

UNDERSTANDING

YOUR

APTITUDES

Johnson O'Connor Research Foundation, Inc.

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A Word of Introduction...

With this book we want to provide in-depth information regarding the aptitudes you heard about in your summary. In each chapter, you will read about the tests themselves, the aptitudes they measure, and examples of how these aptitudes can be used.

Although each chapter has a specific focus, it is important to keep in mind that aptitudes do not function in isolation. That is why we continually refer to the importance of understanding any aptitude in the context of your entire pattern of scores; our research has shown that people who use as many of their aptitudes as possible in their work tend to be more satisfied with what they do. Much like puzzle pieces, one piece all by itself has little value — it's the understanding of how the pieces fit together that provides meaning for each individual.

As a research organization, we continue to carry out Johnson O'Connor's vision, so you may have participated in our ongoing research by taking experimental tests or other tests not featured in these chapters. We thank you for your contribution.

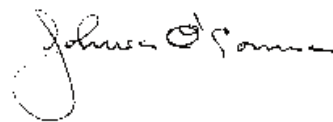
Since our early days, we have endeavored to share our thinking in writing to supplement the extended discussion of the test results with each examinee. Johnson O'Connor wrote and oversaw the production of a variety of books and pamphlets about aptitudes and their place in personal planning. Their legacy remains with us, but they have long been out of print.

*Margaret Broadley, a personal friend of Mr. O'Connor, wrote several books as well, with an observer's perspective on the work of our foundation; many of our testing alumni are familiar with *Your Natural Gifts*, now also out of print.*

*Dean Trembly, a former director of the Fort Worth office who went on to become a psychology professor at California Polytechnic State University at San Luis Obispo, wrote the original version of *Learning to Use Your Aptitudes* in 1974. A copy of this book was given to everyone who was tested by the Foundation for more than thirty years. We trust you will find this a fitting replacement.*



The individual who knows his own aptitudes, and their relative strengths, chooses more intelligently among the world's host of opportunities.





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Aptitudes are natural abilities to learn particular sorts of activities quickly and easily. We're all familiar with aptitudes: we've heard of the "gifted" musician or athlete, the "born" scientist or engineer, the "natural" salesman or politician. When we use these sorts of designations, we mean that these people seem to fit perfectly into a job role, one so suited to them that it almost seems as if they do it without real effort; they succeed in their jobs just by being who they are.

The reality, of course, is that success always requires effort. But for the person whose aptitudes are a good match with the activities involved in the job, the effort required is actually enjoyable, and so does not seem like labor. The "natural" salesman loves meeting and talking with new people; the "born" scientist is enthralled by the workings of some part of the natural world; the "gifted" musician delights in the opportunity to spend time coaxing more beautiful sounds from an instrument. But make the salesman spend hours alone in a room with only a musical instrument for company, or the scientist visit the offices of complete strangers to try to talk them into buying a product, or the musician spend her days on abstruse problems of cell biology, and in all likelihood no amount of effort will elevate them to eminence in those fields. They would not be "doing what comes naturally."

Some fortunate individuals learn early in life what their gifts are, and from an early age have opportunities to express them. Some may benefit from the guidance of perspicacious relatives, teachers, or mentors in discovering their strengths. Others simply fall into a career that happens to be a good fit.

A great many people, however, are unsure about their abilities, and aptitude testing may be a helpful guide. We have found that many people, for instance, discount their strongest aptitudes, thinking that if something comes easily to them, why, surely anyone can do it. Or perhaps they know someone so preternaturally gifted that their own ability seems meager by comparison, when in fact they are among the top rank of persons tested. Frequently a person has had little opportunity for the kinds of activities that would have revealed his or her gifts, or is aware of some strengths but not others. Our own estimates of our abilities are not always accurate, and this is where aptitude testing can help.

Since 1922, first as the Human Engineering Laboratory (the name is still used in Boston) and later as the Johnson O'Connor Research Foundation, we have been administering a battery of aptitude tests to thousands of people each year. They come to us for many reasons — to select schools or major fields of study, to choose a career field, to re-evaluate a career choice, to make decisions about volunteer opportunities, hobbies, retirement activities, sometimes simply to seek more information about themselves. They come away with knowledge of their relative

strengths in many different areas, which they can then apply to the decisions that are facing them.

When we say aptitudes are natural abilities, we mean that they do not seem to be acquired simply through training or experience. One indicator of this is that they are very stable over the adult lifespan. Another is that studies of siblings show a substantial degree of heritability. The evidence so far seems to suggest that we are indeed, as the title of O'Connor's first book put it, *Born That Way*.

But can't we get better at something through practice? Certainly. O'Connor spent quite a lot of time and effort looking at practice effects on his tests. What he found was that, while performance does tend to speed up from one attempt to the next on a test, this improvement does not change one's position relative to another. "Two persons given equal opportunity, equal practice, equal education," he wrote, "keep throughout practice much the same relationship to one another. Both improve, but the slow individual remains relatively slow, the fast relatively fast. If the slow beginner practices, and the fast one does not, the slow, of course, gradually overtakes the fast; but given equal opportunity, equal practice, the slow continues relatively slow, the fast continues relatively fast."

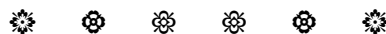
Given this parallel improvement, it is important that we direct our efforts, our hours of practice, toward activities which provide us with an opportunity to use our strongest aptitudes. It is not the lack of an aptitude that will cause us problems; it can be offset, at least to some extent, by training, practice, or technological aids. But an unchallenged aptitude is a frustrating waste of potential; those who are not using their natural gifts will fall short of being as successful as they might have been. One person figures out how to assemble a block puzzle in two minutes, another needs ten. Perhaps you have heard of the "10,000-Hour Rule," the idea that expertise is acquired not through native genius, but by putting in 10,000 hours of practice. With that kind of diligent application, the slower block-assembler may attain a degree of mastery in a field such as mechanical work; but the faster person should attain that same level of mastery in one-fifth the time, just 2000 hours. With 10,000 hours, how much higher a level might the faster one achieve? (That 10,000 hours, by the way, translates to 1,250 eight-hour workdays, or 250 five-day work weeks, or 5 fifty-week work years. That's a lot of time to spend on something for which you have little aptitude, particularly if there is something that comes more naturally to you.)

We believe it is important, if you are to be as successful as you can be, that you look at your high scores, and put in that 10,000 hours of practice on activities in which you exercise your strongest natural abilities.

Test scores are not "good" or "bad"; they merely indicate the degree to which, compared with others, a particular sort of task comes naturally or easily to you. You cannot "pass" or "fail" an aptitude test, any more than you can pass or fail a test for height: being very tall may be an advantage to a basketball player, but for a crew member on a submarine it's likely to result in more than a few bumps to the head. Our research has found that, in many occupations, the characteristic pattern of aptitudes will include some significantly low scores, as well as some high. A counselor who is always trying to visualize problems as three-dimensional would probably become very frustrated; a pilot with a lively flow of ideas might be too easily distracted in the cockpit.

The number of high scores is not important. The majority of those who take our tests have very few. What is important is identifying *which ones* we score high on, and finding ways to direct these aptitudes into congenial activities. Because we should be trying to exert each aptitude to the utmost, what is important, then, is the *pattern* or combination of scores, not the number of highs or lows. One score doesn't tell you much, and in fact might be misleading. Returning to our earlier example of height, those who looked at that factor alone predicted that 5'7" Spud Webb would not be able to play basketball at the college level, much less professionally. But by virtue of his quickness and jumping ability he not only helped his junior college team win a national championship, he played professionally for thirteen years, and even won a National Basketball Association slam-dunk contest, an event typically dominated by players more than a foot taller than Webb.

As you read about the aptitudes, you will find mention of careers characterized by high scores in the ability being discussed. These are examples, based on many years of researching aptitudes and jobs. We test people who have been engaged in their jobs for some time (we generally want at least five years or more) and express satisfaction with the work. If a significant portion of such a group score high in some ability, it may be said to be a characteristic of satisfied people in that field. Presumably, there is some likelihood that others who score high in the ability can find satisfaction in the field as well. But keep in mind the rule about patterns being more important than single scores: just because you lack one of the characteristic abilities of some occupation does not mean you should dismiss it from consideration if you have other abilities that might find expression there. Height alone does not make for a successful basketball player; we have found most occupations to be characterized by combinations of high and low scores, not by a single ability, no matter how important that ability may seem, or how great a percentage of people in an occupation may have it. There are Spud Webbs in every type of job, putting the aptitudes they *do have* to good use, not discouraged by the ones they don't have.



The battery of tests now administered by the Johnson O'Connor Research Foundation had its origins in a General Electric factory at West Lynn, Massachusetts. The plant manager, F.P. Cox, was an engineer by training, and was constantly seeking ways to improve the efficiency and productivity of the manufacturing process. He noted that through the application of sound scientific and engineering principles, great advances had been made in the selection of materials and equipment used in production. But for labor — the people doing the work — who represented the greatest expense in the enterprise, the methods used in selection were largely haphazard and unscientific. He was aware that psychologists in Europe and America had begun exploring both individual differences in abilities, and the application of these differences in industry, and he thought the time was ripe for the development of a scientific approach to selecting employees. To this end he created a department he called the Human Engineering Laboratory, so-called because he wanted to apply the principles of sound engineering practice to the problem of human performance, and placed in charge a young engineer named Johnson O'Connor.

Born in Chicago in 1891, O'Connor had attended the progressive school founded by the illustrious educator John Dewey. He then went to Harvard, where he studied mathematics, and after graduation worked for a time with the astronomer Percival Lowell. When he decided that he would like to learn engineering, he took an entry-level job with GE, advancing to become a department head, before being tapped to create the Human Engineering Laboratory.

O'Connor noted that, when evaluating materials, tools, or machinery, one tried them out on a sample of the work to be done. He suggested taking the same approach with people. Look at the work to be done, isolate its "distinguishing characteristic," and create a "work sample" involving this element. For instance, the assembling of fine instruments required nimble fingers. O'Connor created a board with one-hundred holes on one side, and a flat tray on the other which held three hundred small metal pins. The pins were to be placed in the holes, three at a time, as rapidly as possible, using only the fingers of one hand. The test proved an excellent predictor of success in assembly work, but just as importantly, it turned out that applicants selected for this work on the basis of their dexterity enjoyed and were happy in their jobs.

By 1924, O'Connor had a battery of tests that had proven useful enough to garner notice in the world of personnel selection and industrial management, but he and Cox had begun to recognize some problems with their approach. First, if there were, say, ten thousand jobs in the world, their method of creating worksamples for each would require ten thousand tests, obviously impractical. Second, workers were not expected to stay in one job forever: they were expected to advance to more skilled jobs, or supervisory work, or possibly to transfer to another type of work entirely. Third, many jobs seemed to call not for a single ability, but a combination of several.

