THE NATURE OF HUMAN INTELLIGENCE

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CHAPTER 17

Intelligences about Things and Intelligences about People

John D. Mayer[1]

In 1994, Linda Gottfredson, a professor at the University of Delaware, authored an editorial directed toward the educated public entitled "Mainstream science in intelligence," which was cosigned by 52 eminent intelligence researchers. Gottfredson sought to describe the current status of the field; this would help address what she and others regarded as mischaracterizations of intelligence research that had appeared in media accounts. Her piece appeared in the *Wall Street Journal*, and was subsequently reprinted in the journal *Intelligence* (Gottfredson, 1997). What is of particular interest here are not any missteps of the media at that time, but, given the consensual nature of the document, the opening definition of intelligence. Intelligence is, Gottfredson explained:

> a very general mental capability that, among other things, involves the ability to reason, plan, solve problems, think abstractly, comprehend complex ideas, learn quickly and learn from experience ... [I]t reflects a ... capability for comprehending our surroundings – "catching on," "making sense" of things, or "figuring out" what to do. (Gottfredson, 1997, p. 13)

This already very good definition can be further sharpened, I believe, by acknowledging that intelligence has evolved to help people adapt to and survive in their environments. This evolutionary perspective encourages our consideration of intelligence's role in people's understanding of their surrounding world. Shaped that way, I would describe intelligence as:

> A person's mental capacity to solve problems that concern the inner self and surrounding world. The capabilities include the ability to represent information relevant to specific topics and contexts accurately in memory and to manipulate that information systematically. The ability further involves identifying the similarities and differences among concepts and contexts, "getting the point," and drawing upon appropriate generalizations so as to relate existing information to new problems; it involves "figuring things out," with the purpose of finding effective solutions.

Gottfredson's definition employs the opening phrase, "a very general mental capability . . . ," placing an emphasis on general intelligence. Although I agree people possess a general capacity to problem solve, I also believe they specialize in particular areas of problem solving – especially by adulthood (Ackerman, 2014). For that reason, I have added the idea that the information relates to "particular topics and contexts" relevant to the person – a modification designed to allow for more than one area of intelligence.

Although a theoretical model of intelligence that emphasizes general problem solving fits contemporary data adequately, there is increasing consensus that taking account of a group of differentiated "broad intelligences," such as verbal-comprehension intelligence, perceptual-organizational reasoning, mental speed, and other qualities can enhance our representation of human intellectual performance beyond global reasoning alone.

A Note on General Intelligence and Broad Intelligences

Charles Spearman (1904) first observed that people's abilities correlated positively with one another across a diverse group of intellectual problems: as a person's ability on one task rose, so it did on other tasks. This *positive manifold*, as the positive correlations became known, was a ubiquitous finding. If all human intellectual abilities rose and fell together, Spearman argued, perhaps they could be represented as just one overall general intelligence. Spearman's observation that mental abilities all correlated positively was supported by subsequent research. The correlations among abilities, however, were not all at the same level. Without getting too far into the technical details, I'll observe that subsets of tasks existed that correlated more highly with one another than with other subsets of tasks. The positive manifold, in other words, was not equally present across all abilities, and the statistical grey areas provided potential evidence for subgroups of intelligences (multiple intelligences) as well as a general one. The next 70 or so years were marked by a lively debate over whether human intelligence was best regarded as one or multiple in nature (see, for example, Gardner, 1983; Gignac & Weiss, 2015; Jensen, 1998; Sternberg, 1985; Van et al., 2006; Visser, Ashton, & Vernon, 2006).

