Intelligence and Creativity

Chapter Summary

This chapter examines the cognitive psychology of intelligence and creativity. Binet and Simon defined intelligence as a practical faculty that encompasses judgment, comprehension, and reasoning, and pioneered one of the first tests of intelligence, later known as the Stanford–Binet test.

Spearman laid the groundwork for factor analysis and, with that, proposed the “two-factor theory of intelligence.” This theory includes specific abilities and, at the top of the hierarchy, general intelligence (“mental energy,” or $g$), that is common to all abilities. This form of intelligence is often associated with fluid intelligence (versus crystallized intelligence). The former refers to the ability to think flexibly, while the latter refers to the body of things that one has learned. Furthermore, the ability that is said to underlie general intelligence is called eduction, and it can be measured by tests such as the Raven Progressive Matrices. Moreover, it has been suggested that general intelligence is the same as working memory capacity, although the correlation between tests of working memory and performance on Raven’s matrices is far from perfect.

Garlick, on the other hand, argued that neural plasticity underlies $g$. Kanazawa and others have expanded on this and argue that general intelligence is the same as improvisational intelligence, in contrast to dedicated intelligence. In this case the former refers to flexible intelligence evolved to deal with unique and unpredictable problems, while the latter refers to intelligence associated with domain-specific modules evolved to solve recurring problems. According to the Flynn effect, $g$ has been increasing over time. A number of reasons have been postulated to account to this effect, ranging from environmental influences to improvements in nutrition and health.

Moving away from general intelligence, Sternberg focused his theory of intelligence on intellectual components instead. He proposed three types of components: metacomponents, performance components, and knowledge acquisition components. His triarchic theory of intelligence maintained that there are three types of intelligence: analytical intelligence, creative intelligence (non-entrenched concepts instead of entrenched ones) and practical intelligence. The Sternberg Triarchic Abilities Test (STAT) is said to measure the three areas identified by the triarchic theory. Other researchers have argued that there is no evidence demonstrating that the three types of intelligence are independent, and that $g$ could still nonetheless underpin them.
Gardner put forward his theory of **multiple intelligences**, which argued against a single and collective underlying ability of intelligence. Intelligence, he maintained, must have certain criteria, such as a **symbol system**. Gardner, along with Winner, stated that rather than always improving with age, skills, such as drawing, follow a **U-shaped development** pattern, suggesting that performance (aesthetic “pleasingness”) is initially high, and then declines before rising again. Musical abilities possibly fit in with this pattern. In regards to early innate melodies (**ur-songs**), Gardner disagreed with Berstein and denied their existence. Bamberger proposed a phase that adolescents typically go through when abandoning music: the **mid-life crisis of the musician**. Another criterion that Gardner stated as being essential to intelligence is the existence of **prodigies**. Gardner then looked at expertise more closely. For instance, studies on memory abilities compared chess experts to novices, and it was concluded that experts can better remember piece positions than novices. According to Ericsson and Charness, practice is the most important factor for experts (**10-year rule**).

On the other hand, **creativity** is defined as “the production of novel, socially valued products.” In studying this field, **problem-finding** comes to be of interest. According to Campbell, creative thinking encompasses a process of **blind variation and selective retention**. Simonton adopted his own version of Campbell’s theory. In it, he stated that creative solutions need **chance permutations**. For instance, people who have more permutations have a greater **creative potential**. Original thinking can be measured by the **alternate uses test**. Unlike most people, individuals who are creative tend to see uncommon uses for things with just as much ease as they see obvious uses for them (**flat hierarchies**). Another test of originality is named the **remote associations test**.

**Chapter Objectives**

- To examine the various ways in which cognitive psychologists have conceptualized intelligence and how these conceptualizations have changed over time.
- To describe the Flynn effect and look at possible explanations for it.
- To review and evaluate Robert Sternberg’s theory of successful intelligence.
- To critically consider Howard Gardner’s theory of multiple intelligences.
- To identify the factors related to the development of expertise.
- To explain the processes involved in creativity.