The first problem was overcome when they saw that some of the traits they were measuring seemed applicable to more than one job. Accounting clerks scored high on the Number Checking test, but so did secretaries and file clerks. Engineers assembled the Wiggly Block rapidly, but so did metallurgists and mechanics. If they could isolate traits that were common to many fields, it would reduce the number of needed worksamples. O'Connor adopted "a new philosophy": "It assumed, as an operating hypothesis, the existence of inherent, statistically independent, unit characteristics, mental elements as real and scientifically measurable as the chemical elements."

Two such traits could combine in four ways, which to O'Connor represented four different "ways of thinking." Three traits combine in eight ways; four, in sixteen; five, thirty-two; and twenty traits form more than a million possible combinations. By taking only twenty tests, one might, in essence, sample over a million jobs. Thus, the second and third problems were overcome: the worker with knowledge of his strongest abilities could be advanced into work that utilized more of them.

Ultimately, this new philosophy led to a new approach: rather than using aptitude tests for employee selection, O'Connor wanted to use them to provide guidance to the individual. Successful salesmen, for instance, were characterized by high or low scores on four tests, so if the tests were used to select only applicants with those scores, they should find one in every fifty-four job seekers. This meant, though, turning away fifty-three people, which seemed to O'Connor a huge waste of potential. So, he said, "As early as 1926, we took a momentous step

ahead in our thinking, we decided to place all fifty-four applicants, each where he belonged; instead of starting with the job and seeking the man to fill it, we started with the man and sought the ideal place for his aptitudes.”

All along, many employees were taking advantage of the tests to provide insight into their own opportunities, and soon they were asking O'Connor if non-employees, their relatives or friends, could also be tested. He began by testing in his home on weekends, but the demand became too great, and with the blessings of Cox and GE, the Human Engineering Laboratory became an independent, non-profit scientific organization. Briefly hosted by the Massachusetts Institute of Technology, O'Connor next established a new laboratory at the Stevens Institute of Technology in Hoboken, New Jersey, then another in Chicago, and soon new laboratories were being established around the country.

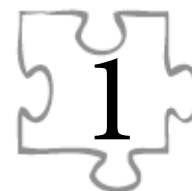
This independence also allowed O'Connor and his staff to expand their testing of occupational groups. No longer confined to the manufacturing plant, they were soon testing nurses, teachers, bankers, and many others — publishing results of these studies as statistical bulletins or technical reports. For some, clear aptitude patterns emerged; for others, there did not appear to be a characteristic pattern of abilities. Over the ensuing decades, we have continued testing people from many occupations, sometimes from new or emerging fields like software engineering, sometimes replicating previous studies, such as lawyers or accountants. Sometimes the aptitudes characteristic of a field do not show much change over the years; others may show a new pattern; yet others may show no real pattern of scores at all. Even in fields for which a common pattern of abilities is evident, individual workers may differ markedly from their peers, yet still be successful by employing those different abilities to bring fresh insights or techniques where those with the more characteristic abilities had all been looking at a problem in the same old way.

There can be no argument that the world has changed in remarkable ways since Johnson O'Connor's death in 1973, and of course much more so since he began the Human Engineering Laboratory in 1922. New technologies and new ideas have created possibilities that were once beyond imagining. Yet the aptitudes innovators use to create these new products and services are the same ones for which O'Connor was developing tests nearly a century ago. Given the increasingly rapid pace of change, and given the new reality that a worker is unlikely to stay with one company, or even in one type of job, for an entire career, it becomes, in our view, more and more important that we heed the advice of Johnson O'Connor, and not look toward *jobs* as the basis of our careers, but look toward inspiring *problems*. Jobs, O'Connor said, are narrowly defined, restricted undertakings. They have been successfully performed many times before, their rules are known, they have become routine. The world has many great problems that remain unsolved, many things that have not been done before, and these are far more likely to provide us with opportunities to engage the full range of our abilities and interests.

“The philosophy of the Human Engineering Laboratory,” O'Connor wrote, “stresses the need of surveying one's own capabilities, not with some fixed job in mind, but with the aim of making that peculiar contribution to the world of which one alone is capable, of planning life from the beginning about one's aptitudes, of reaching constantly for progress to give them ampler expression.”

Be who you are, strive to use to the utmost every one of your natural abilities, and you will undoubtedly leave this world a better place, while finding enjoyment and satisfaction in doing so.

Rusty Burke
Director of Research
November 2, 2011



Structural Visualization

“When I was a girl, when all my friends were playing dress-up with their dolls, I designed and sewed a new wardrobe for mine. When I got tired of that I built her a dollhouse out of wood, cardboard, and fabric.”

“I built a robot out of Legos, complete with arms and legs that moved. It could walk across the room.”

“I used to watch the surgery channel instead of cartoons!”

“My brother complained about sharing a room with me when we were growing up, because I always had loose pieces of electronics strewn all over the place.”

“I was always in charge of packing everyone’s suitcases into the trunk when we went on family vacations.”

From a young age, people who score high on our tests of Structural Visualization are often drawn to taking things apart and putting them back together, building things, designing things, and figuring out how things work. They carry this ability into fields like engineering, design, the physical sciences, computer programming and other technological fields. Who will build the next internal combustion engine, the next personal computer, the next cellular phone — the next invention that transforms society and the way we live? Chances are it will be someone who scored high in Structural Visualization.

Wiggly Block, the test

Wiggly Block was Johnson O’Connor’s first test to successfully differentiate between high-performing and low-performing engineers. Applicants at General Electric who assembled the block as quickly as high-performing engineers tended to excel at engineering work once hired. The test later proved to be a good predictor of success in engineering school. It has been expanded to include more blocks, from the four-piece to one with twelve pieces. There was even once a sixteen-piece block. As you can imagine, however, adding larger blocks quickly proved unwieldy. It has become one of our most memorable tests. Long after others have faded from a client’s memory, Wiggly Block is often vividly recalled.

Paper Folding, the test

In order to improve the reliability of our measurement of the aptitude for Structural Visualization, Johnson O'Connor started to combine the Wiggly Block score with the score from another test. Many were tried. A list of their names tantalizes the spatial thinker: Black Cube, Pyramid, Incomplete Open Cubes, Triangles, Turning Block. Our version of a classic Paper Folding test has proven to be the most successful of these attempts.

It involves looking at a series of pictures illustrating a square piece of paper being folded and then punched with a hole. Examinees try to imagine where the hole or holes will be when the paper is completely unfolded, placing chips on a board where they think the holes will be. We found that when given in a multiple-choice format, this test gave an unfair advantage to a clever test taker, someone adept at guessing the answer when it is in plain sight among several foils. Our version zeroes in on the individual's ability to mentally unfold the paper in the mind's eye, from an imposing number of plausible alternatives, using apparatus, without paper and pencil or verbal engagement.

The combination of Wiggly Block and Paper Folding scores has been found to be a very reliable measure of the aptitude we call "Structural Visualization."

Structural Visualization, the aptitude

Scoring high in this area indicates that you have the ability to visualize in three dimensions, to rotate a three-dimensional object in your mind or imagine what it looks like from another angle. Engineering, architecture, industrial design, software engineering, sculpting, sciences, medicine, physical therapy, surveying, carpentry, metallurgy — all are fields that allow you to use Structural Visualization. In addition, our research has suggested that occupations such as computer programming, actuarial science, mathematical research, statistics, and econometrics are also suitable for those who have this aptitude.

Spatial thinkers frequently enjoy having a tangible result for their efforts or having visible evidence that they've accomplished something. A mechanic has a rebuilt engine, a software engineer has a program that works, and a sculptor has a fine figure that has emerged from a solid block of material.

Constructing your career

Perhaps you aren't interested in any of the fields mentioned already. Structural Visualization is an aptitude that can be incorporated in many fields or related to almost any interest. For example, if you find the idea of graphic design appealing, consider industrial design. If you are drawn to counseling and psychology, consider neuroscience and psychiatry. If you have an interest in history, investigate the study of architectural or art history, art restoration, or historical preservation. Keep in mind, though, that the ability to think in three dimensions is a trait calling out for expression; ideally, you will find an outlet for this in your work.

Ingrid, a spatial thinker in a non-spatial sales job, put it like this: “I feel like I’m not doing anything real all day. I mean, I meet with clients and make sales, but when I look back at my week, I haven’t produced anything I can *see*.” If you can think in spatial terms, it makes sense that your work should have a corresponding 3-D element to it.

Edward described his job as a space planner: “I work for a very large hospital complex that owns dozens of buildings and has a continual need to maximize the use of the space. I spend my days reviewing the needs and requirements of the various departments: how many beds will fit, where will the offices be, how will we reconfigure the utilities?” His Structural Visualization was a definite asset in his job. He said he felt most engaged when actually out in the field, talking to contractors and department heads. “Occasionally, I’m involved in a week-long meeting. It’s so frustrating to only talk, not do!”

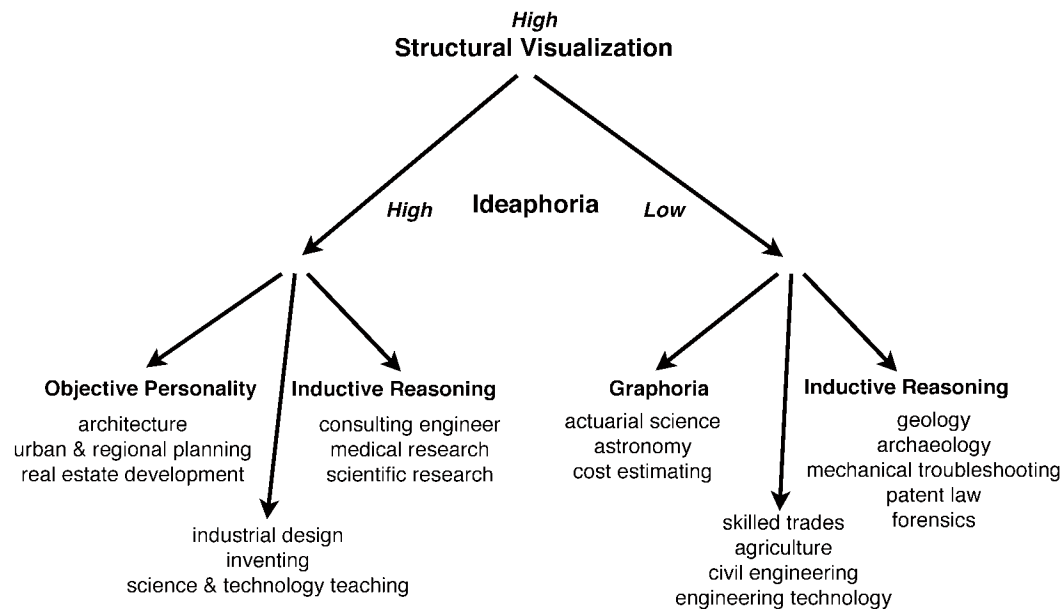
The car you drive, the road you drive on, and the buildings, houses, and parks you drive past, were designed, modified, and assembled by people using Structural Visualization. You can use this aptitude, along with your others, to design and build your own career path. Think of aptitudes as individual building blocks that can work together to form a structure you can use to reach your goals in life.

