The Science of Human Intelligence is an update of the 2012 book with the simpler title Human Intelligence. Earl (Buz) Hunt (1933-2016) was the dean of the school of psychometricians, achieving the difficult balance between being accepted in a politically correct world and speaking the truth as he saw it.

In reviewing the 2012 book this reviewer did not properly appreciate Hunt's ability to recognize all points on the compass of opinion within the field. This update retains much of the openness that he expressed in the original.

In their concluding chapter the authors make the rather anodyne statement that "The idea of a general factor of national cognitive skill is important since it may have a major relationship to key social outcomes. The point of this kind of research is to identify possible causal relationships in complex systems that could provide information useful to policy makers interested in enhancing specific outcomes on a national level."

That notwithstanding, they have cited earlier in the book and at length and fairly strongly endorsed the work of Richard Lynn, Tatu Vanhanen and David Becker measuring national intelligence throughout the world. The statement above essentially says that while it is possible that a century of intelligence studies and the widespread agreement among scholars is wrong, the likelihood is low. Fact is that although the topic is so toxic that relatively few researchers are willing to tackle it, those who do all come to the same conclusion. People are the product of evolution, and we evolved to be different.

In this reviewer's opinion the two living authors, Richard Haier and Roberto Colom are a bit less circumspect than was Earl Hunt himself, and that this book, caveats notwithstanding, does a very good job of presenting contemporary thought within the field. I had very favorably reviewed Haier's The Neuroscience of Intelligence as well as Hunt's first edition of this book and was predisposed to like this second edition.

Of course there is more to be learned. The frontiers of the field are in genetic research, genome wide association studies (GWAS) to identify the thousands of alleles that sum to make significant observed differences in mental ability, investigative technologies that can measure brain activity at the voxel level (i.e., 3D pixels of the brain) in real time, gene modification techniques for enhancing fertilized embryos, and techniques for assessing the probable intelligence of embryos before implantation by IVF procedures.

This review differs from the typical Amazon review. The intention is not to give an opinion so much as to summarize the book. It follows the book chapter by chapter, and includes fairly extensive quotes and figures copied from the book. It is an important book that runs 424 pages and cost $50 on Kindle. My objective is to make its major theses more readily available to people who don't want to invest that kind of time or money into reading the whole thing. A secondary objective is to inspire a few readers of the review to pungle up the money and spend the time. It has more to say about the future society than just about anything else one could imagine. This review tracks the Table of Contents

Introduction

The introduction gives a preview of some of the valuable things to come. One example:

> Using patterns of connectivity among brain areas (the connectome) , we can now identify brain "fingerprints" that predict intelligence test scores.

Chapter 1 A Brief Voyage to the Past

The science of intelligence research is well over a century old, having started with the fathers of statistics Francis Galton, Karl Pearson, Charles Spearman and R.A. Fisher in England and Alfred Binet in France.

> Galton posited there must be individual differences at the mental or psychological level also due to evolution . He adopted Aldolphe Quetelet's bell-shaped curve for quantifying these differences , invented the correlation coefficient to quantify the strength of relationship between two variables , and promoted the use of percentiles for ranking people.

The need for intelligence testing is a recent concept. The early researchers were all interested in the potential of educating individual students. The authors write:

> Universal education, the requirement that every child learn by practicing seemingly esoteric exercises in a setting divorced from everyday life, is a late nineteenth-/early twentieth-century idea.

This book itself may prove to contain anachronistic claims even as it is published. They write that some people remain ignorant, even to the point of "declining to take vaccinations." That certainly defines this reviewer, even before but especially since the Covid episode.

Intelligence research has long had its vociferous detractors. See my review of Gould's The Mismeasure of Man. Hunt, Haier and Colom write

> In 1981, the Harvard paleontologist Stephen J. Gould wrote a scathing analysis of virtually all aspects of modern research on intelligence. He asserted as false the fundamental idea that intelligence was a meaningful term or could be quantified (Gould, 1981). He stated, incorrectly, that g was merely a statistical artifact of factor analysis. He concluded that there was no reliable evidence relating brain size to intelligence.

Gould's fellow academic Marxists wrote in the same vein. Here are links to Not in our genes by Richard Lewontin and Race and IQ by Ashley Montagu. Also at Harvard were Stephen Rose and Stephen Kamin. Other writers were not such esteemed academics. In the same vein, and tellingly vitriolic, are Measured Lies and The Bell Curve Wars. For the past twenty years, however, the naysayers have not published much. As Stephen Pinker wrote in The Blank Slate, they have disparaged, shunned, shouted down, cancelled and attacked intelligence researchers, but not published much to gainsay them. The last of which I know is Race Decoded, a total dud I reviewed a decade and a half ago.

Chapter 2 Basic Concepts

The authors write

> Mechanisms of education such as the school, the newspaper, and the internet are different from, and far more challenging than, the educational systems of the nineteenth century. As a result, today's children generally have better cognitive skills than children in the past. This may be one reason that IQ scores rose from generation to generation throughout the twentieth century, a phenomenon known as the Flynn effect, although some evidence finds the increase already is apparent in infants, suggesting improved nutrition and health care also might be relevant.

