This refers to how positive or negative the advantage or disadvantage is perceived as being. Some advantages are thought to be more positive than others and some disadvantages are thought to be more negative than others. The individual's perception of the degree of positivity or negativity of a given consequence also is important to take into account.

Individuals typically perceive multiple advantages and disadvantages of performing a behavior. The net effect of these are summarized in an overall judgment of favorableness or unfavorableness about performing the behavior, often called an attitude toward performing the behavior. Thus, for each of m consequences associated with the behavior, there is a behavioral belief (i.e., subjective probability or expectancy) and an outcome evaluation. The overall attitude toward performing the behavior is some function of these multiple expectancies and outcome values:

$$\text{Attitude toward behavior} = f(e_1, e_2, \dots, e_m, v_1, v_2, \dots, v_m)$$

where Attitude is the overall felt favorability/unfavorability an individual has about performing a behavior, e is a subjective probability (or expectancy) that performing the behavior will, in fact, lead to a consequence j , and v is how positive or negative consequence j is perceived as being. Theorists disagree about the nature of the function relating expectancies and outcomes values to attitudes (Anderson, 1981; Fishbein & Ajzen, 1975), but as a general rule, individuals feel more favorably about performing a behavior if they perceive it as definitely leading to highly positive consequences and definitely not leading to negative consequences. Individuals feel more unfavorable about performing the behavior if they perceive it as leading to highly negative consequences and definitely not leading to positive consequences.

In general, one can change an adolescent's attitude toward performing a behavior and potentially his or her decision to perform it either by (1) changing the subjective probability associated with a given consequence, (2) changing the outcome value associated with a given consequence (by convincing an adolescent that the consequence is not as bad or good as s/he thinks), or (3) adding a consequence to the adolescent's belief system that she had not thought about before.

Social Norms. A second potentially relevant determinant of an adolescents decision to perform a behavior focuses on the social and normative pressures s/he feels to perform the behavior. Two types of normative influence are studied, injunctive norms and descriptive norms (Cialdini, 2003). Injunctive norms refer to perceptions of the extent to which important others approve or disapprove of the adolescent performing the behavior. Descriptive norms refer to perceptions of base rates, or how many of one's peers are performing the behavior.

In terms of injunctive norms, adolescents perceive approval or disapproval from different referents, such as one's mother, one's father, or one's boyfriend/girlfriend. The different referents may have conflicting opinions about what the adolescent should do. The overall normative pressure to perform the behavior is some function of these differing opinions:

$$NP = f(NB_1, NB_2, \dots NB_k)$$

where NP is the overall normative pressure to perform the behavior and NB_k is the strength of the opinion of referent k , as perceived by the adolescent, that the adolescent should or should not perform the behavior. The various NB are called *normative beliefs*.

Some theorists argue that it is important to take into account the adolescent's motivation to comply with a given referent as well (Fishbein & Ajzen, 1975). A relevant referent may have a strong opinion about what the adolescent should do, but if the adolescent has little motivation to comply with or please that referent, then the overall normative pressure felt by the adolescent will be lessened. Thus, we modify the above expression to reflect motivations to comply with referents, such that

$$NP = f(NB_1, NB_2, \dots NB_k, MC_1, MC_2, \dots MC_k)$$

where MC_k is the motivation to comply with referent k and all other terms are as previously defined. In general, adolescents perceive a more supportive normative environment for performing the behavior if others who are important to them unanimously agree that they should do so and the adolescent is highly motivated to comply with those others. One can change the overall normative pressure to engage in a behavior (and possibly, in turn, the decision to perform the behavior) by (1) changing a given referents opinion about what the adolescent should do, (2) changing the adolescent's *perception* of that referent's opinion, (3) rendering

the referent irrelevant to the decision in the eyes of the adolescent decision maker, or (4) making the opinion of the referent more important to the decision maker.

The second type of normative influence, descriptive norms, has been linked to risk behaviors in a wide variety of studies on adolescent problem behaviors (e.g., Borsari & Carey, 2003). Descriptive norms refer to perceptions of how many of one's peers are performing the behavior. There are different base rates for different referent groups. For example, the perceived base rate might be different for one's close friends, one's general circle of friends, the people at one's high school, the people in one's community, and the nation as a whole. The overall base rate factor, BRF , is some function of perceptions of these more specific group base rates:

$$BRF = f(BR_1, BR_2, \dots, BR_k)$$

where BRF is the overall base rate factor for performing a behavior, and BR_k is the perceived base rate of performing the behavior for some group, k . The social psychological literature on base rates is complex. Sometimes higher base rates lead to increases in behavioral intent, and sometimes lower base rates do. A useful theory for understanding the impact of base rates on behavioral decisions is Deviance Regulation Theory (Blanton, 2003). An intervention strategy that is becoming popular on college campuses for reducing binge drinking is "social norming," which is based on the premise that changing the perceived base rate of binge drinking on campus will affect binge drinking behavior (e.g., Perkins, 2003)

Self Efficacy. Another possible determinant of an adolescent's decision to perform a behavior is the extent to which the adolescent feels s/he can be successful at performing the behavior should s/he try to (Ajzen, 1991). If an adolescent does not think s/he can do something, s/he will not bother trying to do it. The primary determinants of global judgments of self-efficacy are perceptions of the obstacles that impede behavioral performance and one's judged ability (or perceived power) to overcome those obstacles. For example, an "obstacle" to going to college might be that of obtaining good grades in high school and an individual may be uncertain of his or ability to overcome this obstacle. Individuals can perceive multiple obstacles. Associated with each obstacle is a belief that the obstacle can be overcome. The overall judged self-efficacy is some function of these perceptions:

$$SE = f(O_1, O_2, \dots, O_n)$$

where SE is the overall judged efficacy for performing the behavior, and O is the judged likelihood of overcoming some obstacle, n . One can change overall judged self efficacy and possibly, in turn, the adolescent's decision to perform a behavior by (1) convincing an adolescent that a perceived obstacle is not really operating, (2) convincing the adolescent that s/he can overcome the obstacle if it occurs, or (3) the converse of these if the intent is to reduce self efficacy.

Self Concept and Social Images. Adolescents tend to be concerned about the images they project to others. Adolescence is a time when youth are focused on identity formation, and, in later adolescence, transitioning to an adult identity that is positively valued. As such, the consequences of performing a behavior for the social image that one wants to project as well as how consistent that image is with one's own self image is a potentially important influence on adolescent decision making.

Social image influences can be conceptualized using the framework of social prototypes (Gerrard, Gibbons, Reis-Bergan, Trudeau, Vande-Lune, & Buunk, 2002; Thornton, Gibbons & Gerrard, 2002). Social prototypes refer to images that individuals have of the kind of person who performs a certain behavior (e.g., the image of the kind of person who gets drunk). Of interest is how positively or negatively this image is perceived as being and the extent to which a person's own self-concept maps onto that prototype. If there is a close match between the person's self-concept and the prototype of the person who performs the behavior, and if the prototype is positive in character, then the adolescent will be more likely to decide to perform the behavior, everything else being equal.

The similarity between an adolescent's self-conception and the conception of a social prototype on a given dimension can be defined as $S_k - P_k$, where S_k is the extent to which the adolescent believes he or she is characterized by attribute k and P_k is the extent to which the social prototype is characterized by attribute k . (Note: other functions than a difference function could be used to represent this disparity). Let U_k refer to the perceived utility of attribute k , or the extent to which it is perceived as being positive or negative. The overall social prototype factor is some function of these discrepancies and utilities:

$$SP_j = f(S_1 - P_1, S_2 - P_2, \dots, S_k - P_k, U_1, U_2, \dots, U_k)$$

where SP_j is the overall social prototype factor for performing the behavior, and all other terms are as previously described. In general, individuals will be more likely to perform a behavior if their image of themselves maps onto the social prototype of the kind of individual who performs that behavior on dimensions that are positive in character. One can change this prototype factor by (1) changing how one perceives oneself on a given dimension, (2) changing how one perceives the kind of person who performs the behavior on a given dimension, or (3) changing the utility or perceived positiveness of an attribute.

Emotions and Affect. The important role that emotions have on adolescent decision making has become increasingly recognized in recent years (Caffray, Mistine & Schneider, 2000; Slovic, 2001; Steinberg, 2003). Whereas many of the previous variables are cognitive-based, this class of variables emphasizes the affective aspects of behavioral decisions. Emotions typically are viewed as constructs distinct from mood states and more stable affective conditions, such as depression. Emotions tend to be more intense and more short-lived. Many theories of emotion emphasize two core facets, the degree of arousal and the affective direction of that arousal, positive or negative (Mano, 1991; Watson & Tellegen, 1985). Recent research suggests that there may be specific physiological correlates of different emotions and that these physiological reactions need to be taken into account as well (May et al., 2004). In general, individuals who have a strong negative emotional reaction to performing a behavior will be less inclined to do so and those who have a strong positive emotional reaction to performing a behavior will be more inclined to do so (Triandis, 1972).