Structural Visualization — with other aptitudes

A couple, Brian and Lindsay, came in together for testing. She scored high in Structural Visualization, low in the numerical aptitudes and Graphoria, while he was the opposite. When they saw the difference in their results, they laughed and explained that they had just done an extensive remodel on their house. Lindsay was the one who planned the basic design, met with the contractor, and even did some of the preparatory work herself, while Brian made a budget and kept track of the expenses.

This example confounds the stereotype that males are the spatial thinkers while females are more verbal or clerical. Although there is some truth to this distinction — males average higher on spatial tests and females on clerical and verbal tests — knowing this tells us nothing about any individual. Many women excel at spatial thinking. Johnson O’Connor’s wife, Eleanor, was one of the first female graduates from MIT and a successful architect. O’Connor was well aware of the primacy of individual differences over group averages, and he encouraged women with this aptitude to pursue science and engineering careers long before that was a common practice.

After hearing that she had scored high in Structural Visualization, Margo, a graphic designer, obtained training in the field of user interface design. While she had always enjoyed working with colors and graphics, using her Color Discrimination and Observation, the deep technical programming she was now required to do called upon her spatial ability as well. “My work finally satisfies me — not just the design part, but also the spatial part.” Before making this change, she did have an outlet for her spatial aptitude in several hobbies, but she wasn’t using the aptitude daily.



Structural Visualization and low Graphoria

Most students love kindergarten, which usually offers more active learning experiences and a lot of show-and-tell. In later grades there is usually less show and more tell, which can be difficult for the high-Structural Visualization, low-Graphoria student. Often students with this pattern have been turned off to science because of the way it has been taught in school, with lectures and notes taking precedence over labs or field trips. These students may feel they have no gift for science when it is taught in this manner, and may not even consider pursuing science, engineering, or computer fields. To minimize paperwork, try taking labs and other hands-on courses in smaller class settings. For those with low Graphoria scores, Johnson O'Connor advocated attending a small college that could offer more chances for direct class participation and discussion instead of relying on large lecture hall environments and paper-and-pencil tests only.

Depending on your educational goals, it is also worth considering one- or two-year programs that provide training in technical specializations. Many medical and computer technology studies would be examples of such training programs.

Trades such as carpentry and construction, auto repair, electrical work, plumbing, and machinery maintenance and repair can be studied in relatively short school programs or learned via an apprenticeship or on-the-job training. Also consider the arts: fields such as product design, 3-D animation, furniture design, and theater technology offer opportunities for hands-on education as well.

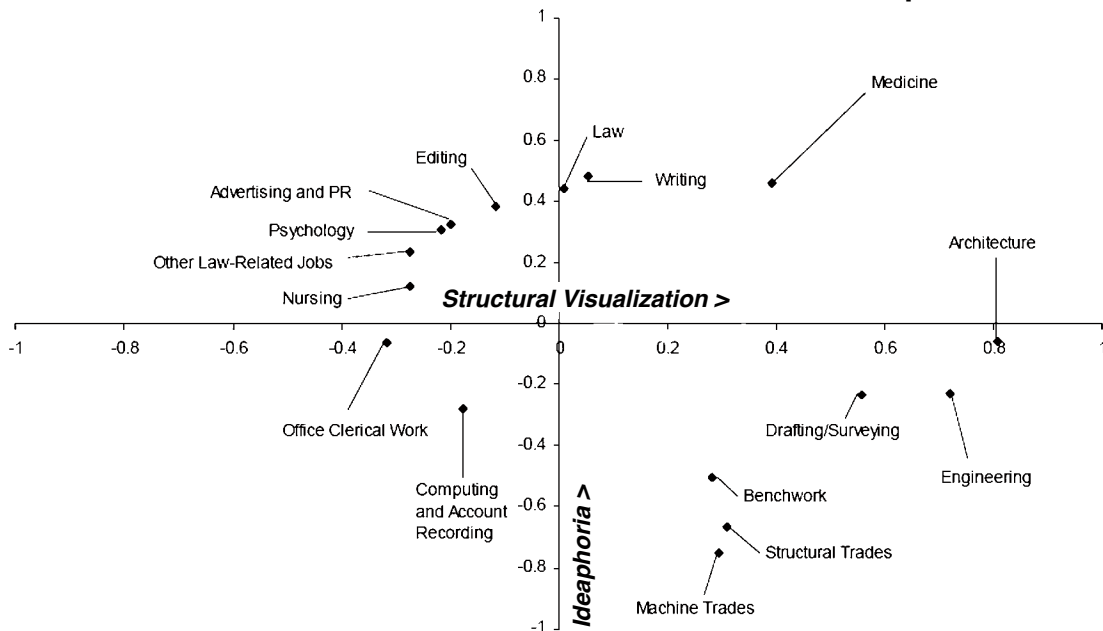
If you score low in Structural Visualization...

Did you ask if you could use a piece of actual paper during the Paper Folding test? Did you feel like throwing the Wiggly Blocks out the window? You are not alone. A highly frustrated business executive that we tested in New York City apparently did just that.

People who do not score high are, logically, far more comfortable working in non-spatial fields. They are happier when they don't have to struggle to understand three-dimensional concepts all day, every day. Over the years, our research has shown that business executives, teachers, accountants, lawyers, salespeople, and writers, among others, tend not to score high as a group in Structural Visualization.

In many jobs, it's an advantage to be a non-spatial thinker. Graham was actually pleased by his low score in Structural Visualization. His sister, an engineer who came with him to the discussion, said, "When I look at a system experiencing problems, my job is to identify and replace the malfunctioning part." Graham, a family therapist, countered, "But you can't do that with a family. And that's part of what I like about my work."

Two-Dimensional Plot for Structural Visualization & Ideaphoria





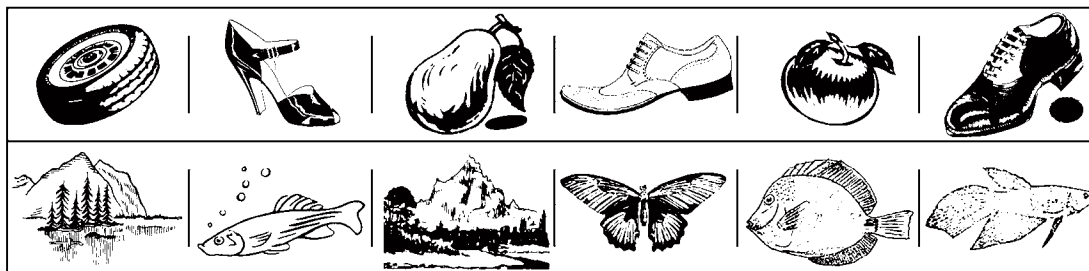
Inductive Reasoning

As an employee of the Office of Records and Registration, Sophie spent her days in the basement of the Library of Congress, filing. By name, by year, by document — she found it endlessly tedious. To assuage her boredom, she began reading the material she pulled for the investigators and lawyers who visited the library. She enjoyed using the information to theorize about their cases and found herself envying their work. It seemed a shame that filing, the last thing on her mind, was the first thing on her job description.

After a visit to the Foundation for testing, Sophie learned that she had a high score on Inductive Reasoning, which may have explained her natural capacity for sleuthing. She was thrilled to find that people in investigative fields of all sorts score high on this test, and was encouraged to bid goodbye to the basement. She needed a career in which drawing inferences from a set of clues was a primary responsibility.

Inductive Reasoning, the test

Inductive Reasoning is a product of O'Connor's early work. He had become disillusioned with the utility of a general IQ score, and was curious to measure gifts not traditionally assessed by such tests. The Foundation's test of Inductive Reasoning was born of that curiosity. While many tests were developed with a specific job in mind, in the hope that the test would predict success *and* satisfaction with that job, the Inductive Reasoning test was constructed in an attempt to measure a certain type of reasoning ability.



In this test, examinees are presented with rows of six pictures, and the task is to quickly identify the three that have something in common or are similar in some way. Using pictorial rather than verbal items provides an assessment of this aptitude independent of other factors such as a person's vocabulary knowledge or clerical speed. Emphasis is placed on *quickness* in spotting relationships rather than simply the ability to perceive them given unlimited time.

14 Inductive Reasoning

The Foundation believes that a speeded test is useful in measuring an isolated aptitude because the more time an examinee spends on each item, the more complex will be the set of abilities he or she uses to get the answer. Consequently, the Foundation's measurement of Inductive Reasoning does not correlate highly with other measurements of reasoning, many of which have a strong correlation with general intelligence instead.

Inductive Reasoning, the aptitude

O'Connor himself called Inductive Reasoning "the ability to sense a unifying principle running through miscellany or a gift for synthesis as compared to analysis." He felt that this ability to see connections might be responsible for the leap of brilliance that allows a scientist to see old facts in a new light or a group of engineers to diagnose the common denominator in a series of product breakdowns. Cutting incisively to the real cause of a problem could be an application of Inductive Reasoning.

Though Inductive Reasoning is often defined as a diagnostic sense — physicians score high — it can also be a gift for critiquing, evaluating, and decision-making. A theater critic with a high score in Inductive Reasoning may employ this aptitude in creating pointed critiques just as a consultant might present a critical evaluation to her clients. The ability to formulate a conclusion or build a theory from a restricted number of clues is another salient feature of this aptitude. Just as was the case for Sophie, people who score high are often naturally drawn to investigative fields in which piecing together a crime, developing a case, or building a research theory requires drawing incomplete information into an accurate conclusion.

Reasoning rapidly

Examinees sometimes comment that to reason inductively feels very much like intuition. This sensation may actually be related to speed: the seeing of relationships often occurs so quickly that a person might be unable to explain *how* the conclusion was reached. What some call instinct may be attributable, in certain cases, to this kind of cognitive speed.

Therefore, people with this facility often enjoy work in which quickness is key and the synthesis involved in diagnostic work or problem solving must be done under time pressure. Imagine a doctor in an emergency room: when a patient in critical condition arrives, the doctor receives a barrage of information — a description of what has occurred as well as the patient's symptoms and vital signs. The doctor must bring together all of these separate pieces into a diagnosis. Depending on the situation, this gathering up and binding together of information may need to be accomplished in a split second.

However, it is important to note that the ability to form quick diagnoses functions best with knowledge. If this aptitude is a gift for drawing a conclusion from the particulars, then the particulars must be accurately understood in order for the conclusion to be the correct one. A doctor requires knowledge to make the diagnostic leap from symptom to malady. Similarly, it is by virtue of training, and not simply aptitude, that a lawyer bases an argument on a precedent embedded within a very different case or a researcher figures out what is causing a disease to spread within a given population.