This reviewer, a former teacher and the father of three school-age children, is not convinced. Reading is difficult, and children default to watching video. It is far quicker to read a passage of text than listen to it, and a diligent student having the opportunity to reread a confusing section will understand it better than a kid who is merely listening passively.

The whole question of rising IQ scores is problematic. Other writers such as Richard Lynn (Dysgenics), Helmuth Nyborg and Edward Dutton (At our wits end) have noted that IQ, SAT, ACT and other standardized tests are re-centered (viz, "dumbed down") generation by generation to reflect decreasing ability.

Chapter 3 Psychometric Models of Intelligence

About early intelligence testing, the authors write:

> Intelligence tests sample different mental abilities. Virtually all tests of mental abilities correlate positively with each other. Most likely, individuals with high scores on one intelligence test will not have low scores on another. This was discovered by Charles Spearman at the beginning of the twentieth century (Spearman, 1904), and it is one of the most replicated findings in psychology. It is known as the positive manifold.

Per Spearman and Galton, all measures of intelligence are aligned. People who are high in verbal intelligence tend also to be high in mathematical and spatial intelligence. Statisticians call the single common factor that underlies them all the g factor.

> The g-factor represents commonality among all cognitive abilities. It alone usually accounts for about 50 percent of variance among the general population, more than any other single factor.

The authors describe five or six different schemes for describing different kinds of intelligence. They conclude by slightly favoring the VPR model, described below.

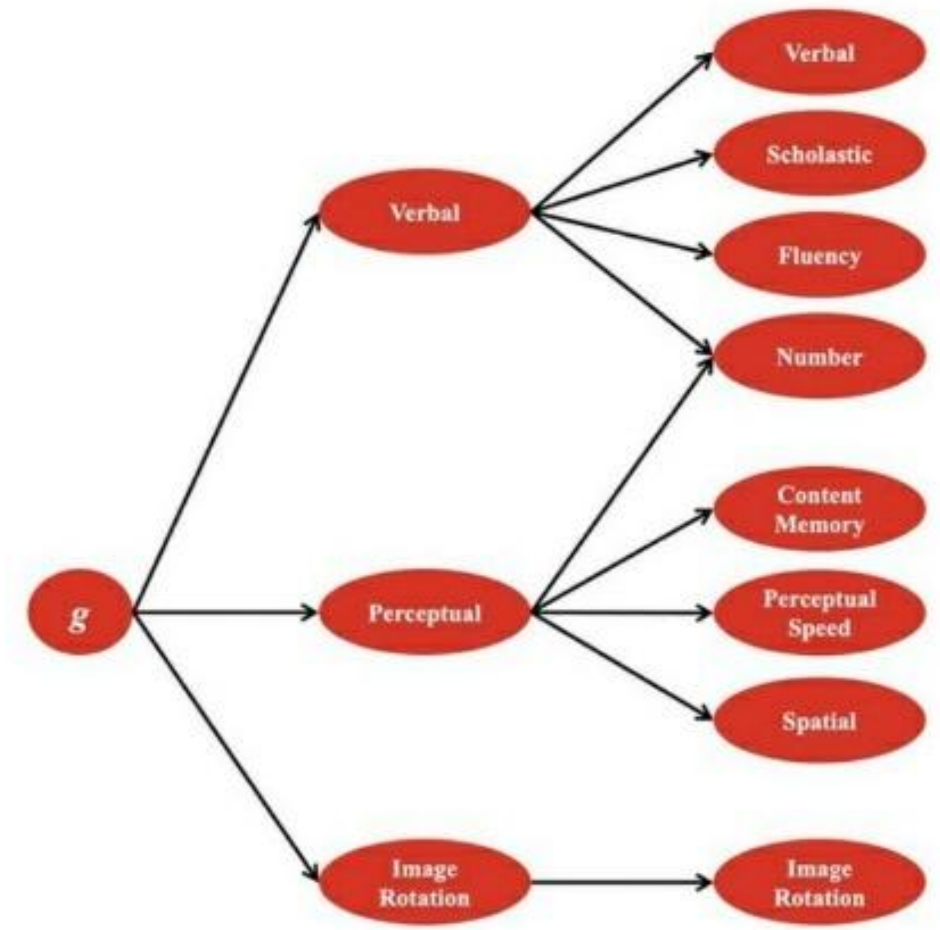
They find Howard Gardner's multiple intelligences scheme to be very weakly supported experimentally and simply not very useful. Emotional intelligence as a concept may have some reality, but it is hard to define and measure.

With regard to verbal intelligence:

> Use of the spoken language is clearly a primary capacity. Normal children learn to speak mostly without explicit instruction simply by being reared by speakers of the local language. Literacy is a secondary skill. Reading and writing are acquired through instruction, and the success of this instruction varies greatly.