In sum, how do adolescents make behavioral decisions? According to the social psychological approach to decision making, they do one or more of the following: (1) they think about the advantages and disadvantages of performing a behavior, (2) they consider the normative pressures to perform the behavior, including whether important others approve or disapprove of their actions as well what their peers are doing, (3) they take into account their ability to perform the behavior and the obstacles that may impede behavioral performance, (4) they consider the social images they will project if they perform the behavior and how this fits with their own self concept, and (5) they consider how the behavior “feels” to them emotionally and affectively. Not all of these factors are considered for all decisions. Sometimes only a subset of them are taken into account. Some decisions will be driven solely by emotions, others solely by what important others

think the adolescent should do, or various combinations of one or more of the factors. Nor are adolescents viewed as deliberately and thoughtfully considering the above factors each time they are faced with a choice. Rather, somewhat crude, psychological summaries of these constructs reside in memory that can be activated instantly and without conscious thought.

Even once an adolescent makes a decision, the decision will not necessarily translate into behavior. Using Figure 3, whether the decision translates into behavior depends on (6) whether the adolescent has the knowledge, skills and abilities to perform the behavior, (7) the environmental constraints and facilitators operating to impede or facilitate behavioral performance, (8) the salience of the behavior to the adolescent and the behavioral cues to action and (9) habit strength and automatic processes.

Hundreds of studies have been conducted on the above variables and each has a rich theoretical, psychometric, and empirical base. A large number of studies have successfully applied variations of the framework to early, middle, and late adolescents (e.g., Morrison et al, 2002a, b; Gilliam et al., 2001; Flores, Tischann & Marin, 2002). Although other variables may impact adolescent decisions independent of the above constructs, the aforementioned constructs promise to account for substantial portions of the variability in many of the decisions that adolescents make and the behaviors they perform.

Individual and Behavioral Differences in Variable Importance. An important point in the above summary is the idea that the relative importance of the model constructs in influencing adolescent decisions and behavior can differ from one population to another and from one behavior to another. For some populations, social norms might be a primary determinant of behavioral decisions, whereas for other populations, their influence may be trivial. Or, for some populations, social images and self concept may be of particular importance but irrelevant for other populations. An important first step for intervention design is to conduct the necessary research to determine which variables are most important in influencing adolescent behavior for the target population of interest so that these variables can be the focus of the intervention. The theory argues against a “one size fits all” mentality and encourages interventionists to appreciate the individual differences that are likely to operate in terms of variable relevance. The kinds of variables that one may need to address for middle school, inner city youth can be quite distinct from those that one may need to address

for older, suburban high school youth. The social psychological decision framework provides a roadmap for the kinds of variables that interventionists should be thinking about as they attempt to understand and impact the choices that adolescents make.

Distal Variables. Another important facet of the theory is that the ten classes of variables discussed represent the more immediate determinants of adolescent behavior. More distal variables may impact behavior (such as the adolescent contextual variables, hormonal changes, gender, ethnicity), but their effects should be reflected in or mediated by the model components. Variables like media exposure, sensation seeking tendencies, academic achievement, felt invulnerability, and depression all can impact behavior, but their effects should be traceable through one or more of the model components. If this is true, then the decision framework can be a useful aid to helping scientists understand the effects of more distal variables on adolescent behavior. For example, suppose it is found that for a given population, parent-adolescent communication about having sex tends to focus on the potential dangers of contracting AIDS and that parents who talk with their children about this issue produce changes in adolescent perceptions about the link between sexual behavior and the possibility of contracting AIDS. If these perceptions are irrelevant to the adolescent's behavior (because the behavioral intention is primarily influenced by social norms and image considerations), then the parental communications will have minimal impact on the behavior of the adolescent. Formal analyses using the theoretical framework would elucidate such a dynamic by showing an influence of parent-adolescent communication on expectancies but not behavioral intentions. As another illustration, it is possible that parent-adolescent communication has systematic effects on an adolescent's decision or intention to engage in a behavior (e.g., use condoms), but that this decision fails to translate into behavior because of environmental constraints that prevent the decision from translating into behavior (e.g., lack of availability). Under such a scenario, if a researcher correlates a communication measure with behavior, then no systematic relationship will be found due to the mitigating influences of the environmental constraints. The researcher might conclude that the communication variable is of limited value. However, systematic relationships would be observed if the investigator related the communication variable to behavioral intentions and such intentions are crucial because having positive intent usually is a necessary but

not sufficient condition for behavioral performance. The communication variable is indeed of central importance because of its relationship to behavioral intentions, but the importance of the variable for behavior will not manifest itself until the environmental constraints blocking behavioral performance are removed. The decision making framework represents a useful tool for intervention design, analysis and evaluation because it provides a comprehensive set of mediators through which the effects of interventions can be traced.

Dyadic and Group Decisions. Many adolescent behaviors, such as sexual intercourse, require two cooperating individuals. Each individual brings to a given interaction episode a set of intentions, skills, habits, attitudes, expectancies, normative beliefs, emotions, self conceptions, and feelings of self efficacy. The orientations that one couple member has on one or more of these variables may take precedence over those of the other couple member in determining couple behavior. The relative impact of a given member's orientations on couple behavior can vary as a function of distal variables (e.g., gender, alcohol use) or features of the behavior (its time, target, or setting). Through discussion and communication, one partner may change the orientations of the other. A complete analysis of dyadic interaction and decision making requires mapping the decision framework onto the orientations of each individual couple member and then examining how couple dynamics impact the contributions of each component on couple behavior. Multidisciplinary analyses of such dyadic decision making can be found in the edited volume by Brinberg and Jaccard (1995).

Additional Perspectives on Linkages to Intervention Design

The social-psychological approach to adolescent decision making has greatest relevance to intervention efforts where specific behaviors are the target of change. As such, it is most applicable to interventions on specific problem behaviors (or specific positive behaviors). The theory can help to pinpoint the variables that the intervention should focus on so as to maximize behavior change in the target population. The theory is of less utility for interventions that focus on positive youth development, because such interventions are aimed at more distal and broad based constructs that are assumed to impact multiple adolescent behaviors simultaneously. This does not mean that the theory is irrelevant to the design and implementation of positive youth development interventions. For example, such programs may focus on increasing parent-adolescent

bonding by encouraging parents to perform certain behaviors with respect to their child. Applications of the framework to the parents of the adolescents can provide insights into factors that need to be considered to help parents enact those behaviors (see, for example, Jaccard, Dittus & Gordon, 2000). For contextual based interventions, the theory can provide a useful set of mediators to help understand how and why changes in adolescents contexts impact (or fail to impact) adolescent behavior.

When applying the decision making framework to adolescent behaviors, it is important to determine if the intervention outcome is a behavior in its own right or, instead, is an end state or outcome of a behavior (Ajzen & Fishbein, 1981; Jaccard & Blanton, 2004). Variables like the occurrence of an unintended pregnancy, the contraction of an STD, or weight gain or weight loss are not behaviors. Rather, they are physical states that are the result of the performance of one or more behaviors. The loss of weight is not a behavior in the sense that it is an overt action that one performs. Rather, it is a change from one physical state to another physical state that is the result of behaviors like exercising, eating less, and consuming diet pills. If the focus is on an outcome rather than a behavior, then the interventionist needs to specify those behaviors that impact the outcome and then focus analysis on those behavioral mediators.

Traditional Approaches to Adolescent Decision Making

Traditional approaches to decision making emphasize the analysis of rational (and irrational) decision activities. Much of the traditional literature compares normative models (what people ought to do) with descriptive models (what people actually do). We focus discussion initially on thoughtful decision making to help structure our presentation of the core issues and ideas in traditional decision making frameworks. We then consider the case of “quick decisions,” where thoughtful deliberation is not possible.

Decision theorists analyze the decision process in terms of seven activities that individuals may or may not engage in. The first activity is *problem recognition*, where an individual determines that a problem state exists and that a decision must be made. The second activity is *goal identification*, where the individual considers those features of the choice situation that he or she wants to optimize. For example, in the case of choosing a method of pregnancy protection, goal identification would be analogous to specifying an idealized, optimal birth control method that has all of the characteristics one wants to optimize (e.g., high

effectiveness, no side effects, convenient to use, acceptable to one's sexual partners). The third activity is *option generation*, where the individual identifies the behavioral options that are available and that constitute the "choice set." The fourth activity is *information search*, in which the individual seeks out information, either about what additional options might be available or about the properties and characteristics of one or more of the options under consideration. The fifth activity is the explicit evaluation of the information one has about the various options followed by the *making of a choice*. Sixth is *behavioral translation*, where the individual translates the decision into behavior. Finally, is *post-decision evaluation*, where the individual reflects on the decision after the chosen option has been enacted and evaluates the decision in light of the outcomes it has produced. Not all of these activities are performed by an individual, nor must they be performed in the sequence described. However, they represent a comprehensive accounting of decision activities that individuals may engage in as they approach the choice process in a thoughtful and deliberate way. The activities serve as a benchmark from which deviations from good decision making practices can be evaluated.