Classroom to consulting

“My mother was a teacher and my grandmother was a teacher. If a record of my matrilineal line existed, I’m guessing they would all have been teachers.” After pursuing an education that prepared her to follow in her family’s footsteps, Carmen hoped the tests would help her understand why a third-grade classroom was such a difficult place for her to be.

She had always wanted to work with children, and had thoroughly enjoyed studying child psychology. But the reality of the school day allowed no time to explore the kind of questions that had fascinated her. With children whirling about and clamoring for assistance, her workplace was certainly the kind of environment that people who score high often crave, but in discussing Inductive Reasoning as a diagnostic or problem-solving aptitude she felt we might have stumbled upon the crux of her discontent.

She worked at a charter school dedicated to incorporating children with disabilities into the regular classroom, and she had several students who suffered from emotional as well as learning difficulties. “When I have free time, these are the kids I think about. I like to imagine how their learning could be structured differently. But trying to manage 30 children at once doesn’t really leave me time to find the solutions those few students need.”

Though managing a classroom involved dealing with problems and mishaps daily, it did not allow for the kind of diagnostic problem-solving her aptitude naturally sought. Carmen reflected on the possibility of becoming an educational consultant, which would move her primary responsibilities away from classroom management into the role of the problem solver. “To have the whole workday to focus on understanding and building solutions for these kids would definitely keep me engaged.”

Art student to buyer

Art school had not been easy. When given an assignment to “express the concept of lassitude in physical form,” Frances concluded that she had landed herself in the wrong crowd. “Everyone around me was full of ideas, and all I could see were the problems with each one.”

Her reasons for remaining in design school became clear during a discussion of her high score in Inductive Reasoning. “I think I might be more of a critic than a creator. My friends say that I am really good at isolating exactly what needs to be improved in their work. I never really thought of this as an ability until my last year, when I was invited to judge a competition of first-year student work.”

Frances strongly identified with the profile of people who score high on this test. “I guess that to select and critique is what I have to do!” As we discussed several possibilities, she felt most enthused about the prospect of becoming a buyer.

Six months after her first appointment, she sent a postcard from Indonesia where she was training to be a buyer of jewelry for a high-end department store. When faced with a huge range of products and limited time, her Inductive Reasoning may have been at work in helping her quickly evaluate and select the finest designs in Balinese gold.

Thomas travels to a destination

Thomas was in his late forties. He had spent the majority of his life traveling, his travels punctuated by periods of working. He had tried his hand at everything from botany to cattle ranching, and had enjoyed achieving a certain degree of proficiency in each. “As soon as I felt I had mastered something, I wanted to move on.” As Inductive Reasoning was his most significant aptitude, his reflections on which experiences were the most engaging made for an interesting look at the aptitude itself.

Thomas had spent a brief period of time working as an ER nurse at the Cook County Hospital in Chicago, a place renowned for the intensity of its working environment. He worked in triage, the quick evaluation of patients and prioritizing of treatments. Despite the sometimes harrowing nature of the position, he often experienced “something special” when the waiting room filled beyond capacity and the situation grew chaotic. “We called those nights ‘Full Moon Friday-Night Payday,’” he said. “This was when the ward was at its craziest. Sure, that intensity took its toll, but somehow the need to make multiple decisions quickly focused me in a way that I really enjoyed.”

There is no doubt that it took a special combination of talents, some measurable and some not, to perform so well under extreme circumstances. Yet, in Thomas’ mind, Inductive Reasoning seemed to describe both an ability and a style of decision-making that formed the basis of his success. “It was a great opportunity to do problem-solving, sometimes with little information and under tremendous time pressure. I’ve done many things in the years since, but have never felt that degree of engagement again.”

Thomas realized how central using his Inductive Reasoning was to the things he enjoyed most. His future work should make use of his varied experience, but also rely heavily on his ability to make decisions in situations where information and time might be limited.

If you score low...

While people who score high demonstrate an inclination toward quick diagnostic work, people who score low tend to be careful, deliberate, and methodical in reaching conclusions. They do, of course, solve problems and make connections, but in general they prefer to take more time and have more information before making their final decisions.

Thinking of this as style, people who score low are often characterized by their thoroughness and accuracy. Some describe this as an insistence on quality over speed, and can feel as if they are often rushed through tasks they’d prefer to give more time to. Being pushed to work quickly may lead them to feel that things have been poorly finished or that decisions have been made too hastily. This more deliberate reasoning style and concern for accuracy are great strengths in many professions. Choosing a job in which such a style is not simply accommodated but valued is very important for people who score low. One such human resources vice president described his hiring process as putting his job candidates through a lengthy series of interviews and tests. Then, even when he thought he had settled on his top choice, he always liked to “sleep on it” before rendering his final decision. Fortunately, his

bosses valued the very low turnover rate among the company's workers and trusted him to determine the best person for the job every time they had an opening to fill.

Michael, the careful craftsman

After spending many years as a cabinetmaker in Boston, Michael moved to northern New Hampshire and bought an old farmhouse with dreams of living the country life. Shortly after settling in, he met an older woman who had fled Czechoslovakia during the Second World War. Knowing that Michael was a woodworker, she shared a few of the heirlooms she had been able to recover, most notably an armoire with an intricate inlay of mother-of-pearl.

It had been badly damaged, and the woman didn't have money to repair it. Thus began Michael's restoration career. "The armoire was over 150 years old. Before beginning, I spent many hours carefully researching the style and craftsmanship of the period. The work itself, especially the inlay, was very slow. Danitsa would stroll over in the afternoons and remark on my patience. Her reaction surprised me, as I enjoyed the slowness and precision of it."

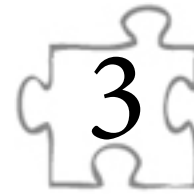
As we discussed the features of a low score in Inductive Reasoning, Michael reflected on how well his careful and methodical style suited restoration work and considered the possibility of taking on very select pieces for his own small business. "I think someone with equal skill but less patience would have done a lesser job. Perhaps it is my low score that allows me to enjoy both the process and the result."

Randall, the attorney

When covering for a fellow attorney, Randall received an urgent phone call from a client who said, "There's a marshal in my waiting room who wants to serve a warrant. What should I do?" His first instinct, Randall related, was to say, "Let me get back to you." He laughed and continued, "I knew *that* was the wrong answer, so I told him to stall until I could get there." He took another attorney with him, and the drive to the client's office provided the amount of time Randall felt he needed to decide on a course of action. But the incident served to underscore that the fast-paced corporate environment was not the right one for Randall. He found an older attorney with a practice in trusts and estate planning who wanted a younger partner. Here, his deliberate and thorough approach was an asset rather than a liability.

Go with your strengths

While Inductive Reasoning is used in many explicitly diagnostic fields — such as medicine and psychology — we really believe that this aptitude could find an outlet in almost any field. The world is beset with problems. As Johnson O'Connor said, "People who score high in Inductive Reasoning should not see their careers in terms of jobs but in terms of interesting problems to solve."



Ideaphoria

Suzy was the despair of the accounting department. She was constantly chatting with coworkers about her favorite new restaurant, or the movie she'd just seen, instead of keeping to her own cubicle and getting her work done. In staff meetings, she would rather discuss improving office procedures or how to attract new clients than focus on learning the latest tax code changes. Her job was to execute tried and true routines — not come up with and advocate novel ways to balance the books.

After her latest disappointing review, she came in for testing and learned about Ideaphoria and how little her current job utilized this. Not having an outlet for the ideas she naturally generated was stifling. It was actually a relief to learn that accounting clerks, bank employees, and other clerical workers generally score low on this test. Suzy scored in the 99th percentile, so she was encouraged to investigate fields in which her ideas would be a cause for pride and praise, not despair and dismissal.

Ideaphoria, the test

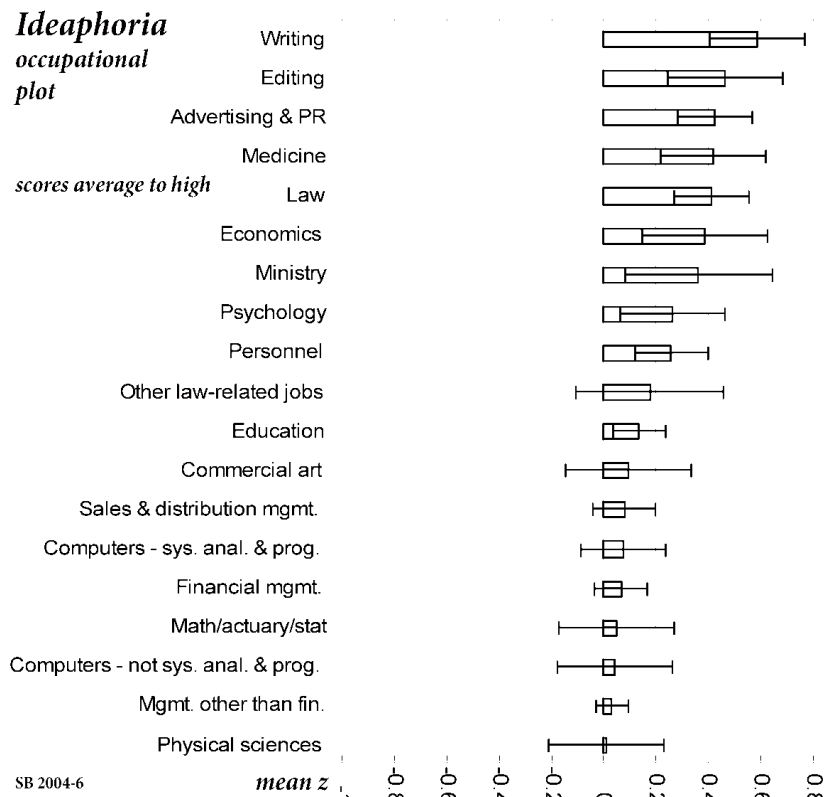
The Ideaphoria test was adapted from one created by British researchers in the 1920s. Seeking to create tests to be used in vocational guidance, they had developed four measures for “creative imagination.” One required test-takers to write about a fanciful question. Given the subjective nature of scoring this measurement required, Johnson O'Connor challenged researchers to devise an objective way of measuring this trait.

Eventually, a simpler scoring method was found: counting the number of words written. No attempt is made to evaluate spelling, grammar, or logic. We ask only that the examinees stick reasonably close to the topic and not repeat the same words or phrases over and over again. The test simply measures quantity, or the rate of flow of ideas.

As mentioned, the test measures *quantity*, but it does not measure *quality* in any way. It does not evaluate the worth of your ideas, nor does it measure originality, creativity, or focus. In fact, people who score high sometimes do not have one consistent thread running through their writing. Their thoughts are divergent, like the branches of a tree, not necessarily straight, like a tunnel through a mountain.

