

**Psychological Perspectives:  
Cognitive Developmental Basis of Risk  
Taking**

**The Rational Regulation of Behavior**

**I. INTRODUCTION**

**A. Psychological Basis of Risk Taking**

- We considered biological basis for adolescents' tendencies to engage in risk taking.
  - Evolutionary tendency triggered by becoming "big" and "mobile"
  - Genetic basis for some to engage in sensation seeking and addictions exacerbated by niche picking
  - Puberty triggers hormonal changes which are directly and indirectly (through secondary sex characteristics) associated with risky behavior.
  - Neurological molecular and structural changes in the brain makes adolescents vulnerable to emotional, impulsive, and risk seeking behavior.

**I. INTRODUCTION**

**A. Psychological Basis of Risk Taking**

- **1 Psychological Regulation of Biological Tendencies**
  - These tendencies need to be controlled or regulated
    - Actions directed towards the control of impulses creates important neurological changes.
  - Psychological regulation is defined as the emergence of self-control over ones actions and reactions through the internalization of standards of conduct.
    - The lack of psychological regulatory mechanism is the "unskilled driver" in the "turbo charged car" metaphor of adolescent risk taking.

**I. INTRODUCTION**

**A. Psychological Basis of Risk Taking**

- **2. Cognitive and Moral Regulation**
  - We will consider the growth of two forms of psychological regulatory mechanisms: Cognitive and Moral
    - Cognitive regulation of risky behavior involves the internalization of rational standards for behavior
    - Moral regulation of risky behavior involves the internalization or moral standards for behavior
  - In both cases, the standards provide a basis for regulating behavior, resisting temptations, etc.
- We will consider cognitive regulation of behavior this week and the moral regulation next week.

## I. INTRODUCTION

### B. Adolescent Cognition and Risk Taking

- Adolescence is a time of conflict and confusion, not only in their behavior but also in how we think about them
- On the one hand, it is believed that adolescents become abstract and logical thinkers who are capable of rationality.
  - Rousseau like Plato believed that adolescents are morally autonomous...have become fully conscious of themselves as rational and responsible creatures.
- From this perspective, risk taking becomes regulated rationally by adolescents quite early.
  - It is coherent act for which teens hold good reasons.

## I. INTRODUCTION

### B. Adolescent Cognition and Risk Taking

- On the other hand, adolescents are thought of as impulsive and illogical who are incapable of rationality.
  - Youth are heated by nature as drunken men by wine," noted Aristotle.
  - Aristotle also noted that "adolescents think they know everything and are quite sure of it."
  - Adolescents "are inclined to contradict their parents and tyrannize their teachers," wrote Socrates.
- From this perspective, risk taking becomes regulated rationally by adolescents quite late, if ever.
  - Its an incoherent act for which there are few good reasons.

## I. INTRODUCTION

### C. Cognitive Development and Risk-Taking

- In this lecture, I will present these two views and discuss both of them.
  - We begin with a inventory of cognitive achievements in adolescence
    - Scientific Reasoning and its Components
    - Decision Making
    - Metacognition, Epistemic Cognition, and self-regulation
    - Adolescent Egocentrism
  - Then we'll consider traditional and newer cognitive developmental accounts of adolescent risk taking.
  - Goal is to decide when adolescents' risk taking tendencies become rationally regulated.

## II. BECOMING A RATIONAL THINKER

### A. Hypothetico-deductive Reasoning

- **Hypothetico-deductive reasoning** is a general term referring to aspects of scientific reasoning.
  - Such reasoning is central to being a rational abstract thinker and it involves least four kinds of reasoning skills:
    - Generating hypotheses: Thinking about possibilities not realities
    - Hypothesis testing: Thinking about the logical connection between ideas or hypotheses and evidence.
    - Entertaining abstractions: Thinking about ideas not things
    - Evaluating evidence: Systematic and unbiased evaluation information bearing on ideas.