Intelligence tests generally use written language. The tests reflect both fluid and crystalized intelligence. Performance, therefore, is related to a person's experience with the written language as well as g – native intelligence.

VPR stands for Verbal-Perceptual-Rotational. Perceptual is largely a question of speed. Mathematical is subsumed by Verbal and Perceptual. How well you understand the presentation of the problem (verbal) and how quickly you solve it (speed). This model is not intuitive, but among parsimonious models these three factors are the most independent of one another.



The g-VPR model aligns with some neuroscientific findings. The ubiquity of g suggests that there are individual differences in some pervasive brain processes. At least three candidate processes have been suggested: individual differences in the ability to control attention, individual differences in the speed and accuracy of neural conduction, and individual differences in the plasticity of neural connections.

A couple of other models have useful features and have been incorporated to some degree in the VPR model.

According to Cattell, Horn and Carroll, the most important of these are fluid intelligence (Gf) and crystallized intelligence (Gc). They are defined as the ability to deal with new and unusual problems (Gf) and the ability to apply previously acquired knowledge to the current problem (Gc). In many contexts, visuospatial ability (Gv), the ability to deal mentally with spatial and visual images, is also important.

Their CHC model makes a distinction between problem solving based on the manipulation of working memory (Gf) and problem solving based on retrieval of previously acquired information (Gc). The Gc component of the three-stratum model is very closely associated with verbal reasoning.

Chapter 4 Cognitive Models of Intelligence and Information Processing

> Any computing device has to be able to do three things:
>
> 1. Perception: Sense the environment.
>
> 2. Categorization: Classify the environment into states relevant to the device.
>
> 3. Memory retrieval: Relate these classifications to previously stored information.
>
> In people, the result of these computations is an internal representation of the current situation as interpreted by memory of past situations.
>
> [Looking at things] this way enables the ability to deal with two or more tasks simultaneously – for example, talking while driving an automobile. The impression of simultaneity is something of an illusion, as both tasks will compete for working memory resources and for attention. When two tasks are done together, therefore, close examination almost always shows that one or both are performed less well than they would be if performed alone.}

The authors write that

> Information in working memory is consolidated in long-term memory. This takes time. Therefore, the probability that a piece of information in working memory will be stored in long-term memory is partially determined by the time it remains in working memory. Items briefly attended to are not likely to be remembered.

Michael Nehls, in The Indoctrinated Brain, provides a lot more detail about how the hippocampus stores short-term memories throughout the day, to be systematically either discarded (the majority) or moved to long term storage in the occipital lobes during REM sleep at night.

Chapter 5 Intelligence and the Brain

The authors describe several techniques for brain imaging. Positron Emission Tomography (PET), Magnetic Resonance Imaging (MRI), Cathode Tomography (CAT Scan), Diffusion Tensor Imaging, (DTI), functional MRI, EEG (electro encephalogram), Event Related Potentials (ERP), and Magnetoencephalography. Each has its own costs, advantages and disadvantages. Some are still, some are real-time. Some are passive, some intrusive. Some involve potentially harmful radiation. Some have resolution down to the voxel (3D pixel) range.

The bottom line is that they are getting more and more refined. The authors write:

> Predicting individual differences in intelligence from neuroimages is now possible. We think this is an amazing advance that would awe the early generation of intelligence researchers working only with psychometrics. Whether the prediction will ever be strong enough to replace psychometric assessments is an empirical question.
>
> The 1988 PET results became the modern version of the brain efficiency hypothesis (BEH; sometimes called the neural efficiency hypothesis, or NEH). The individual differences approach of correlating brain activity with task performance was adopted by many subsequent imaging studies. Haier's group also followed up with a prediction that learning a complex task would result in lower glucose metabolic rate (GMR) if the brain, somehow, became more efficient by learning what networks were not necessary for good performance.
>
> They tested this hypothesis using the famous video game Tetris. As predicted, GMR decreased after students became expert at Tetris, even though after fifty days of practice their scores were higher and the game play more difficult (Haier et al., 1992). Haier's group also predicted that people with low IQ would show higher GMR, suggesting inefficient brains. This was the case in a PET study that compared low-IQ individuals, people with Down's syndrome, and matched controls

They write more about the structure of the brain:

> Psychometric intelligence test scores are correlated to individual differences in brain structure and function. Early neuroimaging studies identified specific brain areas associated with individual differences in scores. Newer studies show that connectivity among brain areas is related to intelligence and that brain connectivity can be used to predict intelligence scores.
>
> Neuroimaging results are fascinating and have advanced our knowledge. Nevertheless, we are still mostly in a descriptive stage despite the increasing sophistication of brain – intelligence models. We have to explain how brain structures and networks function. Connectivity and efficiency investigations ever deeper into the brain are promising, but the "how" of intelligence remains a mystery that likely requires advanced genetic research. Solving this mystery is the ultimate aim of brain – intelligence theories and research.