Clients sometimes ask about this concept of idea flow in relation to the concept of creativity. The test does not measure creativity in the sense of originality or imagination. It measures how much a person can come up with in a limited amount of time.

High scores were characteristic of people successful in selling, advertising, writing, and teaching as well as in the practice of law. O'Connor and his staff also found that a large percentage of engineers who had published papers or been granted patents for inventions scored high on the Ideaphoria test. We now suggest additional fields as offering potential outlets for this aptitude, whether drawing on imagination directly with language or using it in other creative expressions of ideas. Teaching, industrial or set or interior design, architecture, public relations, and communications all provide work in which a rapid flow of words or thoughts could be advantageous.



Ideaphoria, the aptitude

Ideaphoria is one of the aptitudes that we have been measuring since the early days of the Foundation's existence, and while its use has changed dramatically since then, ideas will never go out of style. In the 1940s, one might have used it to create ad campaigns that promoted food conservation or the sale of war bonds. In the present day, it might lead to a career in international brand management for a software company or creating an awareness campaign for a social issue. The sky isn't even the limit anymore for those scoring high in Ideaphoria.

If you scored high, you should consider opportunities in fields in which producing a rapid flow of ideas is integral to your work. Many careers come to mind. Advertising, marketing, public relations, writing, teaching, and sales all utilize a rapid flow of ideas and include activities like talking to people, developing concepts, or thinking up new methods and techniques. Brainstorming often proves extremely satisfying for those with Ideaphoria. If you

are a high-Ideaphoria student, look for courses that include class discussions, essay tests, and presentations as part of your grade.

Transformation: From Corporate Facilitator to Teacher and Advocate

Linda came to be tested because her HR director felt that she was being underutilized. After discussing her high score, her aptitude consultants asked if she had the opportunity to use her ideas at work. She answered that she once did, but her direct supervisor now discouraged Linda from formulating too many solutions to problems. "I always wanted to work on the next project or development, not focus on the old ones," she said. "But the company now wants me to follow through on other people's ideas for months at a time." This change in her work environment frustrated her and now her coworkers considered Linda's never-ending ideas and suggestions troublesome.

Linda, however, had a vibrant forum for her ideas in activities outside of work. Her passion for environmental issues led her to participate in charitable work by developing and designing fundraising campaigns, often with visual components like flyers and publicity materials. She also volunteered as a teacher in community and church groups and wrote her own curriculum. Her volunteer experience excited her because of her passion for it, but all of these opportunities also called for a constant flow of ideas. After reflecting on her situation and networking in the field, she made the transition to development in the not-for-profit world, working for an organization whose focus was on saving wetlands. Here Linda could concentrate on initiating programs that were in line with her values, and her rapid flow of ideas would be an asset, not a hindrance.

Developing New Technologies: Architect to Engineering Pioneer

Michael was dissatisfied with his work as an architect. Though he had the aptitudes of an architect, his current work involved more meticulous and routine checking over of plans than developing new ideas or projects. A former work associate, remembering that Michael had a passion for renewable energy, had recently approached him about a partnership. This friend suggested that the two of them start a business to market energy alternatives, and perhaps develop a network of providers to suit customer needs. In his vision, the company would educate consumers about choices, provide comprehensive research, and suggest ways to switch from traditional energy to alternatives like solar, wind, and biofuels. Michael said he had hesitated, as he was unsure whether he could develop marketing campaigns or teach others about the subject even though it was an area of special interest to him. Knowing his aptitudes, especially the need to find an outlet for his unused aptitude for producing ideas, gave him the confidence to pursue this appealing option.

Variety is the spice....

Work that moves from project to project or otherwise requires a constant influx of new ideas should keep the person with Ideaphoria challenged and fulfilled. Repeating and repeating the same tasks day after day might prove boring or frustrating. Blair Tindall, a professional

musician who was inspired to pursue a career in journalism and writing, partially as a result of scoring high on Ideaphoria, expressed her dissatisfaction with her previous work in the pit orchestra of a long-running show, saying, "...repeating the same music 416 times a year was mind-numbing." Blair has gone on to become a published author.

Taking on new responsibilities and challenges should also prove satisfying. Writing for a company newsletter, involving yourself in volunteer projects, or contributing to community groups are good outlets for ideas. Try traveling to unfamiliar places, starting new hobbies, or experimenting with variations on a favorite recipe. Changes from the routine usually stimulate a person with this divergent thinking aptitude.

If you score low ...

A low score does not indicate a lack of ideas, just a slower rate of flow. In some fields, a rapid flow of ideas is not desirable. Foundation studies show that low or average scores on the Ideaphoria test characterize satisfied people in occupations like banking, clerical work, and management. Often, it can be more important to have a constant level of concentration rather than a multitude of ideas. For example, an executive's main responsibility is to oversee the execution of ideas, rather than flit from one new idea to another. An air traffic controller's job is to carefully orchestrate the complex comings and goings of hundreds of planes, not get distracted daydreaming about upcoming vacation travel plans or home remodeling projects.

Managing: the role of ideas in executive positions

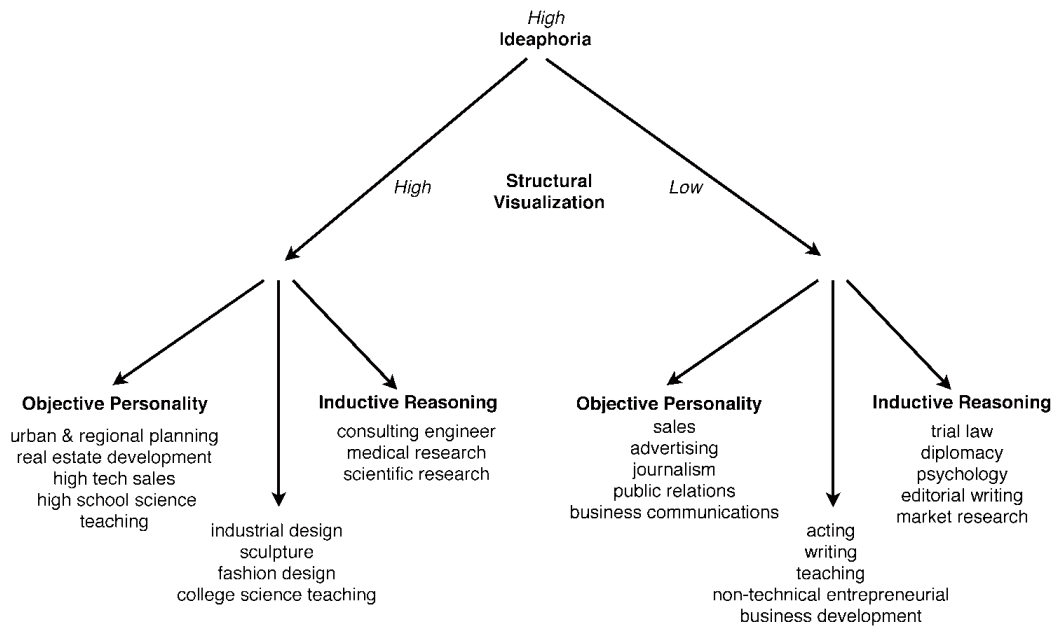
George, a successful CEO, came to be tested after his son had found satisfying work in a new field based on the Foundation's testing and recommendations. As president and CEO of a large charitable organization, George wanted to go through the testing himself to evaluate it for students and adults to whom he might recommend the process. At first, some of his scores surprised him. He assumed that, to be successful, a director of any organization would have a high score in Ideaphoria. With further discussion, he understood that having an abundance of ideas and trying to develop every single one might actually be counterproductive to his role of bringing plans to completion.

For example, one of George's accomplishments had involved increasing his organization's operating budget by several million dollars. A project of this magnitude demanded strict attention to detail and a steady hand at the helm, not someone who jumped rapidly from one idea to the next. Some of his friends with similar responsibilities found themselves bored or stifled. One CEO he specifically remembered was replaced for "being all over the place" with his projects and ideas. "Following every idea," George said, "would lead to loss of productivity, financial resources, and time."

Match your aptitudes to your pursuits

You should work in a field that caters to your Ideaphoria score. Those who score high may feel bored or restless in a field that causes this talent to remain idle. On the other hand, those who

score low or average in Ideaphoria may feel rushed or frustrated in a field that calls for a rapid flow of ideas. As with any aptitude, you should concentrate on types of work for which your score is the norm, not the exception.



4

Graphoria

Jenna finished up her quiz in twenty minutes, skimming over her answers for a last check as she walked up to the front of the classroom to hand it in. On her way out, she looked at the rest of the students in the room, heads still bent over their papers. She didn't know what took them so long, but she always seemed to be the first one done with fill-in-the-blank quizzes.

Meanwhile, her classmate John labored over his quiz. He was prepared and knew everything they had covered in class, but he just thought of himself as a "slow test taker." He usually got right all the questions he answered, but he always felt hurried, as if he didn't even have enough time to read through everything. He looked at the rest of the quiz. "Thirty-five questions in thirty minutes?" He felt like he had little chance of getting them all done. Jenna, who had already finished and left, seemed to have no problem with these types of tests. What was her secret?

We're all familiar with certain aptitudes — some people have a gift for music or possess a keen memory for words — but not many of us think of clerical speed as a measurable trait. The truth is that people read over letters, numbers, and symbols with varying degrees of speed and accuracy. In fact, there is a dramatic difference in performance on a speeded measurement of this trait as opposed to one administered with unlimited time.

The Foundation coined the term "Graphoria" for this trait, and measures it with a test called Number Checking. Our research shows that this aptitude is especially useful in numerically oriented careers such as banking, accounting, finance, and economics, as well as nursing and clerical occupations such as bookkeeping or medical-records keeping. Even though much of the burden of clerical drudgery has been eased by technology, those who score higher in Graphoria are far more likely to flourish in work settings in which attention to detail and checking forms and records predominate than are those who lack this aptitude.

Number Checking, the test

Johnson O'Connor constructed the Number Checking Test in the 1920s for use in hiring people for the accounting department at General Electric, and so the aptitude measured by this test was originally called "Accounting Aptitude." Examinees are presented with two columns of numbers and must make a check mark between the pairs of numbers in each column that are the same. The version in use today still closely resembles the original test, although since then the composition, types of items, and length of the test have been modified. The scoring has always been based on both speed and accuracy.

When people score high...

Those who score high on this test often don't notice the aptitude at work in their own lives. Many say, "Well, of course I went fast. Doesn't everyone?" People who have this clerical ability, like those who possess any other aptitude, assume that everyone can perform at the same level. When asked to think about it, though, they remember that they were generally the first ones finished with multiple-choice tests in school or filling out forms at the doctor's office. They may even get satisfaction out of completing a pile of paperwork in class or at the office. Outside of work, activities like reading a guidebook while touring a cathedral or scanning a train or bus timetable are seemingly effortless for people who possess this aptitude for clerical speed.