**Key Concepts**

**10-year rule** The hypothesis that roughly 10 years of intense practice is necessary in order to become an expert in a domain. (p. 394)

**Alternate uses test (Barron)** A test that requires the person to list uncommon uses for common objects. (p. 397)
**Analytical intelligence** The kind of intelligence that reflects an ability to solve relatively straightforward problems, which is measured by conventional intelligence tests and considered to be general intelligence. (p. 386)

**Associative hierarchy** The idea that the associations used for problem solving are arranged in a hierarchy, and that creative people not only have more associations than most, but have them arranged in “flatter” hierarchies: thus they are more likely than most to recognize alternative possibilities. (p. 398)

**Blind variation and selective retention (Campbell)** The generation of alternative problem solutions without foresight, and the retention of those that work in a particular context. (p. 396)

**Chance permutations** Different combinations of mental elements produced according to no set rule. (p. 397)

**Creative intelligence** The ability to reason using novel concepts. (p. 386)

**Creativity** The production of novel, socially valued products. (p. 395)

**Crystallized intelligence** Intelligence that consists of the things you have learned; may increase throughout your lifetime. (p. 379)

**Dedicated intelligence** Intelligence associated with domain-specific modules that have evolved to solve recurring problems. (p. 382)

**Education (Spearman)** Literally “means to draw out.” General intelligence may be the ability to draw out the relationships that exist in a novel situation. (p. 379)

**Entrenched vs non-entrenched concepts** An entrenched concept strikes us as natural and is easy to reason with, while non-entrenched concepts strike us as unnatural and are difficult to reason with. (p. 386)

**Factor analysis** A statistical procedure that derives from a number of underlying factors that may explain the structure of a set of correlations. (p. 377)

**Fluid intelligence** The ability to think flexibly, which may increase when you are young but levels off as you mature. (p. 379)

**Flynn effect** An increase in IQ scores over historical time. (p. 383)

**General intelligence (g)** The part of intelligence that is common to all abilities. (p. 378)
**Improvisational intelligence** Flexible intelligence that would have evolved to deal with relatively unique problems that are unpredictable. (p. 382)

**Intellectual components (Sternberg)** An elementary information process that operates on internal representations of objects or symbols. (p. 383)

**Intelligence (Binet and Simon)** A fundamental faculty, the alteration or lack of which is of the utmost importance for practical life. (p. 377)

**Knowledge acquisition components (Sternberg)** Processes concerned with learning new information and storing it in the memory. (p. 384)

**Metacomponents (Sternberg)** Executive processes used in planning, monitoring, and decision-making in task performance. (p. 384)

**Mid-life crisis of musicians (Bamberger)** As music students become adolescents, they may feel a conflict between a more explicit understanding of music and their earlier, spontaneous love of music. (p. 393)

**Multiple intelligences (Gardner)** The hypothesis that intelligence does not consist of one underlying ability but, rather, consists of many different abilities. (p. 389)

**Neural plasticity** Changes in neuronal circuitry often associated with maturation, environmental adaptation, and modulation by experience which may lead to learning and behavioural modification. (p. 381)

**Performance components (Sternberg)** The processes that are used in the execution of a task. (p. 384)

**Practical intelligence** The ability to find problem solutions in real-world, everyday situations. (p. 386)

**Problem-finding (Getzels)** The ability to discover new problems, their methods, and solutions. (p. 395)

**RavenProgressive Matrices** The most widely accepted test of g. (p. 379)

**Remote associations test—RAT (Mednick)** A test that requires the person to come up with a single association to link three apparently unrelated words. (p. 398)

**Symbol systems** Different forms of representation, such as drawing, music, and mathematics, which are the expressions of different forms of intelligence. (p. 390)
**Triarchic theory of intelligence** Sternberg’s three-part theory of intelligence consisting of analytic, practical, and creative intelligence. (p. 386)

**Ur-song** The hypothesis that there is a first song that all children spontaneously sing. (p. 392)

**U-shaped development** The hypothesis that the development of many symbolic forms is initially delightfully pre-conventional, but then descends to the merely conventional, and ultimately may achieve the integration of the post-conventional. (p. 391)

**Working memory capacity** The theory that working memory capacity and g are closely related. (p. 380)

## Review Questions

### Fill in the Blank Questions

1. _______ concepts are easy to reason with, whereas _______ concepts are difficult to reason with.

2. The existence of _______ who perform at an expert level in certain disciplines such as math and chess has been taken by Gardner as a sign for his theory.