Chapter 6 The Genetic Basis of Intelligence

> We now know two things. (1) The earlier debate is resolved. Genes influence intelligence differences among individuals. (2) Genetic influences on complex traits like intelligence are more probabilistic than deterministic because they affect the brain and intelligence in complex combinations with multiple factors, including nongenetic ones and random events, during brain development.

> Knowing about genetics is a basic education requirement for being well informed in the twenty-first century, no matter what your educational background or personal politics.
>
> One of the reasons that humans were able to settle all over the globe, in very different ecological systems, is that our big brains and enhanced learning ability allowed us to develop different cultures to adapt to and, crucial for intelligence, to shape different environments for overcoming our limitations when adaptation is not enough. Then these cultures took on a life of their own, as they were socially transmitted and modified from generation to generation. So, there may be differences in intelligence influenced by the sociocultural milieu, as we will discuss in Chapter 7.

The authors write:

> Almost all of the DNA content of the human genome, perhaps close to 99 percent, is shared by all people, but there are significant genetic differences in the remainder between people and populations. [Note: In Chapter 13 below they write that 99% is shared with chimpanzees.]
>
> One percent of 3 billion allows for considerable variation among people and populations defined by a genetic ancestry. For example, Swedes, Tanzanians, Chinese, and the Quechua Amerindians (who live in the Andes) differ in their appearance, within the range of human differences, and they differ in other ways as well. These include sensitivity to sunlight, the ability to metabolize milk and milk products, and susceptibility to a number of diseases. Whether psychological differences are included among these features is an empirical question.

The authors cite Robert Plomin, whose book Blueprint I reviewed favorably.

> Robert Plomin (1999, p. 27) has written, "The most far-reaching implications for science, and perhaps for society, will come from identifying genes responsible for the heritability of g."

They make an important distinction:

> Heritable and genetic are not synonyms. Heritability is a measure that estimates the contribution of genetics (DNA) to the variance of a particular condition or trait like intelligence. Variance is key. Variance among individuals on any variable (e.g., height, weight, eye color, extraversion) can be wide or narrow, depending on the environment in which it is measured. Intelligence in the population is normally distributed and has wide variance around the mean.

The most significant example is children's intelligence. Per this reviewer's analysis, while a child's intelligence is 80% attributable to genetic factors, a third of children born will have measured intelligence thirteen points greater than or less than the average of their parents. Attributable to inheritance does not mean determined by inheritance, by any means. Moreover, the environmental contribution, absent any obviously damaging features, has almost no effect on intelligence.

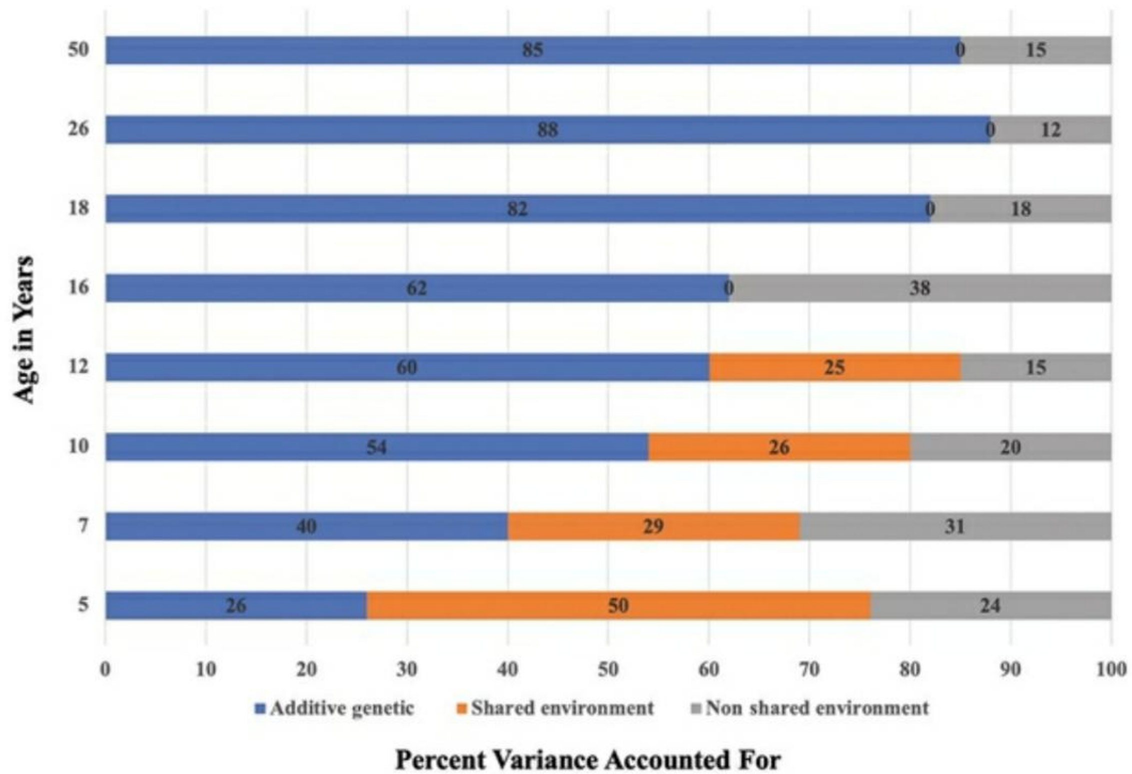
The authors write that the heritability of intelligence is between 40 and 80 percent. That is significantly lower than other authors (viz, Lynn, Jensen, Flynn) would claim. Elsewhere they report (as do the others) that the correlation of measured intelligence of monozygotic (identical) twins is upward of 0.8.