II. BECOMING A RATIONAL THINKER  
A. Hypothetico-deductive Reasoning

▪ **Generating Hypotheses**

- Adolescents are better able than children in thinking about the way they would could be or might have been.
- **Combinatorial possibilities:**
  - Reasoning about possible combinations of things
  - How many unique pizzas can be made from 4 toppings?
- **Counterfactual possibilities:**
  - Reasoning about the way they would could have been.
  - Suppose you were not here right now, what would you be doing?

II. BECOMING A RATIONAL THINKER  
A. Hypothetico-deductive Reasoning

▪ **Hypothesis Testing**

- Adolescents are better able than children in drawing the logical connections between premises and conclusions.
- **Logical necessity:** In what way is argument 1 different from 2 and 3?
  1. If elephants are bigger than dogs and dogs are bigger than mice, then elephants are bigger than mice.
  2. If adults are older than babies and children are older than babies, then adults are older than children.
  3. If dogs are bigger than mice and elephants are bigger than mice, then dogs are bigger than elephants.

II. BECOMING A RATIONAL THINKER  
A. Hypothetico-deductive Reasoning

▪ **Hypothesis Testing**

- Logic of hypothesis testing.
  - Hypothesis: If there is a vowel on one side, there is an even number on the other.
  - Evidence: E K 4 7
    - Verification Strategy: E and 4
    - Falsification Strategy: E and 7
- Adults tend to use the verification not falsification strategy.
- Falsification strategy improves over age in a two year longitudinal study of adolescents.
  - Other inappropriate strategies decrease over time.

II. BECOMING A RATIONAL THINKER  
A. Hypothetico-deductive Reasoning

▪ **Entertaining abstractions**

- Adolescents are better able than children in dealing with abstract ideas than concrete features.
- **Derived concepts**
  - Floating and sinking problems: Distinguishing weight from **specific gravity** (weight / unit volume)
- **Relational Concepts**
  - **Gravity:** It is a relational concept (relating masses to distances) not a concrete concept.

II. BECOMING A RATIONAL THINKER  
A. Hypothetico-deductive Reasoning

▪ **Evaluating Evidence**

- Adolescents are better able than children to be systematic and unbiased when evaluating evidence

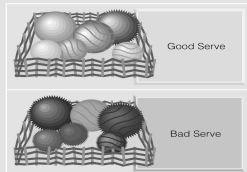
*What features of balls are best for serving?*

Texture (smooth or ridges?)

Size (large or small)

Seams (present or absent)

Color (light or dark)



II. BECOMING A RATIONAL THINKER  
B. Decision-Making

- Although imperfect, adolescents' decision making skills for **evaluating risk** are better than children's and at least as good as adults'
- Compare to children adolescents are better able to...
  - examine a risky situation from a variety of perspectives
  - generate different options or actions.
  - anticipate possible outcomes for their actions.
  - consider the credibility of sources.

II. BECOMING A RATIONAL THINKER  
B. Decision-Making

- However, younger adolescents may be less able than older adolescents and adults to engage in many of these cognitive processes.
  - Experience may lay a significant part of the story.
- Additionally adolescents' and adults' decision-making fails to be completely rational
  - Adolescents and adults fail to be logical in evaluating risk, as many gambling decisions show.

II. BECOMING A RATIONAL THINKER  
D. Metacognition, Epistemic Cognition, and Self-Regulation

- Compared to children, adolescents are better at **metacognition**, thinking about their own thinking.
  - Adolescents are better able to think about their knowledge and the process of knowing.
    - **Epistemic thinking** develops in the direction away from absolutism towards relativism about knowledge.
    - Absolutism: Truth is black and white, immediately knowable, and my knowledge is true.
    - Rationalism: Truth is gray, perhaps not ultimately knowable (although an index of it is knowable), and my knowledge may be false.