The applications of Graphoria are innumerable — almost every job offers some kind of paperwork or forms to fill out. As an example, our testing staff must accurately administer timed tests and quickly and accurately score test papers. In fact, our staff members score well above average in this area. A test administrator who does not have this aptitude might greatly enjoy discussing the results as it involves interacting with people, not paper, but ultimately would find the amount of clerical work demanded frustrating and overwhelming.

There are of course whole industries historically based on clerical efficiency, from insurance to banking to investment and accounting. A clerical error in the wrong time and place could cost millions. With modern barcode scanning and electronic transfers and point-of-sale devices doing much of the reckoning and inventory work, where would a quick number scanner fit in now? Many jobs that used to be torture for low-Graphoria individuals have had their sting removed.

What do those with this clerical processing speed advantage do today? The worlds of finance and business still offer multitudinous opportunities. The original name for the test, Accounting Aptitude, suggests an obvious career path. In our latest validation study, fully half of accountants scored above the 75th percentile on this test. Consider a bond trader, visually bouncing between three computer screens displaying spreadsheets of numbers; seeing opportunity in the profusion of numeric data with speed and accuracy is of the essence.

If you think of your Graphoria as a bonus add-on, it will serve your other aptitudes in rewarding ways. Quickly scanning financial data to solve equations or find investment trends links clerical speed with numeric reasoning aptitudes. Spatial thinkers with Graphoria can be precise with data streams from outer space, and quick inductive reasoners can make connections while auditing questionable financial records. Pianists apply Graphoria to sight-read music while accompanying a singer. Visual aptitudes pair well with clerical efficiency in prestigious auction house and museum curatorial roles. Such citations could go on and on. You may take this aptitude for granted while earning a good living that would be impossible without it. You may have noticed a senior executive casually rifling through income reports who soon asks a probing question about something that did not add up, or know a junior enthusiast who keeps track of all the scores and statistics for a favorite team. The detail-proficient production assistant is often crucial to the seemingly well-informed broadcaster. Outside of work, you might use this ability to handle paying your bills with dispatch so you can get on with favored activities.

When people score low...

Those who score low on the test, on the other hand, feel the weight of paperwork more often. Pencil and paper tasks are often arduous and distasteful. If they are in a career that has mountains of paperwork, they may push it off until they absolutely *must* do it, have to take work home, or daydream of having an assistant. Likewise, jobs such as accounting and banking generally don't even appear on the radar for them; they can't bear the thought of a career that would require constant clerical work.

Cheryl, who scored very low on Graphoria, fought through a couple of months as an administrative assistant. She loved the parts of the work that involved speaking to clients and arranging meetings, but hated the majority of her job as it consisted of clerical tasks that seemed to take up a lot of time and require a great deal of effort. Once she shifted to employee recruiting for a start-up company, she found all the satisfying parts were still there, but the paperwork that she dreaded had all but disappeared.

Graphoria is a simple concept, but scoring low in this area can have far-reaching effects. In a typical school situation, for example, a student's performance is often measured by timed, multiple-choice tests. A student who scores low on Graphoria might get a lower grade on the test, not because he doesn't know the material, but because he couldn't finish the test or made clerical errors. He might find writing essays or participating in class discussions to be easy and stimulating, but a heap of statistical homework a grueling chore that can take hours. We regularly hear from low-Graphoria students and their parents that the clerical aspects of schooling can be frustrating.

While some of these problems might be very apparent in high school, as you exercise more control in your educational choices, they generally diminish. At college, you choose the setting you're in and the classes you take. A small college and/or small seminars and discussion groups can ease the burden. As an adult, you have the greatest control over how you choose to spend your time. An executive chairing a board meeting need not have Graphoria, but the person who is taking minutes of the meeting would do well to. An electrician needs the ability to think in three dimensions to do his work, but the person who does his billing and payroll is the one who should be fast and accurate with paperwork.

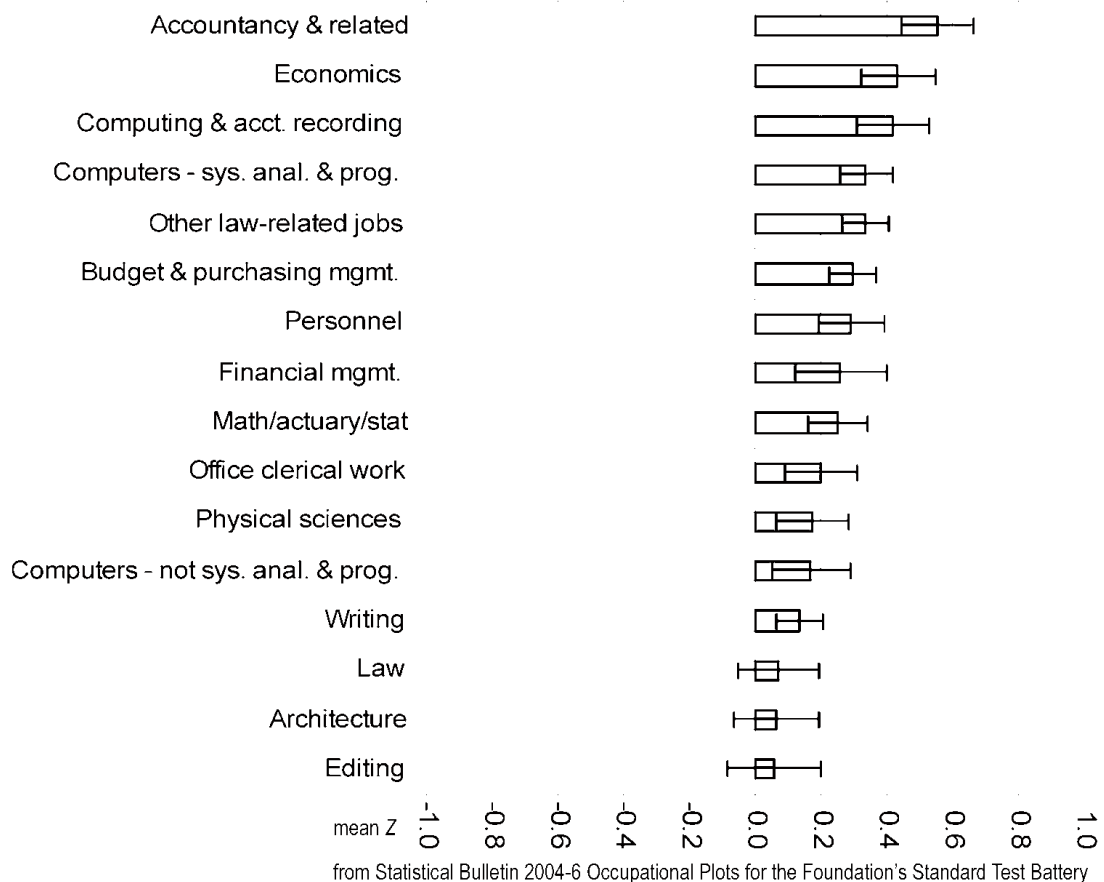
In planning your next steps after high school, take your Graphoria score into consideration. If you are a freshman engineering student at a huge school, for example, it's likely that your classes will have a great many students. This could mean a large lecture-hall setting where the professor talks and you take notes. It could be stressful trying to take notes while also absorbing what's being said. You might also be required to demonstrate your knowledge through timed multiple-choice quizzes that depend on clerical speed as well as comprehension of the subject. Smaller classes are a better setting, as they place more weight on discussions, projects, and essays, and also might allow greater access to the professor.

This is not to say, however, that you should immediately dismiss a school because it has 30,000 students. What is important is class size, not school size. Play to your strengths — consider majors that use the abilities you *do* have, and don't let low-Graphoria issues stop you from pursuing something you want.

If you score in the lower ranges, be mindful that producing and checking paperwork might be tedious for you. Look for ways to minimize or avoid it. Focus on the areas where you *do* have a natural ability. The good news is that, though clerical tasks are prevalent in schoolwork, they aren't always as important in every job or field, so if you score low, your frustration may have an expiration date.

Being quick and accurate on paperwork can aid you in most school subjects and many jobs, but because its uses are so ubiquitous, we often place more emphasis on other aptitudes. If you score high on our Structural Visualization tests, for instance, we think it is more important for you to use your ability to think in three dimensions than to do clerical tasks. Chances are, activities in daily life and on the job will put this aptitude to use, even without you looking for a way to use it. Almost no one complains of not having enough paperwork to do in school or at work!

Occupational Plot of Careers with Above Average **Graphoria** Scores





Analytical Reasoning

“This is such a huge project! How are we ever going to get it done?” whispered two staff members during a meeting. At the head of the conference table, the marketing manager was describing a multi-million dollar account with a new firm with a get-it-done-yesterday time limit. Claire, who had always viewed projects like this as puzzles rather than chores, immediately saw the way to organize her team, systematically split the work, and get the project done ahead of schedule. When she shared her insights with the rest of the room, they unanimously voted to make her the point person for the project. “Anyone this organized without hours to think it through can easily make this one of our best accounts,” said the manager, “Getting things in order seems to be second nature to her!”

Analytical Reasoning, the test

The Analytical Reasoning test is a product of serendipity. In the 1930s, researcher Samuel Horton was attempting to devise an alternate way of measuring Inductive Reasoning using words instead of pictures. He presented test takers with a number of words that had to be arranged on a diagram in logical sequence. When reviewing the data, he discovered that high scores on the new test did not correlate with high scores on Inductive Reasoning, indicating the test was measuring a different ability. It is a test of logical arrangement, not connection of disparate elements.

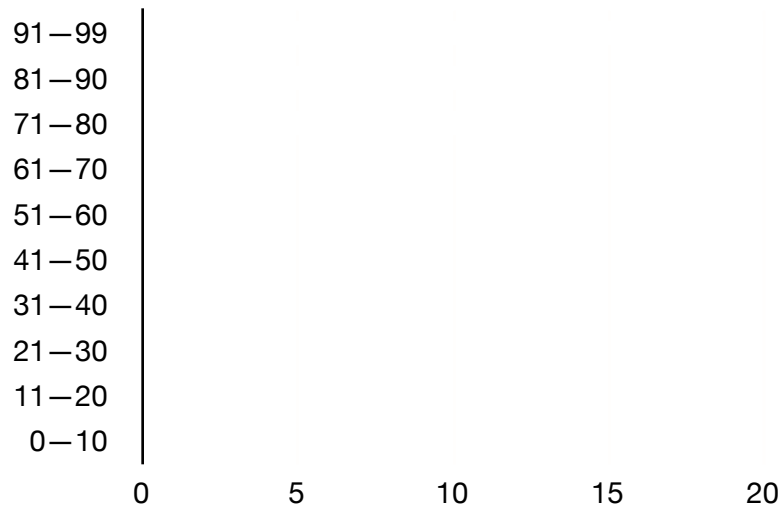
Like many of our tests, Analytical Reasoning seems like a game or puzzle. Organizing chips with words on them into a logical arrangement according to the diagram is to most a novel task. However, to people who can do this quickly and almost effortlessly, the test becomes positively enjoyable. This innate sense of order and system indicates that people who have this aptitude are able to fit a given string of words into a constraining pre-determined pattern with dispatch.