Only late in the book, and in another context, do the authors write that explained variance (viz, causality) is the square of the correlation. The square of .8 is .64, which would still be on the low side. This reviewer's Internet search revealed that even the scientists are not in concurrence as to whether the correlation or the variance (squared correlation) is more meaningful for intelligence.

Where all authors agree is that excepting under very harsh conditions (famine, child abuse, extreme poverty) neither environment nor anything else contributes substantially to intelligence. Other factors are largely unexplained.

In seeming conflict with what they previously wrote, but in accord with the other authors cited, they write in explaining this graph that:

> Genetic influence (blue) increases with age to about 85 percent at age fifty, whereas shared environment (orange) influences decrease to near zero by age sixteen, leaving about 15 percent attributable to unique, nonshared experiences (gray) by age fifty.



And

> However, modern research of twins reared apart overwhelmingly supports Burt's 0.77 correlation and his main conclusion. Averaged over other studies of twins reared apart from around the world, the IQ correlation is 0.75.
>
> The MZ [identical twin] correlations were about 0.8, regardless of the twins' age.

Much of the United States educational system is premised on the notion that all students are equally capable of learning. Therefore, when they do not perform equally, educators assume something is wrong. Somebody is to blame. The authors write:

> Putting this colloquially, according to the TEDS [Twins Early Development Study] results, many of the children who would qualify for special education in reading and mathematics aren't really special; they are just at the lower end of the normal distribution of reading and mathematics skills.
>
> The fact that genetic influences on academic skills are stronger than nongenetic ones suggests that genetic analysis could serve as an early warning signal for identifying children who might have difficulty acquiring language and mathematical skills.

They further write that

> The level at which schoolchildren are considered for special education, in any field, has to be determined by two things : (1) the level of competency the child requires to function in the society and (2) the money available to enroll students in special education programs.

Every student's performance can be improved by spending more money. However, money is limited. The relevant question is the best use of limited resources.

> "To the extent that children's traits predict educational achievement, they do so largely for genetic reasons. … Education is more than what happens to a child passively. Children are active participants in selecting, modifying, and creating their experiences that are correlated with their genetic propensities, known in genetics as genotype – environment correlation. …

The authors write that:

> Currently, an estimated one-third of human genes may have some expression in the brain.

Other authors such as Dutton and Woodly in At Our Wits End put the figure much higher – at around 84%. Which figure is correct does not matter, but the discrepancy is of interest.

There are many causes for mutations. "These include radiation, ultraviolet light, and exposure to certain chemicals."

> A difference that occurs at a single base pair in at least 1 percent of the population is called a common single-nucleotide polymorphism (SNP, or "snip ").

Robert Plomin provides a far more detailed explanation in his book Blueprint.

The authors conclude their discussion of genetics with

> At least within the scientific realm, we are light-years past the old controversies about whether intelligence can be studied scientifically or whether genes have any influence at all. The findings discussed in this chapter are compelling, and we hope you feel the excitement in the field.

But they retreat. With regard to groups of people they write:

> Discussion of the evidence for a genetic basis for intelligence variance differences among individuals is often conflated with discussions of average mean differences between populations.

This is misleading. While there are dull and brilliant individuals within every population, average difference matter. As they write in later chapters, the size of the "smart fraction" has a great deal to do with a society's success. This was recognized by African American scholars such as Booker T. Washington writing about the "talented tenth" in Character Building, or W.E.B. DuBois in Soul of black folks back in a day when we could be more honest with one another.

Chapter 7 Experience and Intelligence

The education establishment, pre-school, K-12 and secondary, is a huge vested interest. They constantly work to convince us of how invaluable they are. The authors write:

> Among intelligence researchers, there is an emerging consensus that schools and teachers do not have as much effect on the development of intelligence as might be expected. This was first reported in a comprehensive US national study (Coleman, 1966) and reinforced by recent studies.

They write that

> only 10 percent of school achievement variance can be attributed to school factors (including teachers); the remaining 90 percent is associated with students' personal features, including intelligence.
>
> … There may no better example of ignoring this warning than the $575 million effort funded from the Gates Foundation ($212 million) and school districts ($363 million) to improve student achievement by increasing teacher effectiveness. It failed for both individuals and for increasing group averages.