3. Creative solutions to problems require some process of variation. These variations are _______ of mental elements.

4. According to Mednick (1962), an individual’s creativity is reflected in his or her _______.

5. The _______ asks people to list as many possible uses for common objects as they can think of and is used to study original thinking.

### Short Answer Questions

1. The finding that a child who does well in one academic domain, such as French, also does well in others, like geography or math, lends support to which theory of intelligence?

2. What is general intelligence (g)?

3. What is the difference between creative intelligence and analytical intelligence? Which of these intelligences would you expect to be consistent with a person’s GPA?

4. What is the difference between entrenched and non-entrenched concepts? Which is more closely associated with creative intelligence?
5. What is the difference between general intelligence and multiple intelligences?

6. What are symbol systems?

7. What is the mid-life crisis of musicians?

8. What are the three core propositions in Simonton’s (1984, 2003) version of Campbell’s creative process theory?

9. What are the two criticisms of multiple intelligence theory?

10. What is the remote associations test and what is the criticism levelled against it?
Answers to Review Questions

Fill in the Blank Questions

1. Entrenched; non-entrenched (p. 386)

2. prodigies (p. 390)

3. chance permutations (p. 397)

4. associative hierarchy (p. 398)

5. alternate uses test (pp. 397–398)

Short Answer Questions

1. The generalized nature of this child’s academic performance is consistent with Spearman’s two-factor theory of intelligence, specifically the concept of a general intelligence that underlies performance in multiple domains. (pp. 377–378)

2. General intelligence is the notion that individuals displaying high levels of skill in some fields also display them in other fields. The idea is that skilled performance does not occur in isolated domains and instead, a general factor of intelligence underlies their ability to perform well in multiple domains. For instance, an individual who displays high levels of fluency in many languages may also be skilled in mathematics or music. This individual would be considered to have a high level of “general intelligence.” (p. 378)

3. Creative intelligence describes the ability to construct novel concepts and the ability to use novelty in the process of reasoning. Analytical intelligence describes the use of the information and skills that have been previously learned (and practised) in the reasoning process. Analytical intelligence is considered more akin to the skills that are tested in academic domains and would thus be considered more consistent with a person’s GPA. (p. 386)

4. Entrenched concepts are ideas that can be used to reason out solutions within familiar situations. These are concepts that an individual has generally had personal experience with and can be easily used in the reasoning process. Non-entrenched concepts, on the other hand, are unfamiliar methods of reasoning that require an individual to step outside familiar routes of problem solving in order to come up with a solution. An individual’s ability to work successfully with non-entrenched concepts is seen as a part of her overall level of creative intelligence. (p. 386)

5. The theory of multiple intelligences explicitly contrasts with the theory of general intelligence. General intelligence implies one general factor that underlies many different manifestations of in-
intelligence in various domains. However, Gardner emphasized that multiple intelligences arise from specific brain areas being responsible for specific skills and that variations in intelligences across individuals can be traced back to these brain regions. In the latter paradigm, an individual with a high level of intelligence in one domain may not necessarily excel in other domains. (p. 389)

6. Symbol systems are methods of representing a particular set of ideas or concepts. Language can be used to represent ideas in verbal format, and music is commonly thought of as a method of expressing emotion. This implies that music is a commonly used symbol system for emotions. Symbol systems can be used in combination to exchange a virtually limitless array of concepts and ideas between individuals. (pp. 389–390)

7. The midlife crisis of a musician is said to arise when young musicians experience a sense of de-personalization from their music. Usually, this is due to the musician’s feeling that he or she is performing due to a desire to impress someone rather than a desire to increase his or her own personal development. This feeling of detachment usually occurs around adolescence, and most young musicians generally tend to give up formal training during this period. (p. 393)

8. The three core propositions are: 1) creative solutions require some process of variation, and these variations are known as chance permutations, 2) a set of criteria is used to select variations, and 3) any variation that meets the criteria is retained. (p. 397)

9. The first criticism is that what the theory calls intelligences is more aptly called talents or gifts. The second criticism is that the theory is not grounded in scientific data as its support comes mainly from case studies. (p. 393).

10. The remote associations test is a test of originality that asks a person to come up with a single association that connects three apparently unrelated words. It does not correlate well with independent measures of the ability to produce remote associations. (p. 398)