## II. BECOMING A RATIONAL THINKER

### D. Metacognition, Epistemic Cognition, and Self-Regulation

- Compared to children, adolescents are better at **metacognition**, thinking about their own thinking.
- Adolescents improve in cognitive **self-regulation** – planning what to do, monitoring progress toward a goal, regulating emotions, and redirecting unsuccessful actions.
- Adolescents are also better than children at **comprehension monitoring**. While reading or listening, they continually evaluate how well they understand.

## II. BECOMING A RATIONAL THINKER

### C. Reflective and Relativistic Thinking

- **Reflective and relativistic thinking** refers to being able to think about one’s own thinking and reevaluate the black and white standards by which one thinks (right/wrong; good/bad).
- Many high school and most college students give up the possibility of absolute truth for multiple or relative truths.
- Research reveals that most adolescents can think relativistically about hypothetical situations related to their personal experiences.

## II. BECOMING A RATIONAL THINKER

### E. Social Cognition

- **Perspective Taking** is the ability to adopt another’s viewpoint and it develops in critical ways in adolescence according to Selman.

TABLE 13.1

Selman’s Stages of Perspective Taking

STAGE	APPROXIMATE AGE RANGE	DESCRIPTION
Level 0: Undifferentiated perspective taking	3-6 years	Children recognize that self and other can have different thoughts and feelings, but they frequently confuse the two.
Level 1: Social-informational perspective taking	4-9 years	Children understand that different perspectives may result because people have access to different information.
Level 2: Self-reflective perspective taking	7-12 years	Children can “step in another person’s shoes” and view their own thoughts, feelings, and behavior from the other person’s perspective. They also recognize that others can do the same.
Level 3: Third-party perspective taking	10-15 years	Children can step outside a two-person situation and imagine how the self and other are viewed from the point of view of a third, impartial party.
Level 4: Societal perspective taking	14 years-adult	Individuals understand that third-party perspective taking can be influenced by one or more systems of larger societal values.

Sources: Selman, 1976; Selman & Byrne, 1974.

## II. BECOMING A RATIONAL THINKER

### E. Social Cognition

- **Adolescent Egocentrism** With the growth of perspective taking skills in early adolescence, teens become egocentrically self-focused
- Their ability to “think about others’ thinking about them” has two consequences:
  - The **imaginary audience** concerns adolescents’ belief that they are the focus of everyone else’s attention and concern.
  - The **personal fable** is the belief of adolescents that they are special, unique, and omnipotent. The personal fable leads teens to conclusions that others cannot possibly understand their thoughts and feelings.

## II. BECOMING A RATIONAL THINKER

### F. Constructing Rationality

- According to Moshman, adolescents are on the role to rationality or *metasubjective objectivity*.
- The notion of rationality is someone aware of their own subjective stance and its influence on their perceptions and judgments
  - Metasubjective objectivity is acquired through three processes, that rely heavily on *metacognition* and *epistemic cognition*.
    - **Reflection:** The ability and tendency to understand one's own point of view and limits it imposes
    - **Coordination:** The ability and tendency to relate one's own point of view with others' or one's own in the past.
    - **Peer Interaction:** Interactions with others of similar status (knowledge power and authority).
- Others hold different but related notions – following rules of logic and mathematics.

## III. COGNITIVE BASIS OF RISK TAKING

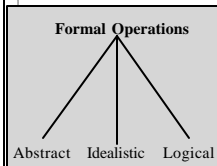
### A. Piaget

- To Piaget, adolescents become rational thinkers in the Formal Operational stage,
  - Formal Operations is the final stage in Piaget's theory of cognitive development.
  - With formal operations, adolescents have the competence to reason rationally but performance factors may undermine such competence, resulting in risk-taking.
  - The nature of adolescents' rational competence will be presented as well how such competence can be undermined by adolescent egocentrism.