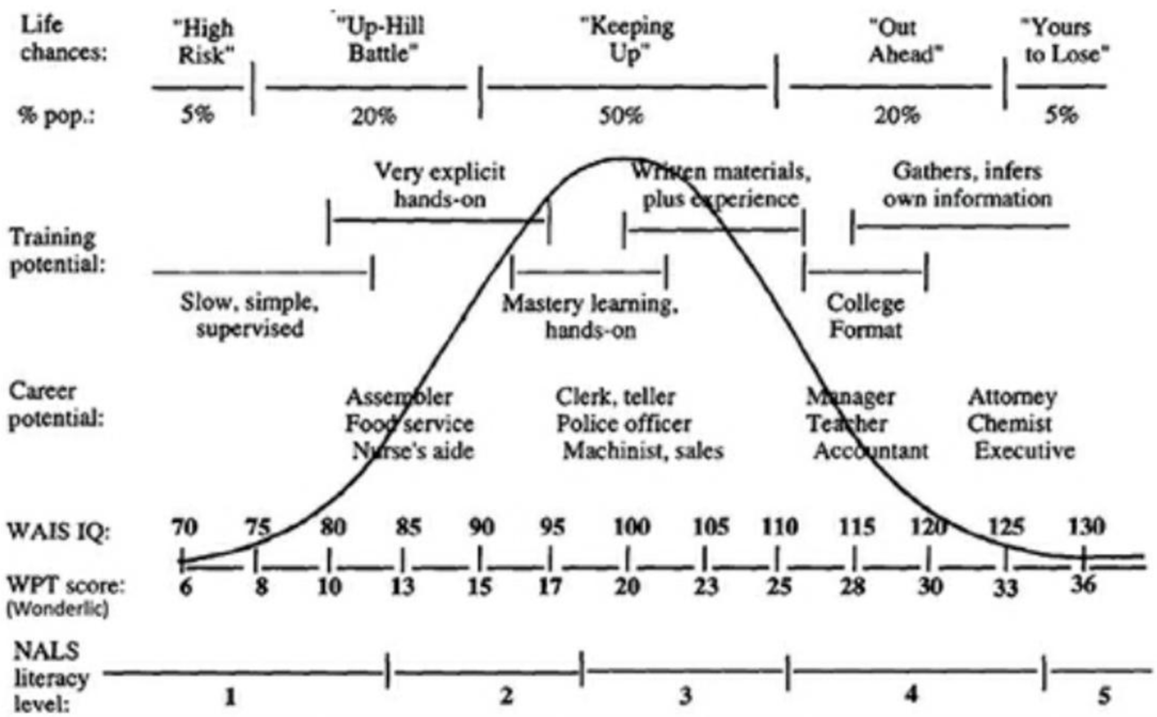
Chapter 8 Intelligence and Everyday Life

On the topic of widely used pre-employment tests such as Wechsler (WAIS) and Wonderlic, they write that “Professionally developed intelligence tests generally have reliabilities of 0.85 or above.” Screening potential employees by such tests is money well spent – measurably better than, for instance, unstructured interviews.

Informal evaluations by teachers and managers are far less reliable.

> Within-class, teacher-assigned grades are less reliable; in the best scenarios, the reliabilities are in the 0.6 –0.8 range. Supervisor ratings typically are about 0.6 or lower.

The authors cite Linda Gottfredson at length, and include her well-known diagram relating measured intelligence to types of employment. Her conclusion is that there is not much meaningful employment available in modern society for a person with an IQ of less than 85.



The “smart fraction” of a population is becoming increasingly determinant of its overall financial success.

> “Three technological changes – computers, communications, and transportation – have combined to produce a workplace where there is an increasingly sharp demarcation between a few good jobs and a large number of mediocre ones. What each of these technologies does is to multiply the effectiveness of a smart person.”

Note that the authors do not address other measures of success, such as how well a society does at reproducing itself in either kind or number. Many other authors note that the intelligent fraction does not fare very well by those measures. On a related note, they write that

> People who are deeply committed to social equality find such a conclusion offensive. It is difficult for them to argue about the empirical facts of differential distribution of intelligence test scores and its importance.

They conclude with a quote:

> “The purely empirical research evidence in I/O psychology showing a strong link between GCA [general cognitive ability] and job performance is so massive that there is no basis for questioning the validity of GCA as a predictor of job performance. … These findings do not reflect the kind of world most of us were hoping for and hence are not welcome to many people. As a result, we see many attempts – desperate attempts – to somehow circumvent these research findings and reach more palatable conclusions. … These attempts are in many ways understandable; years ago, I [quote source Frank Schmidt] was guilty of this myself. However, in light of the evidence that we now have, these attempts are unlikely to succeed.”

Chapter 9 Introduction to the Scientific Study of Population Differences

Getting into population differences, the authors are willing to be more concrete than in the remark above about individual differences.