In the 1970s, mathematical psychologists introduced a new tool called structural equation modeling (SEM) for modeling correlations in the field. SEM allowed for statistical tests of which theoretical representations best fit a set of correlations (e.g., Joreskog, 1969; Kenny, 1976; Thompson, 2004). John Carroll (1993) assembled hundreds of findings from intelligence tests over the 20th century and applied SEM to his

combined data set. He concluded that intelligences could be organized into three strata (levels): his three-stratum model (also referred to as the Cattell-Horn-Carroll model) describes a hierarchy of mental abilities in which general intelligence is positioned at the top, rather like the CEO at the top of a corporate organizational chart, beneath which are a series of 10 to 15 broad intelligences, analogous to the corporate chief officers responsible for the financial, information technology, human relations, and other functions of the organization. Examples of these broad intelligences include the perceptual-organizational, spatial, and verbal intelligences (Flanagan, McGrew, & Ortiz, 2000; Schneider & Newman, 2015). Carroll placed still more specific abilities at the third, lowest level of the hierarchy – analogous to the distinct individuals who run smaller departments of the organization. For example, vocabulary knowledge is part of the broader verbal-propositional intelligence (McGrew, 2009).

Many of the broad intelligences relate to specific subject or topic areas: people use their perceptual-organizational intelligence to understand how to fit objects together, such as the parts of an engine. People use their spatial intelligence to recognize objects and understand how they would appear from different angles, and to throw balls, rocks, and spear-like projectiles along particular trajectories. People employ quantitative intelligence to solve mathematical problems. Other broad intelligences concern memory retrieval and working memory and play more basic, foundational roles in thinking.

Today there is considerable evidence that these broad, interrelated intelligences exist subsidiary to general reasoning ability (Flanagan et al., 2013; Schneider & Newman, 2015; Sternberg & Hedlund, 2002; Sternberg & the Rainbow Project, 2009; Visser et al., 2006). I would argue, however, that the Carroll model of 1993 and models since have examined a diverse but nonetheless incomplete set of intelligences.

A Startling Omission

The problem with the Cattell-Horn-Carroll model of 1993 (and other models of the time) was that, integrative as it was, it nonetheless omitted key areas of intelligence. The broad intelligences focused more-or-less exclusively on reasoning about *things*: puzzle pieces (the perceptual-organizational), objects in space (spatial), quantitative (numbers), even the "things" that are the words and sentences we use (verbal), although words and sentences also include thinking about people. This reflected the more general thing-orientation of academic psychology at the time.

A second example of this thing-oriented focus was the classical approach to primate cognition of the mid-20th century: comparative psychologists, who were studying chimpanzees' and bonobos' intellect, chiefly focused on their "understanding of objects and their various spatial, causal, and featural interrelations" (Tomasello & Call, 1997, p. 25). Psychologists viewed chimpanzees and bonobos as mostly preoccupied with foraging for food: mapping the world around them, finding shortcuts to the food, and predicting where food would next appear (Tomasello & Call, 1997). These nonhuman primates could indeed categorize objects, understand the objects as permanent (in the Piagetian sense), rotate objects in their minds, and count small numbers of objects – mental abilities that paralleled such human intelligences as the perceptual-organizational, the spatial, and the quantitative.

Reasoning about Individuals?

Over time, however, comparative psychologists realized that our nearest primate relatives not only reasoned about things, but also about one another, although the researchers were "somewhat slow to recognize this fact" (Tomasello & Call, 1997, p. 187). Nonhuman primates, it turned out, also strove to assess other individuals' intentions, to learn from them, and ultimately to predict other individuals' behaviors as best they could. Tomasello and Call observed:

> Because primates individually recognize many of the members of their social groups, they come to know ... the ... behavioral tendencies of specific individuals, both toward themselves and toward one another making for a highly complex "social field" in which virtually every decision made must take account of... the social relationships of virtually all the individuals present. (1997, p. 187)

Intelligences about People

Although academic psychologists mostly focused on reasoning about things, there were exceptions: Edward L. Thorndike (1920) had proposed a social intelligence: "an ability to understand and manage men and women, boys and girls, to act wisely in human relations." A first ability-based measure of social intelligence was developed (Hunt, 1928), but sophisticated reviewers regarded its test scores as insufficiently distinct from general IQ to demonstrate the existence of a new mental ability (R. L. Thorndike & Stein, 1937). Twenty-three years later, Lee J. Cronbach concurred that

"social intelligence remain[ed] undefined and unmeasured" (Cronbach, 1960, p. 319). And still today, strong evidence for an independent social intelligence remains elusive (e.g., Conzelmann, Weis, & Süß, 2013).