Most research on traditional decision making has focused on the fifth activity, namely the strategies people use to evaluate options and make a choice given the information at hand. There has been lesser but considerable research on information search and on people's tendencies to distort subjective probabilities relative to objective probabilities. Although other decision activities, such as problem recognition, goal identification, option generation, and post decision evaluation have received lesser attention from those in the fields of cognitive science and economics, there are pockets of research in social, clinical, personality, and developmental psychology that bear on them and that will be mentioned in the sections below.¹

Problem Recognition and Problem Framing

Before a decision can be made, individuals must recognize that a decision is necessary or that a problem needs to be addressed. Some decisions are such that the problem is readily apparent and the individual has no choice but to make a decision. When offered a cigarette to smoke for the first time by a friend, a choice on the part of the adolescent is dictated by fiat. Other problem situations are more nuanced and require that adolescents correctly frame the parameters of the problem. For example, an adolescent who experiences an

unintended pregnancy must consider options of pregnancy resolution (keeping the child, placing the child for adoption, abortion). Postponing a decision can eliminate the possibility of certain options, so adolescents must appreciate the time dependent nature of the problem. Unfortunately, adolescents sometimes procrastinate, delaying decisions they should be facing now. There exists a sizeable research literature on procrastination, including the identification of its personality correlates, descriptions of the reasons people procrastinate, and practical strategies that people can use to overcome procrastination (e.g., Buehler, 2003; van-Erde, 2003; Boice, 1997). Most of this research has been conducted with college students and adults, but much of it probably has implications for adolescents. Tykocinski, Ruffle & Bradley (2003) suggest that for many decision making tasks, the longer people are allowed to wait before having to decide, the more they will prefer to wait rather than decide immediately. In addition, individuals who choose to wait tend to be ones who are less confident about committing themselves to a decision.

Some adolescents are oblivious to the problems brewing around them, while others are keenly sensitive to them and, indeed, anticipate and deal with problems before they occur. Decision making perspectives underscore the need for researchers and interventionists to understand and address basic mechanisms underlying problem recognition and problem framing.

Problem recognition mechanisms are a core feature of interventions designed to assist adolescents in stopping addictive behaviors, such as alcohol and drug use. A crucial step for such individuals is recognizing and admitting that they have a substance abuse problem (e.g., Agnostinelli, et. al, 2004; Simpson & Tucker, 2002). At a more general level, Zwaanswijk et al. (2003) review the adolescent literature on parental and adolescent problem recognition and how it relates to both formal and informal help seeking. There also exists large literatures on parental problem recognition processes and the use of mental health services (e.g., Teagle, 2002). Problem recognition also represents a fundamental concept in the popular Stages of Change model that is the basis of many intervention efforts (e.g., Hulton, 2001). For a discussion of the cognitive mechanisms underlying problem recognition, see Pretz, Naples and Sternberg (2003).

Goal Identification

Once an individual recognizes that a decision must be made, the individual needs to think about one's goals relative to that decision. Goals serve as standards against which different behavioral options are judged or evaluated (Austin & Vancouver, 1996). Goals also organize the information search process as they impact the kinds of information that individuals seek out and attend to. Goals are hierarchical in structure, with proximal goals being linked to broader, more basic goals. A student's goal of doing well on the next exam in a class may derive from a broader goal of obtaining a good grade in the class which, in turn, may derive from an even broader goal of doing well in academics. The goal of doing well in academics may, in turn, be linked to a more fundamental value structure that positively evaluates high income, occupational prestige, and intellectual achievement (Austin & Vancouver, 1996). Goals differ in their content, their time frame, their complexity, their difficulty, their specificity, their controllability, their degree of realism, and their importance, and all of these goal dimensions can impact the choices one makes (Galotti, 2002).

Although the nature of goals and values has received considerable attention in the social sciences, decision theorists typically focus on proximal goals that are tied directly to the decision at hand. Proximal goals can be unstable and may change from one moment to the next depending on what is salient to an individual at a particular point in time (Fischhoff & Quadrel, 1995; Ajzen & Fishbein, 1981). In a series of experiments, Dittus et al. (2004) had college students list factors that would be important to them in making decisions about different topics at two points in time with a two week interval between assessments. Only about 50% of the factors mentioned at time 1 were mentioned at time 2. A primary aim in decision counseling is to help individuals prioritize their goals, to be systematic in the application and use of those goals when making choices, and to think through the importance of a given goal in its own right.

Option Generation

When making decisions, adolescents must generate or recognize the different behavioral options that are available to them. In some cases, the behavioral options are finite, straightforward, and reasonably easy to identify. For example, when choosing a method of pregnancy protection, there are about a dozen or so methods of birth control that are available. By contrast, other decisions require individuals to be creative about generating possible solutions. The choice set is not straight-forward and thought must be given to

creative solutions to the problem at hand. Still other decisions have an overwhelming number of behavioral options (e.g., choosing a career) and the adolescent is faced with the task of somehow reducing the set to a manageable number to think about. There is surprisingly little research on the option generation process in decision making research. Most studies simply define the option set that is of substantive interest.

Gettys et al. (1986, 1987) suggest that people generate options by first searching memory using retrieval cues, with the resulting options being those that match the cues that are most salient to the individual. Klein and Wolf (1998) emphasize not only the retrieval process but also constructive processes that co-occur as one searches memory. Johnson and Raab (2003) suggest that search for options in memory is done sequentially through spreading activation, as different nodes in memory are activated and search is shaped by association strengths with other nodes. Keller and Ho (1988) view option generation as closely linked to the evaluation of options, although Johnson and Raab (2003) do not see the link as essential. Johnson and Raab (2003) argue that many individuals rely on a “Take-the-First” heuristic, where they generate a few initial options and work with those rather than trying to generate all possible options or an exhaustive set of options.

The generation of an initial option is influenced by the above factors as well as experience (Klein et al. 1995). Once the initial option is identified, spreading activation through memory dictates the other options that are generated from it, so whatever option comes to mind first is important. As new options are generated, each subsequent one decreases in similarity to the initial option. Johnson and Rob (2003) suggest that there is a tendency to view the first generated option as the best and that preference often is a function of the serial position of an option during the option generation process.

Research on creativity also is relevant. Research has addressed factors related to the number of ideas generated (Valacich et al, 1995) and the uniqueness of those ideas (Paulus & Yang, 2000). Much of this research tries to derive techniques for improved creative generation (Smith, 1998). Finally, classic research on artificial intelligence has examined “search through problem spaces” via algorithms and these also may be applicable to understanding the option generation process (e.g., Newall & Simon, 1972).

Information Search

Given a set of options, the decision maker needs to gather information about those options for purposes of making a final choice. Hastie and Pennington (1985) distinguish between external search for information in the environment and internal search for information from memory. For the latter, current models suggest that recall from memory is the result of searches through associative networks (e.g., Anderson & Lebiar, 1998; McClelland & Rumelhart, 1985) involving both spreading activation and simultaneous activation mechanisms. Research on the availability heuristic (Tversky & Kahneman, 1973) suggests that people often rely on information that “easily comes to mind” and that is readily accessible from memory. The problem is that information that is most accessible from memory is not necessarily the most appropriate information on which to base a decision. Factors influencing availability of a piece of information to working memory include how recently the information was accessed on prior occasions, how distinct the information is, the vividness of the information, and a host of encoding and retrieval mechanisms that govern memory more generally (e.g., Sia et al., 1997; Hamel et al, 1980). Mood states at the time people encode information have been found to impact recall of information as have mood states during the time of recall (e.g., Bower, 1981).

The external search of information is influenced by many factors. Those with more knowledge about a topic tend to have a better idea about the kinds of information that they need to seek out and often are more efficient in their search strategies (e.g., Yates, 1990). However, metacognitive processes also are relevant, such as how knowledgeable people *think* they are about a topic. In general, people who think they know a great deal about a topic are less likely to search out new information about that topic (Radecki & Jaccard, 1995). Unfortunately, the correlation between how knowledgeable people think they are about matters and how knowledgeable they actually are is sometimes weak (e.g., Radecki & Jaccard, 1995; see also the research on the calibration of subjective probabilities, e.g., Brenner, 2003).

Early research on information search used information display boards (IDBs) in which the various decision options were presented as the columns of a matrix and the rows were informational dimensions on which the options could vary. The cells of the matrix contained the information about a given option on a given dimension and this information was hidden from the research participant. The participant then told the experimenter which information s/he wanted to see and the information acquisition process was studied in

terms of the amount, nature and sequence of information acquisition. Payne (1976) found that as the number of options increased in the choice set, people tended to acquire a smaller fraction of the available information and this also was true as the number of informational dimensions increased. With many options to choose from, people tend to use across option-within dimension search strategies whereas with few options to choose from, the search strategies tend to be within options and across dimensions (Senter & Wendell, 1999). Individual differences also have been noted, with, for example, anxious individuals tending to search out more information than less anxious individuals (Nichols-Hoppe & Beach, 1990). Research also has explored the pursuit of useless information (e.g., Bastardi & Shafir, 1998, 2001). Developmental studies suggest that the search strategies adolescents use are more efficient than those used by young children (Davidson, 1991).