> As Alice Dreger wrote, “science and social justice require each other to be healthy, and both are critically important to human freedom. … Justice and morality require the empirical pursuit. … Evidence really is an ethical issue, the most important ethical issue in a modern democracy.”
>
> For some people, even the suggestion of an average group difference is evidence of prejudice of any researchers who report such differences.

The authors offer ethical guidelines in

> <u>General Principles for the Study of Population Differences</u> by Earl Hunt and Jerry Carlson (2007) made a number of suggestions about conducting research on intelligence and population differences:
> 1. The measures of intelligence must have construct validity. That is, they must measure what they purport to measure.
> 2. Intelligence measurements must be valid within the populations compared.
> 3. The fact that a score on an intelligence measure can be changed by training is not evidence against an inherent population difference unless the altered score is as valid a measure as the original score.

4. Generalization to populations at large depends crucially on the relation with the studied sample to the population of interest. Convenient samples may not be informative. A generalization from observations of a population difference in college students, for instance, to a conclusion about population differences for people of all ages is not likely valid.

5. Summations of the evidence must be done carefully, with special attention to research results that do not conform to the reviewer's conclusions. Complete objectivity might be impossible, but discussants in a scientific debate should strive for this ideal.
6. Alternative hypotheses and models should be explicitly considered.
7. The alternatives should duly represent the original authors' ideas. Straw models should not be set up in order to be knocked down. This has been a particular problem in the study of population differences. For instance, people sometimes attack the position that these differences are either entirely genetic or entirely nongenetic, whereas the real question is how much the genetic and nongenetic factors may contribute to a difference.
8. Heritability coefficients are measures of the relative size of genetic and nongenetic contributions to phenotypic individual differences within a population and can change across populations.

9. When a policy recommendation is made, one's policy model, including attitudes about desirable consequences, should be stated.

10. Be willing to say "we don't know." In many cases, we do not know what causes a population difference. There are some cases, especially involving the evolution of intelligence, where it is unlikely that we shall ever know. Be willing to acknowledge such situations. Acknowledging ambiguity is not a sign of weakness; it is a sign of honesty.

Chapter 11 Intelligence and Aging

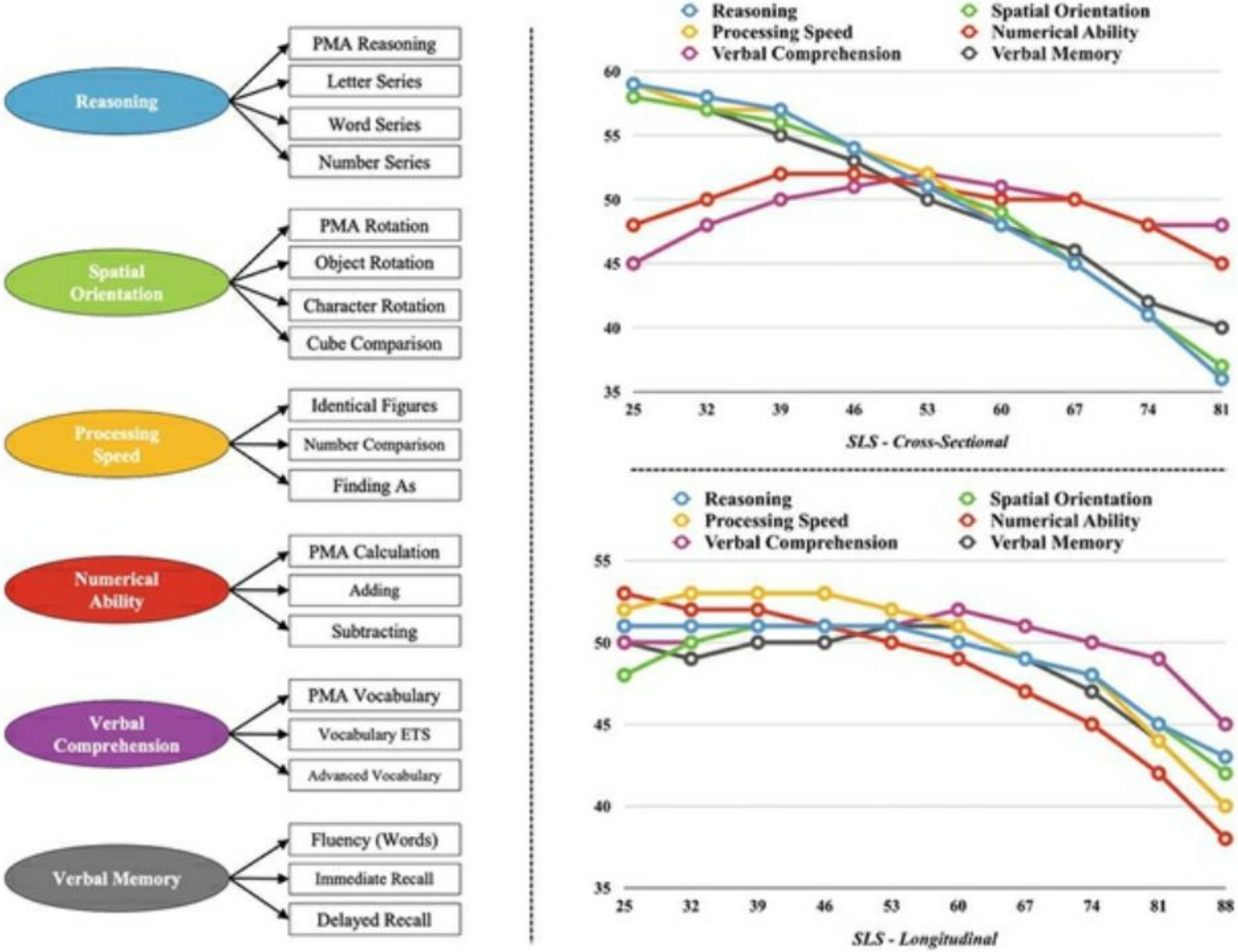
Different kinds of studies give significantly different results when it comes to aging.