Subsequent studies found that — despite being in fields with rather different demands — engineers, scientists, and editors all tended to score high on this test. The common thread is work that requires the ability to select and organize relevant information for the solution of a problem. Because of the analytical nature of these fields, the test was called Analytical Reasoning. Over the years, the Foundation has found that Analytical Reasoning may also play an important role in the work of electronics technicians, accountants, computer professionals, actuaries, physicians, and teachers. It is highly correlated with grades in a wide variety of course areas, including mathematics, natural sciences, and economics.

Analytical Reasoning, the aptitude

Those who score high in Analytical Reasoning often demonstrate the ability to organize ideas and concepts in their minds, without the use of exhaustive, step-by-step instructions. They love the challenge of creating more efficient ways to do things, mapping out systems that work more economically, or solving logical puzzles.

Once the puzzle is solved, however, or the efficient system is in place, the analytical work is done. People with this aptitude then need another set of data, activities, tasks, or steps to put in order. For them, the satisfaction comes from exercising their logic: not just finding the solution but also figuring out how to reach it. When told to follow set procedures, they often ask, “Where’s the fun in that?” Imagine a high scorer enjoying the daily need to figure out a new delivery schedule as the manager of a floral design shop. No two days will have the same stops along the route. Now imagine this task factored up to an airline adapting schedules with weather delays. Time to apply computer algorithms to make very complex systems work.

Software Engineers — TR 2003-1

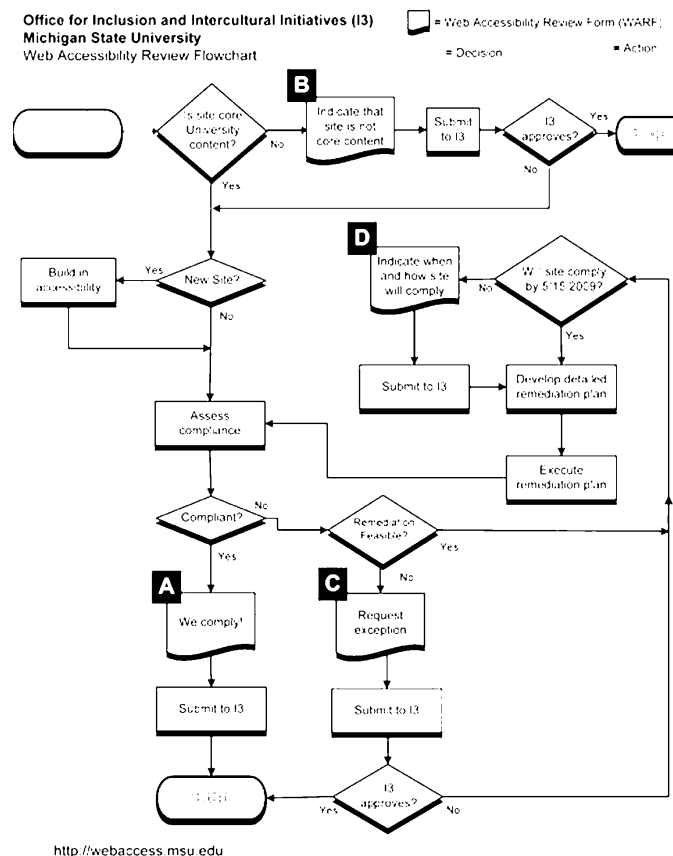
Analytical Reasoning — Scores by Deciles
 n = 60 median %ile = 80

Although the test predates even the concept of computer software, the aptitude underlying high performance on this test has been found in individuals pursuing careers in software engineering and computer programming. It has limited correlation with inductive reasoning, but those who have both aptitudes have an advantage in both setting up a logical system and quickly debugging or investigating to solve problems in software development.

That a test becomes valid for a new career field that emerged long after the test was initially designed speaks to the presence of the aptitude inherent in some individuals. Analytical Reasoning has shown itself to be an adaptive trait over the years we have been measuring it.

Analytical Reasoning in action

The cumulative evidence from occupational validation studies of Analytical Reasoning indicates that this aptitude is utilized, at least to a moderate extent, in quite a number of career fields. However, the most satisfying use of it seems to come from working in jobs that rely on logic and organization. Editors use this aptitude to make sure the large volume of essays and articles that come across their desks flow coherently. Engineers use it to arrange procedures in a systematic way. Computer programmers use it to create an efficient flow of steps in a program. Indeed, traditional flow charts found in programming often look like an elaboration of the design of items on this long-established test.



Like other aptitudes, Analytical Reasoning can certainly be used concurrently with other abilities. The spatial thinker, for example, might seriously consider a branch of engineering or computer science, as those fields seem especially to call for organizational logic. The person with Ideaphoria would use his or her talent for creating order to help organize all those ideas into a well-honed article as an editor or into a viable plan of action as a public relations strategist. A high scorer with numerical skills might utilize this additional aptitude as a financial advisor helping clients formulate a retirement plan or educating investors. A musician or artist could tap into this organizational ability to plan concerts, shows, or

exhibitions. Remember, using your overall combination of talents, not just this one, is what is ultimately important to your satisfaction in life and career.

Teacher to administrator

Previously, Elizabeth had enjoyed teaching immensely, working for seven years as a full-time teacher at a high school. After taking time off to start a family, she returned to the field as a substitute teacher. She discovered that this new role was not satisfying, and she wondered, “What’s wrong? I mean, I’m still a teacher.” She was asked what drew her to teaching in the first place. “The planning!” she exclaimed, “Looking at how best to break down a year, a unit, even a lesson was my favorite part. At my old high school, my principal used my lesson plans as the benchmark for what everyone else *should* be doing. But now, I’m thrown into a day without knowing what the learning plan is or what the students are studying. There’s no planning and there’s no opportunity *to* plan!” This made sense in terms of her aptitude pattern, as one of her predominant aptitudes was Analytical Reasoning. She has since transferred her talents into an administrative role for a high school in which she can plan and organize not just for a class, but also for an entire institution.

Step by step to success

Dave, a consultant who specialized in employee morale, heard about this aptitude and said, “Of course! I’ve always wondered what that ability was called.” In his work, he often had to dissect a problem first and then write a plan for how to tackle it. Though he found the first part of his job relied mostly on knowledge, he had always noticed that he had a knack for arranging a step-by-step approach to implement a solution more easily than his colleagues could. “So many people at my work try to apply a template, but actually tailoring solutions to each individual case is enjoyable for me.” In fact, his boss often tapped Dave for this particular aspect of projects because he handled it with aplomb.

Insurance representative to industrial engineer

Her whole life, Traci had liked figuring out systems, whether it was how to build a bookshelf system or how to organize her trip to Vancouver. But when it came to work, because of her knack for numbers, she followed her dad’s advice to major in business and became an insurance representative. Though she loved the process of organizing the information in each case she handled, once she mastered it, the satisfaction wore off and she found herself longing for a new project. After discussing her high score in Analytical Reasoning and how it could transfer to different fields, she seemed to light up. “I’ve always loved applying organizational principles to everything,” she said in her consultation, “but I didn’t make the connection that I could do this with objects as well as people.” Her friend reminded her how much she had liked an intro to engineering class, but Traci wasn’t sure she was the kind of person who could handle the coursework. After a discussion of her spatial aptitudes and her Analytical Reasoning, she felt more confident. “If I can easily see where a system would break down or how to streamline work, why not get paid to help businesses do the same?” Pursuing a master’s degree program for industrial engineering, perhaps specializing in management science, would put her logical and quantitative aptitudes to good use.

The sound of order

Sean would never have called himself “organized.” His desk was teeming with papers, shoes were strewn about his bedroom, and his books sat in piles on the floor. When it came to cataloging the music at the radio station where he worked though, he dove into the task with vigor. He would classify the music in several different ways so that it could be searched for by anyone who needed it: alphabetical, genre, mood, and date, with each system a little more intricate than the last. “It’s the process of coming up with the system that’s interesting to me,” he told his consultant. “Once it’s in place, I want to go create other systems, new ways to organize, better ways to make sense of things.”

Analytical Reasoning is our name for the ability to naturally and quickly organize information, activities, or steps in a process. To capitalize on this ability, seek out ways to create systems, craft strategies, and be involved in planning. While it seems to be especially important in many fields — science, engineering, editing, mathematics, and accounting among others — it is also something that’s useful in almost any line of work as well as in everyday life. Whether you’re a head chef keeping the kitchen running smoothly, a dentist streamlining office procedures, or a travel agent plotting out a tour group’s itinerary, being able to be logical and organized puts your Analytical Reasoning to good use.

If you score low ...

If you scored low or average, this is not to say that you can’t be organized or can’t plan out activities, just that it might be more of a deliberate effort and that you might need more time. You might find it helpful to develop organizational strategies and habits to keep yourself organized at school or work. For example, students who score low might try to start projects early so they have ample time for organizing their thoughts or to seek out the assistance of a teacher or writing tutor. A working adult might ask a coworker or friend to read over or listen to a paper or presentation to assist with its editing. Either group might benefit from an outline or other framework to help them streamline their thoughts when writing, making a presentation, or giving a talk or speech.

People who score low often think of themselves as super-organized, and may look very neat, as they may find it helpful to rely on the external order of daily planners or calendars. It certainly does make life easier to organize closets and keep a tidy office and living space as well, but you don’t need to score high in Analytical Reasoning to be neat and tidy. Indeed, those scoring high may well lack the temperament to express themselves in an orderly way outside the mind.

Not having this aptitude really just compels you to draw on others: use Ideaphoria to begin a writing project, with editing to come later, perhaps with someone’s help; Inductive Reasoning may encourage you to see connections quickly, even jump to conclusions, to get the big picture without stepping through a procedural analysis; numerical aptitudes may turn you to mathematical reasoning to solve problems; visualizing in three dimensions without an engineer’s analytical mind might lead to design and creative thinking instead of step-by-step planning. Finding the best fit for your personal profile is what will be most likely to lead to career and life satisfaction.



The Numerical Aptitudes

Number Series • Number Facility • Number Memory

Cindy had always been an excellent student, and was planning to become a physician, although she reported that she had struggled with the upper level biology and chemistry classes during her senior year of college. Though she had persevered and gotten her usual excellent grades, the idea of facing a similar struggle through medical school was daunting.