Much of the above research was conducted prior to the availability of the internet and it is somewhat ironic that a criticism of the approach was that information in the display boards was “too easy” to obtain and not reflective of the costs of information search in the real world. The introduction of the internet has made information accessible to adolescents in unprecedented ways. Unfortunately, research on how adolescents use the internet for purposes of information acquisition is in its infancy.

Integration of Information and Making a Choice

A large research literature exists on how people combine information for purposes of making a choice, although the vast majority of this work has focused on adults rather than adolescents. A classic model that has inspired much of this work is that of subjective expected utility theory (Savage, 1954; Hastie & Dawes, 2001). It is beyond the scope of this paper to consider the many facets of SEU theory and its variants. The basic idea is that each decision option has associated with it a set of consequences or outcomes that will occur with a given (and sometimes unknown) probability if the option is chosen. Each consequence or outcome has a *utility* associated with it, representing its worth or value to the decision maker. An overall subjective expected utility can be defined for each option which is the sum of the expected utilities for that option, i.e., the sum of the probability times the utility across outcomes. The decision maker chooses the option that has the highest overall subjective expected utility (SEU) associated with it.

There are many issues that have been addressed in this framework. We highlight three of them. The first is the nature of the subjective probability that links an option with a consequence or outcome. The second is the integration rule by which the multiple weighted utilities are combined for defining the overall value of the option. The third is the idea of choosing the option that maximizes the overall utility.

Subjective Probabilities. In the ideal world, the decision maker knows the true probabilities that link an event or action to a given consequence, i.e., there is perfect correspondence between the decision maker's subjective probability that performing the behavior leads to a consequence and the actual probability of that happening. Unfortunately, this often is not the case. A tremendous amount of decision research has explored factors that bias judgments of probabilities, documenting the information processing limitations of humans with respect to probabilistic information. The list is extensive. People tend to underpredict compound probabilities relative to the probabilities of the individual events comprising the joint event. People tend to assume conditional symmetry, that is $p(A|B) = p(B|A)$, when it may not exist. People tend to be conservative in their revisions of probability given new information, as dictated by Bayes theorem. People tend to attribute probabilities to random processes that do not respect the randomness involved. Wishful thinking can distort probabilities. Mood states can distort probabilities. Feelings of invulnerability can distort probabilities. Contexts can distort probabilities. For example, adolescent males rate the probability of contracting an STD from having unprotected sex as lower after they have viewed photos of highly attractive women as opposed to more plain women just prior to making the ratings (Blanton & Gerarrd, 1997). Table 1 presents a partial listing of some of the heuristics and biases that have been studied in the decision making literature that can bias probability judgments or that, in one or another, compromise the decision making process. A useful contribution of decision research is that it can identify important biases that are likely to operate and then steps can be taken to correct them. Millstein (2003) presents a useful analysis of subjective probabilities in the context of adolescent risk perception more generally.

Integration Rules. The overall utility or value of an option is assumed by different variants of multiattribute decision models to be a summed function of the subjective probabilities times the utilities. However, people do not always combine information in this fashion. Two general classes of integration rules

have been described in the decision literature, compensatory rules and non-compensatory rules. A compensatory integration rule is where the decision maker allows the positive consequences associated with a given option to “cancel out” or “compensate for” the negative consequences. In essence, there is a balancing and trading-off of positive versus negatives. A non-compensatory integration rule does not incorporate such a dynamic. If an option has an unacceptable value on a certain dimension or leads to just one consequence that is negative, then the option is rejected by the decision maker no matter how many positive consequences are associated with it. Some people only want to avoid bad things, so they prefer options that minimize the negatives without regard to the positives. Others only want to experience positives irrespective of the negatives and prefer options that maximize the positives regardless of the negatives. A value of decision research is that it recognizes the wide range of integration rules that individuals use as they approach decision tasks and provides methods for discerning the different integration rules (e.g., Anderson, 1981).

Choosing Options that Maximize Expected Utilities. Classic decision theories assume that individuals strive to optimize, that is, they choose options that have the highest overall utility associated with them. However, several theorists have noted that individuals sometimes use “satisficing” rather than optimizing strategies (Todd & Gigerrenzer, 2003; Schwartz et al., 2002; Hastie & Dawes, 2001). In satisficing strategies, individuals set a minimum utility value that an option must surpass in order for that option to be deemed acceptable. If the overall utility of a behavioral option falls below this threshold, then it is rejected as a viable course of action. As opportunities for pursuing different options occur over time, the individual chooses to pursue the first option encountered that meets or surpasses the minimum threshold. Such a satisficing rule can result in a choice that is not optimal in the sense that the chosen option may not have the highest utility from those in the entire choice set. Rather, the option was the first “acceptable” option that came along. Many decisions are dynamic and evolve over time, and individuals may “satisfice” when an acceptable opportunity avails itself. An important contribution of decision theory is the recognition of different functions relating option utilities to overall choice.

Translating the Decision Into Behavior

Once a choice is made, the individual must enact the decision, i.e., translate it into behavior. We already have discussed many of the factors that interfere with this in the context of the social psychological model of decision making. The main additional point we emphasize here is that translating decisions into behavior often requires planning. Scholnik and Friedman (1997) characterize planning as a complex set of conceptual activities that anticipate and regulate future behavior. The decision maker must look to the future and think about the steps that are necessary to perform the behavior that he or she desires. It also requires the ability to foresee obstacles that may arise and to develop strategies for dealing with those obstacles. The research program by Gollwitzer (1999; Gollwitzer, Fujita & Oettingen, 2004) has shown that strategizing about how to deal with future obstacles can have noteworthy effects on subsequent behavior and the translation of decisions into behavior.

Post Decision Evaluation

After the choice has been made and the behavior enacted, good decision makers reflect on the process, evaluate the choice in light of the consequences that have happened, and consider altering one's course of action if things are not working out as planned. Decision theorists have identified numerous phenomena that impede this decision activity. One is the phenomenon of sunk costs (Hastie & Dawes, 2001). This refers to the tendency to weigh too heavily what one has invested into the chosen course of action instead of evaluating the new potential courses of action (including the current one) in terms of what they portend for the future. The analogy is to an organization that becomes committed to a faulty program because it has invested heavily in it in the past, failing to recognize that money can now be better spent and with greater benefit on alternative programs. Another bias is that of selective exposure to information. Research has shown that people tend to prefer and seek out information that is consistent with their initial choices and behavior (e.g., Jonas et al., 2001). Finally, psychologists have documented a tendency for people to revise their judgments of the attractiveness of options purely as a function of the fact that they were chosen or rejected, thereby invoking rationalization processes (Brehm & Rozen, 1972).

Quick Decisions

Although adolescents undoubtedly think carefully about many decisions they make, they often find themselves in situations where they must make quick decisions that have important consequences. An older adolescent may drive to a friend's house for a party, get drunk, and then be faced with the prospect of driving home while alcohol impaired. A middle school student might be on a "date" with a boy she really likes when he starts making inappropriate sexual advances at her.

Suppose an adolescent has been offered a marijuana cigarette for the first time and must decide what to do "on the spot." Theoretically, the adolescent can be thought of as having a set of generalized cognitions and feelings about smoking marijuana that impact her decision, as well as a set of situation-specific cognitions and feelings that augment, alter, dampen, or override these generalized perceptions. For example, the adolescent may, in general, be negatively disposed toward smoking marijuana based on previously thinking about one or more of the variable categories outlined in the social psychological model of decision making. However, the specific parameters of the situation in which she finds herself may lessen that disposition somewhat by her seeing situation-specific advantages of performing the behavior. There is thus a dynamic interplay between the generalized cognitions and feelings that an adolescent brings to the situation and the situation-specific cognitions and feelings that manifest themselves.

The generalized orientations that adolescents bring to a situation derive from previous experiences in similar situations, observational learning, information from peers, parents, teachers, media, and other sources. Such orientations can readily be targeted by behavioral interventions. Situation-specific perceptions are more difficult to target because they tend to be idiosyncratic to a situation. Interventions can still be effective by targeting generalized cognitions and feelings to the extent that such cognitions and feelings impact behavior in specific situations. In addition, interventions can help adolescents anticipate the situations they may encounter, understand the kinds of reactions and feelings they probably will have in those situations, and help them form specific strategies for dealing with those situations. In essence, the focus of the intervention is on helping the adolescent apply thoughtful decision analysis prior to encountering the situation so that the adolescent will not have to "think spontaneously" when the situation does, in fact, arise. With a well

developed and thought out plan, the adolescent's choices will be impacted by the previously carefully considered decision made in anticipation of the situation (Gollwitzer, 1999; Gollwitzer et al., 2004).

Adolescents undertake, automatically and without effort, some form of cognitive appraisal of the situations they are in as well as some form of affective appraisal (i.e., emotional reactions). These two appraisal systems are intertwined and dynamically interact. How one interprets the emotions one is feeling is influenced, in part, by the cognitive appraisals that are made and how one cognitively interprets the situation is influenced, in part, by the emotions one is feeling (Schachter, 1964; Bodenhausen, Macrea & Hugenberg, 2003). Understanding these dynamics is essential to understanding quick decisions.