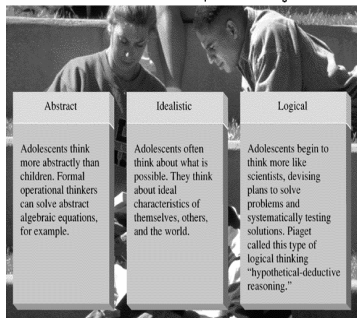
## III. COGNITIVE BASIS OF RISK TAKING

### A. Piaget

- Acquiring formal operations means new abilities for logical, abstract, and idealistic thought which emerge together in a connected manner



Characteristics of Formal Operational Thought



## III. COGNITIVE BASIS OF RISK TAKING

### A. Piaget

- However, risk taking may occur because of egocentrism.
  - According to Arnett's (1992) account of adolescent *recklessness*, adolescent egocentrism makes them vulnerable to risk taking.
  - Adolescent egocentrism may involve:
    - Uniqueness: Feeling that no one understands them.
    - Invulnerability: No susceptibility to common dangers etc.
    - Omnipotence: Unrealistic sense of power, authority, or force.
  - These feelings undermine adolescents' ability to validly perceive risks and make rational judgments
    - Empower adolescents to engage in reckless behavior.

### III. COGNITIVE BASIS OF RISK TAKING

#### A. Piaget

- Arnett's account of adolescent risk-taking includes not only egocentrism but also sensation seeking as a separate and independent factor.
  - This suggests a model of risk taking which emphasizes both biological and cognitive factors.
    - The connection between biological urges to engage in risk taking and cognitive beliefs about invulnerability were also made by Nell, for whom risk taking was related to reproductive success.
  - One problem of such a model is that risk taking as an expression of invulnerability would be in the interest of only male but not female reproductive success.

### III. COGNITIVE BASIS OF RISK TAKING

#### A. Piaget

- Johnson & Green (1993) examine the impact of egocentrism on women's contraception use.
  - They found that female adolescent uniqueness represented by thinking such as, "I'm the only one in the world who feels the way I do." was negatively related to mature decision making (adult-like) in a contraception problem.
  - Interestingly, independent thinking, represented by thoughts such as "I know what is best for me." was also negatively related to mature decision making.
    - Perhaps *independent* thinkers would be less inclined to think like an adult.

### III. COGNITIVE BASIS OF RISK TAKING

#### A. Piaget

- Greene et al (2000) examine both egocentrism and sensation seeking in risk taking
  - They found sex differences in risk behaviors, sensation seeking, and egocentrism (except uniqueness).
  - Sensation seeking and egocentrism are different but roughly additive variables in predicting risk taking
    - high in both → more risk taking
    - Low in sensation seeking (irrespective of egocentrism) → less risk taking
  - *Risk seeking* adolescents (defined as a personality profile high in disinhibition – i.e., not exercising self control) engage in more risk taking.

### III. COGNITIVE BASIS OF RISK TAKING

#### A. Information Processing: Decision theory

- **Information Processing-based criticisms**
  - Rather than reflecting an undermining of rational competence, adolescent may make imperfect but nonetheless rational adult-like decisions.
    - Adolescents may not misperceive risks because of being blinded by egocentric invulnerability beliefs.
    - Adolescent risk taking may reflect no fundamental cognitive limitation, only a disagreement with adults about the value of engaging in certain behaviors.
  - Adolescents may merely value taking risks over not taking them and so act in a relatively rational (but dangerous) manner

### III. COGNITIVE BASIS OF RISK TAKING

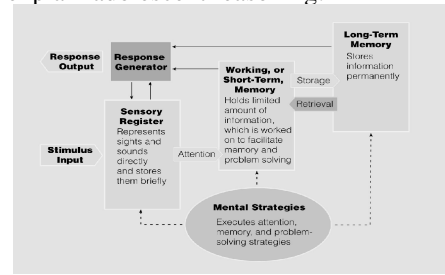
#### A. Information Processing: Decision theory

- Teens acquire adult-like IP abilities.
  - Capacity and speed of processing**
    - Increase due to the effects of brain development and experience.
  - Strategies** (goal-directed and planned actions)
    - Strategies become more effective, improving information storage, representation, & retrieval.
  - Knowledge** (facts and causal beliefs)
    - Expansion results in more information being available.
  - Metacognition** (cognition about cognition)
    - Increases lead to better monitoring, more control, and new understanding of the mind and how it works.