Cross-sectional tests examine a large number of subjects of the same age. Longitudinal tests reexamine the same subjects at different ages throughout their lives. Both are subject to confounding effects.

Different generations have different average levels of education, are subjected to different diseases, treatments and vaccines, and are affected by different social trends in music, public policy, religion and so on. A cohort of 25-year-old subjects in 2025 is not the same as one measured in 1975.

Longitudinal studies are subject to drop-outs. People measured in 1975 cannot be located in 2025. They may have died, moved, or institutionalized. The dropouts are likely to be systematically less intelligent because intelligence and longevity are positively correlated, and intelligence and institutionalization are negatively correlated. There is a question of recruiting substitutes for dropouts or continuing with a smaller group. Nothing is easy.

All that said, fluid intelligence appears to diminish significantly with age, down by over one standard deviation (15 IQ points) by the early 80s. Crystalized intelligence – vocabulary, comprehension, memory – fare significantly better.



The authors do not correlate decreased intelligence with decreasing health. Most of us in our 80s have some comorbidities which would contribute to brain fog and the like. There should be a way to measure and correlate it as a factor.

Chapter 12 Intelligence in the World

In contradiction to the earlier claim that we share 96% of our genome with chimpanzees, the authors write in this chapter that:

> "We share 99% of our genes with Bonobo Chimpanzees. That % makes a huge difference in cognitive capacity: one hundredth of 1% might make a huge difference between socially identified groups."

The number, 96 or 99, does not make much difference. The observation about the implication, whatever it is, does.

The authors examine at length the research by Richard Lynn, Tatu Vanhanen and David Becker with regard to world intelligence. While the naysayers cited above object strongly to the morality of even doing such research, and dispute its findings, none of them to date have done their own research. The findings remain that country averages range from the 100s in Northeast Asia and Europe down through 80s in Latin America and south Asia to the 60s in Africa. Whether or not intelligence tests designed to predict success in industrialized Western nations provide the researcher with information that is relevant to tribal and agricultural societies, they admit, is a very good question. The tests do, however, accurately predict success for all demographics in the societies for which they were developed.

Chapter 13 Enhancing Intelligence

The authors write that

> If for no other reason, increasing intelligence should be a priority for alleviating social problems associated with IQs under 85, which describes 16 percent of the population based on the assumptions of a normal distribution.

This reviewer notes how this figure correlates with figures elsewhere in the book.

1) Per the Gottfredson charts in Chapter Eight, employment opportunities for people with an IQ below 85 are quite scant.
2) 85 is the often-cited average intelligence of Americans of African ancestry.
3) World average intelligence, per Lynn and Vanhanen, is 82.

Combining these observations, one would conclude that there is not much opportunity for the bulk of mankind. Yet some countries such as India and Brazil, right around the world average, appear to be getting along reasonably well. They have large pockets of poverty, but survive.

A topic the authors do not address is the fact that almost no nation with an average IQ above 95 has a fertility rate above replacement. The last time this reviewer checked, Argentina, IQ in the mid-90s, was the closest. On the other hand, average intelligence in the countries that are burgeoning (due to Western health practices, investment and aid) is significantly above replacement.

The authors describe techniques that might increase intelligence. They include using genomics to select gametes for in-vitro fertilization. Using GWAS findings to select an embryo with the highest likely intelligence. Using CRISPR gene-modification techniques to improve gametes before fertilization.

These appear for the moment to border on science fiction, but are likely to become practical within a couple of decades.

The authors do not address social trends. The anti-fertility movement (viz, single lifestyle, promiscuous, pro-homosexual, planned parenthood etc.) may have peaked. Both Europe and North America appear to be returning to more traditional values. Parenthood may be coming back into fashion.

The authors conclude:

> Perhaps as you finish reading this book, you might consider this goal of intelligence research in a new light.

This is absolutely the case. The future of the human race depends on how intelligently we manage our societies. That, in turn, depends on how smart the people are. Intelligence research is vital.