Quick decisions have been the subject of study in the decision making literature. In one approach, individuals are conceptualized as having a set of "fast and frugal" heuristics that drive scenarios where quick decisions are required (Connolly, 1999). Gigerenzer and Goldstein (1996) propose a set of "one reason decision rules" that people often use to choose between options. Klein (1998) has developed a theory of naturalistic decision making that emphasizes pattern matching in which the decision maker instantly and unconsciously "matches" the current situation to prototypes stored in memory of similar situations and then modifies the derived course of action in accord with unique information in the current situation. Klein's theory, however, has been applied primarily to professionals in emergency situations (e.g., firefighters and police officers).

Linkages to Intervention Design

The traditional decision making framework has important links to interventions that adopt a positive youth development perspective. One goal of these programs might be to teach adolescents effective decision making skills and strategies. Such skills represent broad based constructs that are likely to impact adolescent development across multiple content domains (Parker & Fischhoff, 2003). The seven decision activities outlined above represent a blueprint for the kinds of skills and issues that might be addressed. Different skills and activities can be emphasized depending on the developmental status of the adolescent (early versus middle versus late adolescence). Such programs also can address the many decision biases and faulty heuristics that impact adolescent (as well as adult) decision making. Decision-based interventions already

exist and descriptions of a wide mix of these approaches can be found in Baron and Brown (1991; see, in particular, the chapter by Beyth-Marom, Fischhoff, Quadrel & Furby, 1991).

The traditional decision making framework also has applicability to the design of interventions aimed at specific adolescent problem behaviors. As noted earlier, adolescent decisions to engage in problem behaviors are the result of many of the processes identified and studied in traditional decision making research. Importantly, the traditional framework offers insights and points of emphasis that the social psychological framework of decision making does not. As one example, a central tenet of decision theory is that one must consider how adolescents construe each option in the choice set when making their decisions. It is not sufficient to understand how they view a single option. Two individuals may view a given option identically, yet make very different choices with respect to that option depending on the other options available to them. Suppose that the overall utility or value associated with Option A is the same for two individuals. For the first individual, all other options in the choice set have a lower utility while for the second individual, at least one other option has a higher utility. The first individual probably will choose Option A but the second individual probably will not. Without consideration of the entire choice set, one cannot understand why these two individuals made different choices and behaved differently because their construals of Option A were identical. This suggests that the social psychological framework be expanded to include how individuals construe all of the behavioral options, applying the analysis of the variables in Figure 4 to each option.

Many behaviors of interest to intervention designers involve multiple behavioral options. Indeed, at the simplest level, behavior can be viewed as having two choice alternatives, (1) perform the behavior and (2) do not perform the behavior. There has been increasing interest in “abstinence” as a behavioral option in its own right, both in interventions aimed at sexual risk taking as well as interventions aimed at adolescent alcohol and drug abuse. In many communities, adolescents self identify as “straight edge,” signifying a formal statement of abstinence from sex, drugs, tobacco and alcohol. The decision making framework suggests that it is as important to understand how adolescents construe abstinence as it is to understand how they construe engaging in sex, or using substances to fully understand their behavior. Numerous studies have illustrated the utility of taking into account behavioral alternatives. For example, in studies of alcohol impaired driving

(AID) one factor that distinguishes those who engage in AID from those who do not is how they view the alternatives to driving home drunk (e.g., asking someone else to drive, taking a taxi home; Turrisi, Jaccard & McDonnell, 1997).

Other differences that the traditional decision making framework emphasizes relative to the social psychological framework that have important implications for intervention design include (1) the recognition of the diversity of trade-off algorithms used by adolescents (e.g., compensatory and non-compensatory) when considering the multiple consequences of their actions, (2) the need to understand the mechanisms of problem recognition and problem framing, (3) the need to understand the mechanisms of goal identification and value clarification, (4) the need to understand the mechanisms of information search, both in the internal and external environments, (5) the need to understand the relationship between objective and subjective probabilities and the factors that distort this relationship, (6) the need to understand satisficing as well optimizing choice strategies, and (7) the need to understand post-decision evaluations. It is not our purpose here to undertake a systematic conceptual analysis of the difference between the traditional and social psychological approaches to adolescent decision making. Both approaches have strengths and both highlight important issues for interventionists to consider.

Another important implication of traditional decision research is its highlighting the need to understand “quick decision making.” Many interventions are aimed at influencing general knowledge, beliefs, attitudes, expectancies and perceptions of peer influence. However, risk behavior occurs in specific situational contexts and these contexts often demand quick decisions on the part of the adolescent. Decision research provides frameworks for thinking about quick decisions that can be used to help design interventions to affect them.

For contextual based interventions, traditional decision theories offer a framework for identifying the mediators of the effects of contextual changes on adolescent behavior. Decision research also provides a framework for teaching parents, teachers, and community organizations how to help adolescents become more effective decision makers.

A frequent complaint against traditional decision making perspectives is that they are “too cognitive” and assume rationality when rationality is the exception rather than rule. These criticisms are misplaced. A great

deal of decision making research is indeed focused on normative (i.e., optimal) decision making, but this also provides a basis from which deviations from normative decisions can be studied. There are extensive literatures in decision making on heuristics, biases, non-optimal information processing, emotions, and contextual influences that have a great deal to offer those interested in studying “non-cognitive” and “irrational” processes.

Adolescent Decision Making Revisited

As noted earlier, most research on decision making has been with adults and knowledge about the developmental emergence of decision making skills is limited. Byrnes (2002) has reviewed the developmental literature on adolescent decision making and noted several trends. He notes that the absolute capacity of working (short term) memory does not increase much after the age of eight, so that differences in decision making after that age can not be attributed to such capacity differences. Older decision-makers are thought to make greater use of this memory than younger decision-makers but this is because of developmental changes in knowledge, memory strategies, and processing speed rather than memory capacity per se.

Byrnes notes that many personality traits are linked to decision making, such as impulsivity and sensation seeking, and that there are known developmental progressions in these traits. Some that are conducive to better decision making become more prominent as children age, while others become less prominent. For example, sensation seeking is thought to decrease as adolescents approach adulthood whereas emotionality is thought to decrease between adolescence and adulthood (Byrnes, 2002).

Several studies have found that adolescents are similar to adults in terms of their decision processes and the impact of bias on their thought processes during decision making. This result is surprising to some because one thinks of children as developing increasingly sophisticated thinking and logic skills as they mature and transition to adulthood. Jacobs and Klaczynski (2002) address this quandary by noting that there are two systems that impact decision making, a system of logical reasoning and thinking skills and a system of heuristics and “mental shortcuts” that people use when making judgments and decisions. Although children developmentally show increases in their ability to think abstractly, to think logically and to plan,

they also show increases in the use of the same heuristics and mental shortcuts used by adults that ultimately undermine effective decision making. For example, the representativeness heuristic involves predicting the likelihood of an uncertain event by relying on information that represents salient characteristics of the event rather than true base rates of that event. Such a bias has been demonstrated as young as first grade (Jacobs & Potenza, 1991) and the use of the heuristic has been found to increase between the sixth grade and college (Jacobs & Klaczynski, 2002). Jacobs and Klaczynski argue that in our rush to uncover developmental trajectories of competencies, we have tended to ignore the social, motivational, and affective influences on everyday cognitive activities and it is in this realm where many decisional “short cuts” are learned over time. The development of decision making skills does not represent progression along a single trajectory but rather multiple trajectories that interact in complex ways. For elaboration, see Jacobs and Klaczynski (2002) and Klaczynski (2002).

Concluding Comments

Adolescent decision making is a fundamental activity in the lives of adolescents. This paper has presented a highly simplified characterization of the research literatures on decision making that can potentially be brought to bear in the design of interventions to improve the lives of adolescents. Although we know a great deal about decision making, there is a great deal yet to be learned, especially in the realm of adolescent decision making. As those who do research in decision making join hands with those who design adolescent based interventions, both fields will prosper in the advancement of their respective knowledge bases.