### III. THEORIES

#### B. Criticisms of Piaget

- IP theorists adopt a computer metaphor to explain adolescent reasoning.



### III. COGNITIVE BASIS OF RISK TAKING

#### B. Information Processing: Decision theory

- IP basis for rational decision making.
  - Rational decision making is defined as computing and comparing the subjective value and likelihood of each decision option (taking vs. not taking a risk)
    - Capacity/Speed**: Adolescents acquire capacity to process relevant information.
    - Strategies** become more effective in adopting strategies for computing and comparing values.
    - Knowledge**: Adolescents know better the risks and values of various options.
    - Metacognition**: Adolescents become more skilled at monitoring and directing their thinking.

### III. COGNITIVE BASIS OF RISK TAKING

#### B. Information Processing: Decision theory

- In a classic review paper, Quadrel et al., (1993) critiqued the idea that adolescent risk taking is due to their tendency to be egocentric and hold invulnerability beliefs.
- They argued that ....
  - there is little evidence of such beliefs being held endemically by adolescents
    - Adults may also hold invincibility beliefs and many adolescents do not.
  - Such beliefs may only reflect *ignorance of risk* and not *irrationality of judgments*.



### III. COGNITIVE BASIS OF RISK TAKING

#### A. Information Processing: Decision theory

- Quadrel et al., tested the risk assessments of teen low-risk takers, their parents, and teen high-risk takers.
  - Participants judged their own risks compare to that of targeted others for each of eight events, some of which were controllable other were not.
  - There was very little evidence for adolescents judging themselves as particularly unique in their susceptibility to risk relative to others.
    - The teens and the adults looked alike as did the low and high risk taking teens. Each showed a some weak invulnerability.

### III. COGNITIVE BASIS OF RISK TAKING

#### B. Information Processing: Decision theory

- Following up on the previous work, Beyth-Marom et al. (1993) compared teen-adult pairs on how they think about risky behaviors.
  - Participants read a scenario of a risk taking opportunities which were accepted or rejected
  - Participants were then asked to list the perceived risks and benefits of an particular action.
    - The results were coded for type, valence (good vs. bad) and directness (direct vs. negated or avoidance) of judgments
  - Generally, they found that adults and adolescents responded similarly, although adolescents thought more about peers than did adults.

### III. COGNITIVE BASIS OF RISK TAKING

#### B. Information Processing: Decision theory

- Millstein et al. (2000) assessed invulnerability beliefs in 5<sup>th</sup> graders, 7<sup>th</sup> graders, 9<sup>th</sup> graders, and young adults.
  - Participants read a scenario of a specific event and assessed the chances it would be associated with a negative outcome
    - The judgments for each risk assessment was made by selecting a value between 0% to 100%
  - Adults demonstrated more invulnerability beliefs (as measured by lower risk assessments and more 0% judgments) than adolescents.

### III. COGNITIVE BASIS OF RISK TAKING

#### C. Alternative Models

- So adolescents who take risks do so because...
  - IP Decision Models: Adolescents have limited but basically intact decision making capacities and rationally choose to engage in such risks
  - Piaget: Adolescents hold irrational invulnerability beliefs which obscure their underlying rational competence.
- This fight has been ongoing for some years, but recently theorists are beginning to look for new ways of thinking about adolescent reasoning competence.

### III. COGNITIVE BASIS OF RISK TAKING

#### C. Alternative Models

- One way out is suggested by the work of Gerrard et al., (1996).
  - They independently assessed adolescent risk behaviors and risk cognitions three times, one year apart.
    - Risk behaviors included self reported drinking, driving, smoking rates.
    - Risk cognitions included judgments of perceived vulnerability to problems, thoughts about health and safety, and perceived prevalence of each risk behavior.

