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## Fluid and Crystallized Intelligence

Lyndsay T Wilson 1.9K reads

**Charles Spearman's noted student Raymond Cattell expanded on Spearman's theory of a unified  $g$  and explored the difference between two independent but correlated factors of general intelligence: crystallized and fluid, which he called  $G_c$  and  $G_f$ .**

"...it is apparent that one of these powers... has the 'fluid' quality of being directable to almost any problem. By contrast, the other is invested in particular areas of crystallized skills which can be upset individually without affecting the others."

Raymond Cattell

Fluid intelligence is the ability to tackle new problems by recognizing patterns and using logic and reasoning to find a solution independent of any experience or knowledge. It represents the "nature" component of intelligence, and occurs independent of any training. This is evidenced by the fact that brain injuries affect  $G_f$  more than  $G_c$ .

Crystallized intelligence, on the other hand, is the total of a person's intellectual skill, knowledge, stored vocabulary, and learnt verbal and numerical abilities. It more accurately represents the "nurture" component of intelligence and comes about from life experience and education. Familiarity and memory allow us to solve problems similar to the ones we have already encountered.



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# The Relationship Between Fluid and Crystallized Intelligence

As you can imagine, a high Gf allows a person to develop a high Gc – their inbuilt intelligence lets them effectively gather and retain knowledge. “Cognitive investment” can be thought of as the depositing of Gc into various “banked” knowledge chunks.

But it’s important to note that Gc is not crystallized *from* Gf – they are two distinct processes. Gc is merely the factor that cements itself in knowledge, while Gf is the more abstract factor drawn on to solve novel problems.

A child can be understood to be born with nothing but Gf and later develop their Gc according to their education and life experience. Psychologist Janet Belsky suggested a “use it or lose it” way of understanding these two factors and aging. While Gc increases steadily with age, there does come a point where the rate of forgetting is faster than the rate of acquiring new knowledge!

## Measurement

The Sentinelese people who live on North Sentinel Island off the coast of India are unique in that they have had virtually no contact with the outside civilized world, and they retain a hunter-gatherer lifestyle in an isolated jungle. If a Sentinelese child were given an IQ test, there is no question that she would obtain a very low score, even if it were translated into her native tongue.

Modern IQ tests such as the Weschler Intelligence Scale for children (WISC), test a mix of both Gc and Gf. But the Sentinelese child will have vastly different crystallized intelligence compared to the modern, westernized child such a test was designed for. In fact, the notion of taking an IQ test at all would be a novel experience and not something she could tackle using her education or past experience. She would have to rely exclusively on her fluid intelligence.

This raises important questions about fairness and validity in IQ assessment. The difficulty of testing Gf independently and outside of any accrued cultural or educational knowledge is challenging. The Cattell Culture Fair IQ test and the Ravens Progressive Matrices (RPM) attempt to tap Gf by relying as little as possible on the vocabulary and acquired skill bestowed by formal education.

The test requires the child to complete a series of pictures by choosing from a given selection. The idea is to assess the child’s ability to appraise relationships and make representational analogies. They have to uncover the hidden rules of increasingly complex questions, but without relying on any crystallized skills they might have developed prior.

The RPM test and others like it can thus identify a child’s mental capacity regardless of any education they’ve received till that point. Such tests are not only effective ways of measuring Gf, but they are also more culture-neutral. In other words, they would likely give a more accurate score for our hypothetical Sentinelese child!

## Fluid Intelligence in the Workplace

Crystallized intelligence is easily and frequently measured in academic exams. It's not too difficult, either, to assess the retention of various facts and skills with vocational or on-the-job tests. An employee's fluid intelligence, however, has also been shown to be a good predictor of work performance in the corporate environment.

Certain tests have been designed to measure a person's ability to adapt to workplace complexity and uncertainty. In a job where the "rules" are frequently in flux, such intelligence would be more useful than crystallized knowledge of any particular rule.

Finally, critics of the application of this theory of intelligence point out that tests for fluid intelligence may actually measure a person's *interest* in the problem at hand. If Gf is independent of crystallized knowledge, it can be directed to any activity and solve any problem. Therefore, the choice of where to invest this ability may come down to idiosyncratic features.

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<b>FLUID</b>	<b>CRYSTALLIZED</b>
Abstract reasoning	Vocabulary
Puzzle solving	General knowledge
Deduction and induction	Analogies and relationships
Visualization	Acquired skills
Pattern recognition	Education

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