References

- Adams, G. & Berzonsky, M. (2003). *Handbook of adolescence*. Walden, MA: Blackwell.
- Agostinelli, G., Floyd, T., Grube, J., Woodall, G. & Miller, J. (2004). Alcohol problem recognition as a function of own and others' perceived drinking. *Addictive Behaviors*, **29**, 143-157
- Ajzen, I. & Fishbein, M. (1981). *Understanding attitudes and predicting social behavior*. Englewood Cliffs, NJ: Prentice Hall.
- Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, **50**, 179-211.
- Anderson, N.H. (1981). *Foundations of information integration theory*. New York: Academic Press.
- Anderson, J. R. & Lebiere, C. (1998). Knowledge representation. In: J.R. Anderson and C. Lebiere, (Eds.), *The atomic components of thought*. Mahwah, NJ: Erlbaum.
- Austin, J.T. & Vancouver, J. (1996). Goal constructs in psychology: Structure, process and content. *Psychological Bulletin*, **120**, 338-375.
- Babad, E., Hills, M. & O'Driscoll, M. (1992). Factors influencing wishful thinking and predictions of election outcomes. *Basic and Applied Social Psychology*, **13**, 461-476.
- Bandura, A. (1975). *Social learning theory*. Englewood Cliffs, New Jersey: Prentice-Hall.
- Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*. Englewood Cliffs, New Jersey: Prentice-Hall.
- Bar-Hillel, M. (1990). Back to base rates. R. Horgath (Ed.) *Insights in decision making*, pp. 200-216. Chicago: University of Chicago Press.
- Baron, J. & Brown, R. V. (1991). *Teaching decision making to adolescents*. Hillsdale, NJ: Erlbaum.
- Bastardi, A. & Shafir, E. (1998). On the pursuit and misuse of useless information. *Journal of Personality and Social Psychology*, **75**, 19-32.
- Bastardi, A. & Shafir, E. (2001). Nonconsequential reasoning and its consequences. *Current Directions in Psychological Science*, **9**, 216-219.
- Beyth-Marom, R., Fischhoff, B. Quadrel, M. & Furby, L. (1991). Teaching decision making to adolescents: A critical review. In J. Baron and R. Brown (Eds.), *Teaching decision making to adolescents*. Hillsdale, NJ: Erlbaum.
- Blanton, H. (2003). Deviance: A theory of action and identity. *Review of General Psychology*, **7**, 115-149.
- Blanton, H. & Gerrard, M. (1997). Effect of sexual motivation on men's risk perception for sexually transmitted disease: There must be 50 ways to justify a lover. *Health Psychology*, **16**, 374-379.
- Bodenhausen, G. V., Macrae, C. & Hugenberg, K. (2003). Social cognition. In T. Millon & M. Lerner (Eds.). *Handbook of psychology: Personality and social psychology*, Vol. 5. New York: Wiley.

- Boice, R. (1996). *Procrastination and blocking: A novel, practical approach*. Wesport, CT: Praeger.
- Borsari, B. & Carey, K.B. (2003). Descriptive and injunctive norms in college drinking: A meta-analytic integration. *Journal of Studies in Alcohol*, **64**, 331-341.
- Bower, G. (1981). Mood and memory. *American Psychologist*, **36**, 129-148.
- Brehm, J. & Rozen, E. (1971). Attractiveness of old alternatives when a new attractive alternative is introduced. *Journal of Personality and Social Psychology*, **20**, 261-266.
- Brenner, L.A. (2003), A random support model of the calibration of subjective probabilities. *Organizational Behavior and Human Decision Processes*, **90**, 87-110.
- Brinberg, D. and Jaccard, J. (1989). *Dyadic decision making*. New York: Springer-Verlag
- Buehler, R. & Griffin, D. (2003). Planning, personality, and prediction: The role of future focus in optimistic time predictions. *Organizational Behavior and Human Decision Processes*, **92**, 80-90.
- Byrnes, J. P. (2002) The development of decision-making. *Journal of Adolescent Health*, **31**, 208-215
- Caffray, C.M., Mistine, M & Schneider, S. L. (2000). Why do they do it? Affective motivators in adolescents' decisions to participate in risk behaviours. *Cognition and Emotion*, **14**, 543-576.
- Catalano R, Berglund L, Ryan J, et al. Positive youth development in the United States: Research findings on evaluations of positive youth development programs. *Prevention Treatment* [serial online], 2002:5(15): Available from, URL: <http://journals.apa.org/prevention/volume5/toc-jun24-02.htm>
- Cauffman, E. & Steinberg, L. (2000). (Im)maturity of judgment in adolescence: Why adolescents may be less culpable than adults. *Behavioral Sciences and the Law*, **18**, 741-760.
- Chou CP, Montgomery S, Pentz MA, et al. (1998). Effects of a community-based prevention program in decreasing drug use in high-risk adolescents. *American Journal of Public Health*, **88**, 944-48.
- Cialdini, R. (2003). Crafting normative messages to protect the environment. *Current Directions in Psychological Science*, **12**, 105-109.
- Connolly, T. (1999). Action as a fast and frugal heuristic. *Minds and Machines*, **9**, 479-496.
- Davidson, D (1991). Children's decision making examined with an information based procedure. *Cognitive Development*, **6**, 77-90.
- Ditto, P. H., & Lopez, D. (1992). Motivated skepticism: Use of a differential decision criteria for preferred and non-preferred decisions. *Journal of Personality and Social Psychology*, **63**, 341-51.
- Dittus, P., Jaccard, J. Poynton, T. & Dodge, T. (2004). Factors influencing belief salience and stability: The impact of information, characteristics, situational variables, and individual difference variables. Under editorial review. Department of Psychology, State University of New York, Albany.
- Elkind, D. (1985). Egocentrism redux. *Developmental Review*, **5**, 218-26.

- Fischhoff, B. & Quadrel, M.J. (1995). Adolescent alcohol decisions. In G. Boyd and J. Howard (Eds.). *Alcohol problems among adolescents: Current directions in prevention research*. (pp. 59-84). Hillsdale, NJ: Erlbaum.
- Fishbein, M. & Ajzen, I. (1975). *Belief, attitude, intention and behavior: An introduction to theory and research*. Reading, Massachusetts: Addison-Wesley.
- Fishbein, M. Triandis, H., Kanfer, F., Becker, M., Middlestadt, S & Eichler, A. (2001). Factors influencing behavior and behavior change. In A. Baum, T. Revenson & J. Singer (Eds.) *Handbook of health psychology*. Mahwah, NJ: Erlbaum.
- Flay B. R. (2002). Positive youth development requires comprehensive health promotion programs. *American Journal of Health Behavior*, 26, 407-424.
- Flay B. R. (2000). Approaches to substance abuse prevention utilizing school curriculum plus environment change. *Addictive Behaviors*, 25, 861-85.
- Flay B. R., Allred, C.G., & Ordway, N. (2001). Effects of positive action program on achievement and discipline: Two matched-control comparisons. *Prevention Science*, 2, 71-89.
- Flores, E., Tischann, J. M., & Marin, Barbara (2002). Latina adolescents: Predicting intentions to have sex. *Adolescence*, 37, 659-679.
- Friedland, N., Keinan, G. & Regev, Y. (1992). Controlling the uncontrollable: Effects of stress on illusory perceptions of controllability. *Journal of Personality and Social Psychology*, 63, 923-31.
- Friedrich, J. (1993). Primary error detection and minimization (PEDMIN) strategies in social cognition: A reinterpretation of confirmation bias phenomena. *Psychological Review*, 10, 298-319.
- Galotti, K.M. (2002). *Making decisions that matter: How people face important life choices*. Mahwah, NJ: Erlbaum.
- Ganzel, A. K. (1999). Adolescent decision making: The influence of mood, age, and gender on the consideration of information. *Journal of Adolescent Research*, 14, 289-318.
- Gerrard, M., Gibbons, F., Reis-Bergan, M., Trudeau, L., Vande-Lune, & Buunk, B. (2002). Inhibitory effects of drinker and nondrinker prototypes on adolescent alcohol consumption. *Health Psychology*, 21, 601-609.
- Gettys, R. & Fisher, S. (1986). Plausibility assessments in hypothesis generation. *Organizational Behavior and Human Decision Processes*, 37, 14-33.
- Gettys, R., Pliske, C. Manning, C. & Casey, J. (1987). An evaluation of human act generation performance. *Organizational Behavior and Human Decision Processes* 39, 23-51.
- Gilliam, G.A., Eke, A., Aymer, F. & O'Neil, C. (2001). Developing a theory-based, culturally sensitive intervention for adolescents: The Antigua School Project. *Journal of HIV/AIDS Prevention and Education for Adolescents and Children*, 4, 105-126.
- Gigerenzer, G. & Goldstein, D. (1996). Reasoning the fast and frugal way: Models of bounded rationality. *Psychological Review* 102 (1996), pp. 684-704.