### III. COGNITIVE BASIS OF RISK TAKING

#### C. Alternative Models

- They tested whether earlier cognitions about risk predicted later risk behavior, controlling for earlier risk behavior.
  - They showed that changes in Risk Cognition lead to changes in Risk Behavior.
    - Time 2 health and safety thoughts predicted all three Time 3 risk behaviors, such that higher levels of health and safety thoughts were associated with subsequent decreases in risk behavior.
    - Time 2 estimated prevalence predicted changes in both drinking and smoking, but not driving (beyond the influence of health and safety) such that high prevalence estimates predicted increases in risk behavior.

### III. COGNITIVE BASIS OF RISK TAKING

#### C. Alternative Models

- They also tested whether earlier risk behaviors predicted later risk cognitions, independently of earlier cognitions.
  - Evidence showed that changes in Risk Behaviors lead to changes in Risk Cognition.
    - Risk Increases increased in their perceptions of their personal risk as well as their estimates of the prevalence of risky behavior among their peers
    - However, risk increases reduced influence of concerns about health and safety.

### III. COGNITIVE BASIS OF RISK TAKING

#### C. Alternative Models

- These data suggest that adolescent risk taking may be both rational and irrational.
  - The Risk Behavior → Risk Cognition relation (particularly the lowering of health and safety concerns due to an increase in risk behavior) is suggestive of invulnerability beliefs (born from cognitive dissonance).
  - The Risk Cognition → Risk Behavior relation (particularly the decreases of risk behavior due to increases of health and safety concerns) is suggestive of the behavioral impact of rational decision making.

### III. COGNITIVE BASIS OF RISK TAKING

#### C. Alternative Models

- Amsel et al. (submitted) also report data suggesting that adolescent risk taking may be both rational and irrational.
- They examined decision making from a Dual Process perspective.
  - The theory holds that there are increases in two separate cognitive systems in adolescence
    - Experiential: Emotional, intuitive, heuristic, and learned reactions become expressed faster.
    - Analytic: Logical, rational, deliberate, and thought through responses are acquired and can be deployed.
  - Adolescent risk taking may be the result of decisions which bypass Analytic and use Experiential processes

### III. COGNITIVE BASIS OF RISK TAKING

#### C. Alternative Models

- Amsel et al. (submitted) tested the theory using the ratio-bias task (choosing between 2 equal gambles).
- They found external and internal factors in whether experiential processes are used
  - External Factors: How the task was framed seemed to affected choices on the task but not risk taking behavior.
  - Internal Factors: The extent to which Analytic process can be distinguished between predicted task performance AND risk taking behavior.
    - Those who showed no ability to discriminate between Analytic and Experiential processes tended to engage in risk taking. Tendency is higher in younger teens and related to metacognition and epistemic cognition.

### III. COGNITIVE BASIS OF RISK TAKING

#### C. Alternative Models

- Amsel et al (2005) also explored the roles of rational and irrational processing in adolescent risk taking.
- They compared risk- and regret-based decision making were directly compared on a task offering to exchange a lottery ticket for an incentive
  - Risk-based decision-makers would typically accept the exchange.
    - Incentives increase the value of an exchanged ticket but with the same chance of winning as the original ticket.
  - Regret-based decision makers wouldn't exchange.
    - They refuse the incentive in order to avoid the potential regret of having traded away the winning ticket.
- Only adults engaged in regret-based decision making, no adolescent anticipated the regrets from their risks and so may be more vulnerable to risk taking.

### III. COGNITIVE BASIS OF RISK TAKING

#### C. Alternative Models

- Analytic-based risk assessment processes may coexist with experiential regret assessment ones.
  - But in this case, Experiential (regret-based) processes leads to no risk taking and Analytic (risk-based) leads to risk taking.
    - Flexibility to use Experiential or Analytic processes in decision making
  - The development of the regulatory ability to bypass one processing option (Analytic) in favor of the other (Experiential) and vice versa may be the central story of adolescent decision making.