But alternative concepts fared better: in 1990, Peter Salovey and I introduced the idea of an "emotional intelligence" – an ability to reason about emotions (Mayer, DiPaolo, & Salovey, 1990; Salovey & Mayer, 1990), which drew on precursor ideas, including those of social intelligence and Gardner's (1983) theory of multiple intelligences. In 2008, I introduced *personal intelligence*, described as the capacity to understand personality in oneself and others (Mayer, 2008). Personal intelligence drew together areas of reasoning described in such earlier concepts as psychological mindedness (Appelbaum, 1973) and the good judge of people (Funder, 2001), and involved an explicit rationale for the existence of a unitary reasoning process about personality (Mayer, 2009, 2014).

At the time of Carroll's three-stratum model, the idea of any intelligence focused on personality, or on people's emotions, seemed a poor fit with the more thing-focused intelligences of the day. Initially, many psychologists rejected the possibility that an emotional intelligence might exist (Davies, Stankov, & Roberts, 1998; Locke, 2005). Although I will focus on emotional and personal intelligences here, there are other possible members of the group, including practical intelligence (Wagner, 2000; Wagner & Sternberg, 1985), spiritual intelligence (Emmons, 2000), and the aforementioned social intelligence (Conzelmann et al., 2013; Weis & Süß, 2007; Wong et al., 1995).

Measuring People-Centered Intelligences

The Test Development Process

The most direct evidence for intelligences about people comes from empirical research based on the ability-based theories of emotional and personal intelligences: if a reliable measure of a well-defined psychological variable can be developed, and its validity demonstrated, the existence of the variable is supported (Cacioppo, Semin, & Berntson, 2004; Haig, 2005). In our laboratory, we have been involved in a program of test development and improvement around both the emotional and personal intelligences (Mayer, Caruso, & Salovey, 2016).

For both intelligences, we have engaged in a multiple-step process of test development (see Figure 17.1), centered around the principle that

Figure 17.1 Initial processes involved in developing an intelligence test.

these intelligences can be assessed as mental abilities (Mayer et al., 2016). In the first stage of test development, we define the intelligence in part by specifying its problem-solving domain (Figure 17.1, left-hand box). For example, personal intelligence is focused on reasoning about personality-related information; emotional intelligence is concerned with reasoning about emotions and emotion-related information (brief definitions are shown in Table 17.1 (Row 1).

Specifying the relevant areas of problem-solving content helps to define both areas of intelligence and to distinguish them from other similar areas of reasoning. The four areas of reasoning for personal intelligence shown in Table 17.1 involve identifying personality-relevant information, forming models of personality, guiding personal choices, and systematizing personal plans (Table 17.1, Row 2).

We next describe the informational building blocks, termed the conceptual *units*, people reason about in the area (Figure 17.1, second box), as well as the mental processes they apply to those units. For personal intelligence, one type of unit is the "mental trait," including instances such as extraversion and verbal intelligence. Then we consider possible *operators* – clearly specified procedures of reasoning – used with those units (cf., Newell, Shaw, & Simon, 1958, p. 152; Newell & Simon, 1972). For example, one key operator relevant to traits is the "go together" operator: if person X is dutiful, then person X is also likely to be self-disciplined and cautious, according to several models that examine hierarchies of personality traits (DeYoung, Quilty, & Peterson, 2007; Goldberg, 1993).