- Gollwitzer, P. M. (1999). Implementation intentions: Strong effects of simple plans. *American Psychologist*, **54**, 493-503.
- Gollwitzer, P. M., Fujita, K. & Oettingen, G. (2004). Planning and the implementation of goals. In R. Baumeister and K. Vohs(Eds). *Handbook of self-regulation: Research, theory, and applications*. (pp. 211-228). New York: Guilford Press.
- Guilamo-Ramos, V. Litardo, H. & Jaccard, J. (2004) Prevention programs for reducing adolescent problem behaviors: Implications of the co-occurrence of problem behaviors in adolescence. *Journal of Adolescent Health*, In press.
- Hamil, R., Wilson, T & Nisbett, R. (1980). Insensitivity to sample bias: Generalizing from atypical instances. *Journal of Personality and Social Psychology*, **39**, 578-589.
- Halpern-Felsher, B.L. & Cauffman, E. (2001). Costs and benefits of a decision. Decision-making competence in adolescents and adults. *Journal of Applied Developmental Psychology*, **22**, 257-273.
- Hastie, R. & Dawes, R. (2001). *Rational choice in an uncertain world: The psychology of judgment and decision making*. Thousand Oaks, CA: Sage.
- Hastie, R. & Pennington, N. (1995). Cognitive approaches to judgment and decision making. In: J. Busemeyer, D.L. Medin and R. Hastie, (Eds.). *Decision making from a cognitive perspective*. London: Academic Press.
- Hauenstein, N., & Alexander, R. (1991). Rating ability in performance judgements. Special Issue: Theories of cognitive self-regulation. *Organizational Behavior and Human Decision Processes*, **50**, 300-23.
- Hulton, L. J. (2001). Application of the transtheoretical model of change to adolescent decision-making. *Issues in Comprehensive Pediatric Nursing*, **24**, 95-115.
- Izard, C.E. (2002). Translating emotion theory and research into preventive interventions. *Psychological Bulletin*, **128**, 796-824.
- Jaccard, J. (1975). A theoretical analysis of selected factors important to health education strategies. *Health Education Monographs*, **3**, 152-166.
- Jaccard, J. & Blanton, H. (2004). The origins and structure of behavior: Conceptualizing behavior in attitude research. In D. Albarracín, B. T. Johnson, & M. P. Zanna (Eds.), *Handbook of attitudes and attitude change*. Mahwah, NJ: Erlbaum
- Jaccard, J., & Becker, M. (1985). Attitudes and behavior: An information integration perspective. *Journal of Experimental Social Psychology*, **21**, 440-65.
- Jaccard, J., Dittus, P. J. and Gordon, V.V. (2000). Parent-adolescent communication about premarital sex: Factors associated with the extent of communication. *Journal of Adolescent Research*, **15**, 187-208.
- Jacobs, J.E. & Klaczynski, P.A. (2002). The development of judgment and decision making during childhood and adolescence. *Current Directions in Psychological Science*, **11**, 145-149.
- Jacobs, J. & Potenza, M. (1991). The use of judgment heuristics to make social and object decisions: A developmental perspective. *Child Development*, **62**, 166-178.

- Janz, N. & Becker, M. (1984). The Health Belief Model: A decade later. *Health Education Quarterly*, **11**, 1-47.
- Jemmott J.B. & Jemmott, L. (2000). HIV risk reduction behavioral interventions with heterosexual adolescents. *AIDS*, **14**, 40-52.
- Jemmott, J.B., Jemmott, L., & Fong, G.T. (1998). Abstinence and safer sex HIV risk reduction interventions for African American Adolescents. *Journal of the American Medical Association*, **270**, 1529-36.
- Johnson, J. G. & Raab, M. (2003). Take the first: Option generation and resulting choices. *Organizational Behavior and Human Decision Processes*, **91**, 215-219.
- Jonas, E., Schulz, H., Frey, D. & Thelen, N. (2001). Confirmation bias in sequential information search after preliminary decisions: An expansion of dissonance theoretical research on selective exposure to information. *Journal of Personality and Social Psychology*, **80**, 557-571.
- Kagan, J. & Coles, R. (1972). *Twelve to sixteen: Early adolescence*. New York: Norton.
- Kanfer, F. H. (1996). Motivation and emotion in behavior therapy. In K. Dobson and K. Craig (Eds.). *Advances in cognitive-behavioral therapy*, Vol. 2. Banff international behavioral science series. (pp. 1-30). Thousand Oaks, CA: Sage
- Keller, L. & Ho, J. (1988). Decision problem structuring: Generating options. *IEEE Transactions on Systems and Cybernetics* **18**, 715–728
- Kirby D. *Sexuality education: An evaluation of programs and their effects*. Santa Cruz CA: ETR/Network Publications, 1984.
- Klaczynski, P. A. (2000). Motivated scientific reasoning biases, epistemological beliefs, and theory polarization: A two-process approach to adolescent cognition. *Child Development*, **71**, 1347-1366
- Klaczynski, P. A (2001a). Framing effects on adolescent task representations, analytic and heuristic processing and decision making. Implications for the normative/descriptive gap. *Journal of Applied Developmental Psychology*, **22**, 289-309
- Klaczynski, P. A. (2001b). Analytic and heuristic processing influences on adolescent reasoning and decision-making. *Child Development*, **72**, 844-861
- Klein, G. (1998). *Sources of power: How people make decisions*. Cambridge: MIT Press.
- Klein, G. & Wolf, S. (1998). The role of leverage points in option generation. *IEEE Transactions on Systems, Man, and Cybernetics—Part C: Applications and Reviews* **28**, 157–160.
- Klein, G., Wolf, S., Militello, L. & Zsombok, C. (1995). Characteristics of skilled option generation in chess. *Organizational Behavior and Human Decision Processes*. **62**, 63–69.
- Lipsitz, J. (1977). *Growing up forgotten*. Lexington, MA: Lexington Books.
- Mano, H. (1991). The structure and intensity of emotional experiences: Method and context convergence. *Multivariate Behavioral Research*, **26**, 389-411.

- Marks, G., & Miller, N. (1987). Ten years of research on the false consensus effect: An empirical and theoretical review. *Psychological Bulletin*, **102**, 72-90.
- May, J.C., Delgado, M.R., Dahl, R. E., Stenger, V.A., Ryan, N>D., Fiez, J.A. & Carter, C. S. (2004), Event related functional magnetic resonance imaging of reward related brain circuitry in children and adolescents. *Biological Psychiatry*, **55**, 359-366.
- McClelland, J. & Rumelhart, D. (1985). Distributed memory and the representation of general and specific information. *Journal of Experimental Psychology: General*, **114**, 159–188.
- MacLeod, C., & Campbell, L. (1982). Memory accessibility and probability judgements: An experimental evaluation of the availability heuristic. *Journal of Personality and Social Psychology*, **63**,890-902.
- Millstein, S.G. (2003). Risk perception: Construct development, links to theory, correlates, and manifestations. In D. Romer (Ed.) *Reducing adolescent risk: Toward an integrated approach*. Thousand Oaks, CA; Sage.
- Morrison, D. M., Mar, C.M., Wells, E.A., et al. (2002a). The theory of reasoned action as a model of children's health behavior. *Journal of Applied Social Psychology*, **32**, 2266-2295.
- Morrison, D. M. Golder, S., Keller, T. E. & Gillmore, M. R. (2002b). The theory of reasoned action as a model of marijuana use: Tests of implicit assumptions and applicability to high-risk young women. *Psychology of Addictive Behaviors*, **16**, 212-224.
- Mullen, B., & Johnson, C. (1990). Distinctiveness-based illusory correlations and stereotyping: A meta-analytic integration. *British Journal of Social Psychology*, **29**,11-28
- Newell, A. & Simon, H. (1972). *Human problem solving*. Englewood Cliffs, NJ: Prentice Hall.
- Nichols-Hoppe, K. & Beach, L. (1990). The effects of test anxiety and task variables on predecisional information search. *Journal of Research in Personality*, **24**, 163-172.
- Payne, J. (1976). Task complexity and contingent processing in decision making. *Organizational Behavior and Human Decision Processes*, **16**, 366-387.
- Paulus, P. & Yang, H. (2003). Idea generation in groups: A basis for creativity in organizations. *Organizational Behavior and Human Decision Processes* **82**, 76–87.
- Perkins, W. (2003). *The social norms approach to preventing substance abuse in school and college age substance abuse*. San Francisco: Jossey-Bass.
- Pretz, J., Naples, A. & Sternberg, R. J. (2003). Recognizing, defining, and representing problems. In J. Davidson and R. Sternberg. (Eds). *The psychology of problem solving*. New York: Cambridge University Press.
- Ormond, C. L., Luszcz, M. A. & Beswick, G. (1991). A metacognitive analysis of decision making in adolescence. *Journal of Adolescence*, **14**, 275-291.
- Parker, A. & Fischhoff, B. (2003). Decision making competence and risk behavior. In D. Romer (Ed.) *Reducing adolescent risk: Toward an integrated approach*. Thousand Oaks, CA; Sage.

- Quadrel, M.J., Fischhoff, B. & Davis, W. (1993). Adolescent (in)vulnerability. *American Psychologist*, **48**, 102-116.
- Radecki, C. M., and Jaccard, J. (1995). Perceptions of knowledge, actual knowledge and information search behavior. *Journal of Experimental Social Psychology*, **31**, 107-138.
- Rosenstock, I., Strecher, V. & Becker, H. (1988), Social learning theory and the Health Belief Model. *Health Education Quarterly*, **15**, 175-183.
- Schachter, S. (1964). The interaction of cognitive and physiological determinants of emotional state. In L. Berkowitz (Ed.) *Advances in experimental social psychology*, Vol. 1. New York: Academic Press.
- Schwartz, B., Ward, A., Monterosso, J., Lyubomirsky, S, White, K., & Lehman, D. (2002). Maximizing versus satisficing: Happiness is a matter of choice. *Journal of Personality and Social Psychology*, **83**, 1178-1197.
- Senter, S. & Wendall, D. (1999). Information presentation constraints and the adaptive decision maker hypothesis. *Journal of Experimental Psychology: Learning, Memory and Cognition*, **25**, 429-446.
- Sia, T. L., Lord, C., Blessum, K., Ratcliff, C. & Lepper, M. (1997). Is a rose always a rose? The role of social category exemplar change in attitude stability and attitude-behavior consistency. *Journal of Personality and Social Psychology*, **72**, 501-514
- Simpson, C. A. & Tucker, J. (2002). Temporal sequencing of alcohol-related problems, problem recognition, and help-seeking episodes. *Addictive Behaviors*, **27**, 659-674.
- Slovic, P. (2001). *Smoking: Risk, perception and policy*. Thousand Oaks, CA; Sage.
- Steinberg, L. (2003). Is decision making the right framework for research on adolescent risk taking? In D. Romer (Ed.) *Reducing adolescent risk: Toward an integrated approach*. Thousand Oaks, CA: Sage.
- Sussman, S., Dent, C., Burton, D., et al.(1995). *Developing school-based tobacco use prevention and cessation programs*. Newbury Park, CA: Sage.
- Sussman S, Dent C, Stacy A, et al. (1993). Project Towards No Tobacco Use: One year behavior outcomes. *American Journal of Public Health*, **83**, 1245-50.
- Taylor, S. E., & Brown, J. (1988). Illusion and well-being: A social psychological perspective on mental health. *Psychological Bulletin*, **103**, 193-210.
- Todd, P. & Gidenrenzer, G. (2003). Bounding rationality to the world. [*Journal of Economic Psychology*](#), **24**, 143-165.
- Turrisi, R., Jaccard, J. and McDonnell, D. (1997). An examination of the relationship between personality, attitudes, and cognitions relevant to alcohol impaired driving tendencies. *Journal of Applied Social Psychology*, **27**, 1367-1383.
- Tversky, A. & Kahneman, D. (1973). Availability: A heuristic for judging frequency and probability. *Cognitive Psychology*, **5**, 212-213.

- Tversky, A. & Kahneman, D. (1981). The framing of decisions and the psychology of choice. *Science*, **185**, 1124-1130.
- Tversky, A., & Kahneman, D. (1983). Extensional versus intuitive reasoning: The conjunction fallacy in probability judgment. *Psychological Review*, **90**, 293-315.
- Teagle, S. E. (2002), Parental problem recognition and child mental health service use. *Mental Health Services Research*, **4**, 257-266.
- Thornton, B, Gibbons, F., & Gerrard, M. (2002). Risk perception and prototype perception: Independent processes predicting risk behavior. *Personality and Social Psychology Bulletin*, **28**, 986-999.
- Triandis, H.C. (1972). *The analysis of subjective culture*. New York: Wiley.
- Tykocinski, O, Ruffle E & Bradley, J. (2003). Reasonable reasons for waiting. *Journal of Behavioral Decision Making*, **16**, 147-157.
- Valacich, J.S., Wheeler, B., Mennecke, B. & Wachter, R. (1995). The effects of logical group size on computer-mediated idea generation. *Organizational Behavior and Human Decision Processes* **62**, 318–329
- van Eerde, W. (2003). A meta-analytically derived nomological network of procrastination. *Personality and Individual Differences*, **35**, 1410-1418.
- Watson, D., & Tellegen, A. (1985). Toward a consensual structure of mood. *Psychological Bulletin*, **98**, 219-235.
- Yates, F., 1990. *Judgment and decision making*. Prentice-Hall, Englewood Cliffs, NJ.
- Zwaanswijk, M. Verhaak, P., Bensing,-Jozien, M., van der Ende, J. & Verhulst, F. (2003). Help seeking for emotional and behavioural problems in children and adolescents: A review of recent literature. *European Child and Adolescent Psychiatry*, **12**, 153-161

Footnotes

1. Our treatment of traditional decision theory is broader than some would conceptualize it. In the more narrow approach, the focus is on two general activities, (1) a normative phase that specifies how a decision ought to be made given known probabilities of events occurring and (2) a descriptive phase that documents how people deviate from this normative process. The focus is then on teaching individuals to conform to the normative models. A limitation of this approach for many risk behaviors is that there are large individual differences in known probabilities of events occurring and documenting such objective probabilities is very difficult. For example, an adolescent may think that having sexual intercourse will increase her boyfriend's romantic feelings for her. Determining the objective probability of this happening would be an empirical challenge, especially when one recognizes that the probability might be quite different for adolescent girls in rural settings in the Midwest as opposed to adolescent girls in inner city settings in major metropolitan areas.

The preparation of this paper was supported by funds provided by the William T. Grant Foundation.

Table 1

Examples of Judgmental Heuristics and Biases

<i>Heuristic/Bias</i>	<i>General Definition</i>	<i>Reference</i>
Availability Heuristic	Retrievability of instances from memory can bias frequency judgments of an event	MacCleod & Campbell (1992)
Base Rate Fallacy	Tendency to ignore base rate information when making frequency judgments	Bar-Hillel (1990)
Confirmation Bias	Tendency to seek information that will confirm one's expectations or beliefs	Friedrich (1993)
Conjunction Fallacy	Tendency to overestimate compound probabilities	Tversky & Kahneman (1983)
Egocentric Bias	Tendency to see oneself as the center of attention; Tendency to see oneself as unique	Elkind (1985)
False Consensus Bias	Tendency to overestimate the degree to which other people agree with oneself	Marks & Miller (1987)
Framing Effects	Tendency to be risk averse when decision is framed in the negative but risk seeking when decision is framed in the positive	Tversky & Kahneman (1981)
Halo Effects	Tendency to evaluate the specific attributes of an object based on one's overall evaluation of the object	Hauenstein & Alexander (1991)
Illusory Correlation	Tendency to see two unrelated events as being related	Mullen & Johnson (1990)
Illusion of Control	Tendency to overestimate one's control over an event	Friedland et al. (1992)
Negativity Bias	Tendency to weigh negative information more heavily than positive information	Jaccard & Becker (1985)
Self Serving Bias	Tendency to attribute successful outcomes to self and failures to extenuating circumstances	Ditto & Lopez (1992)
Unrealistic Optimism	Tendency to distort reality in a direction that enhances self esteem and maintains personal efficacy and optimism	Taylor & Brown (1988)
Wishful Thinking	Tendency to see desirable outcomes as more probable and undesirable outcomes as less probable	Babad et al. (1992)

Figure 1

The Developmental Matrix

	Physical Development	Cognitive Development	Social Development	Emotional Development	Moral Development
Early Adolescence					
Middle Adolescence					
Late Adolescence					

Figure 2

The Problem Behavior Matrix

	Sexual Risk Taking	Alcohol and Drug Use	Tobacco Use	Suicide and Depression	Nutrition and Eating Disorders	Delinquency
Early Adolescence						
Middle Adolescence						
Late Adolescence						

Figure 3

The Immediate Determinants of Behavior

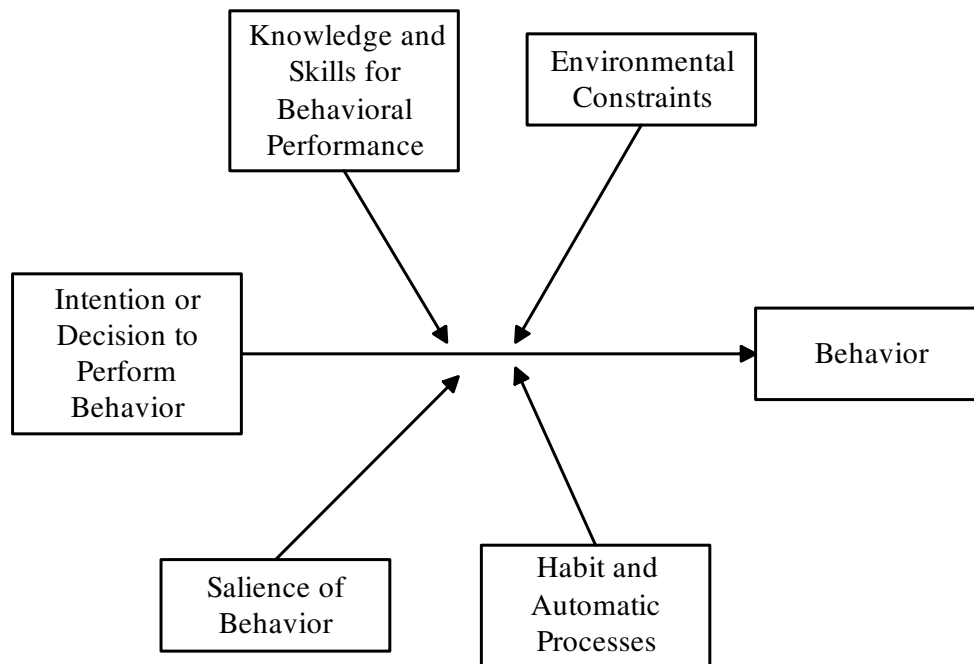


Figure 4

The Immediate Determinants of Behavioral Intentions