Dynamic pairs (DPs) are pairs of personality parts or aspects of personality that, relative to society, may cause the personality system conflict, owing to the inner or social conflicts they may elicit. A dynamic pair that leads to social conflict is the trait of *disagreeableness* in social relationships: a person with disagreeableness exerts considerable effort to disagree with others rather than going along with a crowd. In addition, disagreeable people are often shunned, potentially reducing their well-being (Baumeister & Leary, 1995).

Table 17.1 *A Brief Overview of Emotional and Personal Intelligences and their Measurement*

	Emotional Intelligence	Personal Intelligence
Brief definition	The ability to reason validly with emotions and with emotion-related information, and to use emotions to enhance thought*	The ability to reason about personality – both our own and the personalities of others – including about motives and emotions, thoughts and knowledge, plans and styles of action, and awareness and self-control*
Areas of reasoning	(a) Perceiving emotions, (b) using emotion to facilitate thought, (c) understanding emotions, (d) managing emotions	(a) Identifying personality-relevant information, (b) forming models of personality, (c) guiding choices with personality-relevant information, (d) systematizing plans
Ability test description	*Mayer-Salovey-Caruso Emotional Intelligence Test* (Mayer, Salovey, & Caruso, 2002); see also MacCann and Roberts (2008) for an alternative	*Test of Personal Intelligence* (Mayer, Panter, & Caruso, 2012; 2017)
Sample test item	If a person feels more and more frustrated over time, and thinks he has been treated unfairly, the person may become (choose one): a. regretful b. angry c. guilty d. happy	If a person is outgoing and talkative, most likely, she is also inclined to be (choose one): a. self-controlled b. willing to take more risks than average c. anxious and impulsive d. fairly thick-skinned

* from Mayer, Caruso, & Salovey, 2016, p. 7

Dynamic pairs of traits or goals sometimes also may cause inner conflict. A person who is both anxious and sensation-seeking will simultaneously crave risk and be fearful of the consequences his or her daring acts may entail. As a second example, a person whose goals include "being honest all the time" but who also hopes "to appear better in public than I really am" will face some difficult decisions regarding his or her aspirations (Emmons & King, 1988). Dynamic pairs also emerge from misrepresentations of the self, for example, if people's erroneous beliefs as to who they are causes friction with how others see them. A narcissistic individual may believe he is cool whereas others perceive him as exploitative – and this ultimately can lead to negative social consequences for the individual such as impaired work performance (Oltmanns & Turkheimer, 2006).

In the third step of our test development (Figure 17.1, Step 3) we formulate test questions that pertain to the subject area and concern the units and operators described previously. Table 17.1 (Row 3) provides references

for the specific tests we and a few others have developed in the area along with some sample test items, for example, the *Test of Personal Intelligence* or *TOPI*. That measure includes items such as the one reproduced in the bottom right of Table 17.1: that asks, "If a person is outgoing and talkative, most likely, she is also inclined to be..."? followed by four alternatives. The correct answer is "b. more assertive than average," because research on the big five personality traits indicate that talkativeness and sociability are more highly correlated with assertiveness than with the other listed alternatives.

Although both personal and emotional intelligences concern people, they are substantially different in their subject areas. It is possible, for example, to write 100 test items in the area of personal intelligence without much mention of emotions. Similarly, it is possible to write 100 questions about emotions without asking anything much about personality traits or other information about personality. In Step 4, we administer test items to people to evaluate whether the intelligence exists, and simultaneously, the quality of our test items and test. Our theory of personal intelligence predicts that people who recognize personality-relevant units and their interactions will score higher on our test of personal intelligence than other people.

Personal and Emotional Intelligences as Broad Intelligences within the Three-Stratum Model

Findings from personal and emotional intelligence tests indicate that each one samples a broad range of problems solving, and each individually assesses a reliable individual-difference variable (reliabilities typically in the $r = 0.80$ to 0.90 range for the overall tests) that is largely unitary. (How each intelligence might be best subdivided remains unsettled).

MacCann and colleagues reported the results from a large-scale study funded by the *United States Army Research Institute* and *Educational Testing Services*. Their findings indicated that emotional intelligence, represented as three factors of the Mayer-Salovey-Caruso Emotional Intelligence Test (MSCEIT), fit well within the broad-intelligence stratum of the Cattell-Horn-Carroll model (MacCann et al., 2014). A reanalysis of the same data by Legree and colleagues reached the same conclusion regarding the MSCEIT's fit within the three-stratum model, but represented all portions of the test as a single factor (Legree et al., 2014). (For a more detailed discussion of the MSCEIT's indeterminate factor structure, see Mayer et al., 2016).

Personal intelligence, the newer construct, has not yet been tested in such a large-scale study, but it exhibits the same positive manifold with other broad intelligences suggestive of a broad intelligence. Personal intelligence may also divide into two subsidiary factors that correlate about $r = 0.80$ with one another (Mayer, Panter, & Caruso, 2017). The first factor involves perceiving consistencies in people's behaviors. The second factor represents reasoning about personality dynamics, such has how goals interrelate, and how multiple observers each may perceive the same person differently.

Thing-Centered versus People-Centered Intellectual Development

People vary in their interest in things versus people beginning as early as the third grade. To ask yourself which you are most interested in, decide whether you most like "to stop to watch a machine working on the street" or "to make the first attempt to meet a new neighbor" (Graziano et al., 2012, p. 468). Intellectual development may be guided by these interests. William Skimmyhorn and I were able to model course performance at the U.S. Military Academy at West Point largely by dividing GPA into course grades for thing-related courses such as engineering, math, and science, on the one hand, and for people-related courses such as literature, philosophy, and environmental and social sciences on the other (Mayer & Skimmyhorn, 2017). Occupations, too, are often distinguished by whether they are thing- or people-oriented: compare accounting, clerical, engineering, and research work, on the one hand, to sales, social services, and interior decorating on the other (Holland, 1966). Interest in the two general areas may in turn encourage a person to develop thing- or person-centered intelligences over adulthood (Von Stumm & Ackerman, 2013).

Specificity of Prediction?

Correlates and Predictions

A number of findings distinguish people- from thing-focused broad intelligences. First, within the generally positive correlations among broad intelligences, the more specifically thing-oriented an intelligence is, the lower its correlation with people-centered intelligences. For example, personal

intelligence correlates just r = 0.17 and r = 0.20 with SAT-Math and spatial intelligence measures, but rises to r = 0.39 with verbal intelligence (which presumably is midway between thing- and person-focused), and rises again to r = 0.53 with the Reading the Mind in the Eyes scale, a measure of understanding people, and exhibits an r = 0.69 with the MSCEIT understanding emotions and managing emotions areas (the latter, managing emotion area, arguably blends somewhat into personal intelligence at a conceptual level).

Second, most intelligences correlate with the openness dimension of the Big Five at about the r = 0.20 level, but people-focused intelligences, compared to thing-focused intelligences, exhibit a unique pattern of correlations with the Big Five personality traits beyond that. Individuals who are better able to reason about themselves and others are also able to interact with others more smoothly and their self-understanding may lead to better self-control. Both personal and emotional intelligences, it turns out, also correlate with higher levels of agreeableness and conscientiousness (an index of self-control) than thing-focused intelligences (DeYoung, 2011; Mayer, Panter, & Caruso, 2012; 2017; Mayer & Skimmyhorn, 2017).

Specificity of Course Performance. Mayer and Skimmyhorn (2017) presented evidence that personal intelligence predicted performance in person-centered courses – those in the humanities and social sciences – better than thing-focused courses. Eight pairs of correlations were computed over a main and a replication sample (Ns = 893 to 1063) between an intelligence type (e.g., thing- or people-centered) that matched or mismatched grades in a course type (e.g., thing- or people-focused). In each case, when the intelligence and course types matched, the correlation was higher than when they mismatched. For example, personal intelligence correlated more highly with courses in literature and philosophy than did spatial intelligence, also in both samples; spatial intelligence correlated more highly with thing-focused courses than personal intelligence did over both samples.

Specificity of Social Relationships. Both tests also appear to predict better interpersonal relationships with others. People better like and respect individuals who have higher personal and emotional intelligences than those with lower ability levels (Mayer, Roberts, & Barsade, 2008; Mayer & Skimmyhorn, 2017). Emotional intelligence relates to fewer depressive symptoms and greater well-being (Fernádez-Berrocal & Extremera, 2016;

Lopes, 2016; Mayer et al., 2008) and higher personal intelligence may protect against symptoms of personality disorders (Mayer et al., 2012).

Discussion

The Definition of Intelligence Revisited

At the outset of this chapter, I compared two definitions of intelligence – one that emphasized general intelligence and the other that allowed for more consideration of broad, content-focused intelligences. The identification of a group of broad intelligences argues for the importance of content-specialization for at least some broad intelligences (others, such as mental speed, may be more general). I further argued that one key means of organizing such intelligences was into those focused on things, and those focused on people.

Too Many Intelligences? Yes and No

In a pair of influential commentaries, Hedlund and Sternberg (2000) and Austin and Saklofski (2005) raised concerns that there were, perhaps, too many proposed intelligences to accommodate in contemporary research: how, they wondered, would we manage an expansion of the already large number of broad intelligences? One possible solution raised here is to arrange broad intelligences according to key dimensions that distinguish them and help to define their interrelationships.

Thing- and person-centered intelligences. Our focus here was on a person-thing continuum: indeed, people-centered intelligences appear to have predictable and distinct predictions relative to thing-centered intelligences, such as the courses at which students may excel (Mayer & Skimmyhorn, 2017). But there may be other dimensions as well.

Basic versus subject-oriented broad intelligences. A possible second organizing continuum may be a basic, neurocognitive versus subject-focused dimension, in which the neurocognitive side is occupied by mental speed, working memory and memory retrieval, and the subject-focused end contains both the thing- and people-oriented intelligences discussed here. It seems likely that the neurocognitive intelligences may be more *g*- and fluid-intelligence related, whereas the thing- and person-centered intelligences may reflect more crystallized intelligence.

Implications of Person-Centered Intelligences for Education

Although intelligence levels are hard to change, education is highly effective at improving a person's functioning given the intelligence level people do possess. For example, we are unlikely to improve people's *quantitative intelligence* simply by teaching them algebra, but teaching high school students how to organize their thinking about algebra and about the already-worked-out ideas of the field is very effective at improving how well students solve problems in the area. Most people won't come up with the binomial or quadratic equations on their own, but once taught them, can use the equations to solve algebraic problems. Similarly, by guiding people to build and organize their knowledge around personality, we may improve their effectiveness in thinking in the area.

A number of after-school programs seek to promote skills about human relationships by teaching emotional knowledge, social understanding, and self-understanding more generally. Although the curricula of these programs vary widely, and not all might meet the standards of teaching their areas well, meta-analyses of social and emotional learning programs indicate that teaching people about interpersonal relationships allows students to function better interpersonally (and often academically) with substantial effect sizes in the range of 0.21 to 0.41 (Durlak et al., 2011). As we better specify the units and operators of people-centered intelligences, we may be able to teach people these areas of study more effectively.

Concluding Thoughts

Between 1905 to 1990, just a few measures of people-centered intelligences existed, mostly of social intelligence, and research use of them had proven disappointing. As a consequence, the new models of human mental abilities that emerged in the 1990s mostly omitted their consideration. Now we have tests, data, and intriguing findings in the areas of both personal and emotional intelligences. None of the tests in these new areas is perfect, but collectively they indicate that intelligences about people exist and are consequential. The research on people-centered intelligences has been eye-opening as to the importance of reasoning about oneself and others. To succeed in life doesn't depend just on "who you know" or "what you know," but also on "what you know about who you know."

Note

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