She came in for testing and found out she scored low in Structural Visualization, and very high in all the numerical aptitudes. Her low scores on the spatial tests helped her understand why aspects of the sciences were more difficult for her. Looking back on her courses in college, she realized that her math classes, along with a statistics class she had taken “for kicks,” had always been much more enjoyable than her science classes. She shifted her attention from medical school to graduate programs in bioinformatics, and enrolled in a PhD program in computational biology.

Phone numbers, prices, account numbers, restaurant bills, addresses, flight numbers, the stock market — you can’t go a day without encountering some kind of numbers. Some people can remember them effortlessly, while others can multiply or divide them quickly, while others can understand them easily. The numerical aptitudes we measure seem to be separate and distinct abilities. Scoring high on one of the tests, or even two, doesn’t mean you’ll score high on all three. The combination of your scores on all three of these tests can indicate the nature of the talent you have with numbers.

Number Series, the test

This is an adaptation of something called the Dominoes Test, which consisted of pictures of dominoes laid out in different configurations. The examinees were asked to use the numbers on the dominoes to find a numerical pattern. Analysis indicated that the Dominoes Test correlated with our spatial tests to a reasonably high degree, so the test was then converted into its current form, consisting of a list of numbers, rather than illustrations of actual dominoes. This change significantly reduced the correlation with our tests of spatial ability and enabled the measurement of Number Series as a separate aptitude.

On the Number Series test, you looked at sets of seven numbers, arranged according to a particular pattern. You tried to figure out the pattern behind each grouping, and then what the next number in the pattern would be, like this:

6 5 7 4 8 3 9 __?

(Can you figure it out? If not, the answer can be found at the end of the chapter.)

Number Series, the aptitude

Being able to see meaning in numbers is useful in fields that involve analyzing and/or interpreting numerical information. Someone who works with statistics, or in financial analysis, accounting, auditing, budgeting, market research, cost estimating, mathematics, economics, or demography would use this aptitude.

In a way, it's the most significant of the three numerical aptitudes. You could work in any of the fields mentioned without necessarily being able to remember numbers or add them quickly. Numbers can be written down, and calculators are available almost everywhere. Still, having the other two numerical aptitudes could reinforce someone's decision to go into a numerically-oriented field.

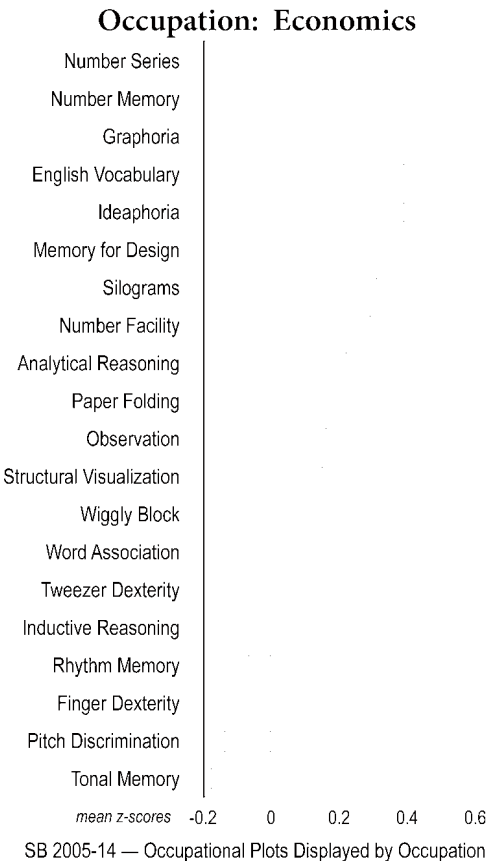
Number Facility, the test

On the Number Facility test, you arranged six chips with numbers on them into two equations, and your score was based on how quickly you were able to arrange the chips correctly. It is more than making one calculation quickly, though, you have to juggle two separate arithmetic calculations, fitting the six numbers into one of two simple equations, with partial solutions potentially interfering with finding the full answer.

Number Facility, the aptitude

People who score high on this test have a facility for doing arithmetic quickly and accurately. Occupations such as bookkeeping, accounting, and banking would utilize this talent. It is most likely useful in a frenzied numbers environment like bond trading or arbitrage. You can even use Number Facility in performing everyday tasks like splitting up a check at a restaurant, calculating savings at a 15% off sale, or keeping track of how much you are spending at the grocery store.

During the discussion of the numerical aptitudes and the different meanings each test had, Carolyn's mother chimed in about her daughter's interesting "job" when the family traveled. "Carolyn's in charge of exchange rates!" her mother said. "When the rate is fairly equal, we do all right, but when we're someplace where that's not the case, she's the one who lets us know how much we're actually paying for things." Carolyn went on to tell us that she really enjoyed



that activity, and that when her brother uses the calculator tool on his phone, she laughs at him. She pointed out, however, that she'd had a hard time with the statistics class she'd just finished. "I'm good with the simple arithmetic, but once that gets into what the numbers mean, it's hard for me." Carolyn's scores reflected this — high on Number Facility but low-average on Number Series.

Number Memory, the test

The Number Memory test consists of a series of eight six-digit numbers, flashed one by one on a computer screen in four separate trials. You have to remember as many numbers as you can after each trial. If you score high in this aptitude, you may find you are a "number magnet," and you may remember numbers even when you are not deliberately setting out to do so. You may remember the phone number of your best friend from high school or the license plate of a car you no longer own! But this is also a very useful aptitude in everyday life, helping you to remember phone numbers and addresses, your Social Security or credit card number.

Number Memory, the aptitude

Professionals who work with numbers, like accountants, bankers, and engineers, tend to score high in this aptitude. We have also found that pilots score high. This occupation involves memorizing multiple numbers — for air speed, atmospheric pressure, altitude, and many others. An aptitude for remembering numbers makes these tasks easier.

Harry loved baseball. As much as he loved the excitement of the game, his favorite part was the wealth of statistics that the game afforded him. He relished knowing not just his favorite players, but almost the entire league, past and present. His grandfather came to the summary session with him, and nodded his head vigorously during the discussion of Harry's number memory. "You can ask that kid anything about any player and he'll tell you how many RBIs, errors, you name it! He's a walking encyclopedia!" Harry had been using his memory for numbers since he was a child.

Stephen worked as a consultant to organizations making decisions about downsizing and internal reorganization. He loved the detailed and complex calculations involved with the work, but had a difficult time remembering all the numbers he worked with daily. He laughed when going over his scores on the three tests, saying, "People make fun of me all the time — I always have a pad of paper in my shirt pocket to write down that employee ID number or new calculation." His scores reflected this — high on the Number Series test, but very low on the Number Memory test.

Numerical Aptitudes and Graphoria

The Graphoria test measures your ability to quickly and accurately scan and compare numbers. A high or average score here is a good supporting aptitude for the other numerical aptitudes, because in the process of calculating or analyzing numbers, you are often working

on paper or on a computer. In school, students who score high on Number Series but lower on Graphoria (or Number Facility) often have no trouble with the concepts in math classes, but they sometimes lose points on tests simply through clerical or arithmetic errors. Often they become frustrated with math classes because they have to spend so much time getting their homework done, even when they understand perfectly how to solve each problem.

If you score low on the Graphoria test but have other numerical aptitudes, try to keep this kind of detail-oriented work to a minimum. Have an assistant or secretary to do the routine paperwork, leaving you to do the analytical work. Using a computer to generate and keep track of numbers can make the clerical aspects of business or technical subjects generally far less time-consuming.

Slow clerical speed need not deter someone who performs well on the numerical aptitude tests from considering a numerical field. Find ways to think about and explain numbers rather than merely notating and checking columns of numbers. Balance time on the computer with time spent in other tasks, for example, as a financial advisor, a math or finance teacher, or someone who gives tax information seminars. These jobs involve clerical work — filling out forms, grading papers, to be sure — but also allow someone to spend time in numerical problem-solving and quantitative analysis along with discussing numeric information with clients or students.

Leo, a high-school math teacher, scored high on Number Series and Ideaphoria, and low on Graphoria and Number Facility. He explained that his least favorite part about teaching was the day he gave a math quiz, because he knew he would be spending his evening grading papers. His favorite part was the next day, though, when he worked through all the problems and the mathematical concepts they illustrated on the board and then helped his students analyze the mistakes they had made. His pattern suggested he try to focus on *talking* about numbers with other people, rather than spending all of his time painstakingly calculating and checking numbers.

It all adds up

Depending on the rest of your aptitude pattern and your interests, your numerical aptitudes may be the focus of your career, or may play a more supporting role. If you end up in a career field in which numbers are not the focus, you may find that your numerical aptitudes are still very useful. All business careers have a numerical component, even if interpersonal relationships are the predominant focus, as in a sales or managerial position. Navigating a ship, calculating a pricing structure for a wholesale electronics business, or seeing a project through a fashion house will generate numbers that must be calculated or interpreted.

Numerical aptitudes can be helpful in your personal life as well: aiding in balancing your checkbook, doing your taxes, handling a monthly budget, planning for retirement...

*...and for figuring out the answer to the Number Series item!
The answer is 2, and here's the pattern in case you didn't get it:*

$$6 (-1) \ 5 (+2) \ 7 (-3) \ 4 (+4) \ 8 (-5) \ 3 (+6) \ 9 (-7) = 2$$



Auditory Aptitudes

Musical brothers Carlos and Alex each played several instruments, performed in groups, and were involved with music production and technology. When they got together to practice: “Oh, that’s terrible!” said Carlos, “Can’t you tell that we need to tune up before we go any further?” “What do you mean?” said Alex, “It sounds fine to me; I just want to start making some music!”



The two auditory memories seem to draw people into music — when you can easily learn or remember a new tune or rhythmic line, music becomes more compelling and you may want to make room in your life for it. Since both of the two men described above are strong in these memories, it is not surprising that they enjoy listening to music and playing instruments. For them, it’s easier to learn a new song or recognize a chorus they’ve heard or played before.

Pitch Discrimination, however, measures the ability to hear fine differences between notes, to tell whether a sound is right on key or is a little off. People like Carlos who score high on Pitch Discrimination can be very particular about making the note sound just right. This is important for playing certain instruments, especially those like the violin for which the musician can’t rely on keys or frets but must be able to hear when his fingers are in exactly the right place.

Though both brothers have auditory aptitudes, it’s not surprising that they might take different approaches to music. Like anyone with high scores on the auditory tests, their interest in music is likely to endure, and they should strive to make time for playing and listening throughout their lives. Other aptitudes must be considered, however, in deciding whether to pursue a musical career.

Auditory aptitudes, the tests

Measuring auditory aptitudes was a pioneering step in the identification of distinct aptitudes. While musical talent had long been looked at as one discrete gift, the auditory tests of Carl Seashore, first developed in 1919, served to break down this ability into component parts.

This concept of measuring specific aspects of what previously had been perceived to be one cohesive ability was at the time revolutionary, and paralleled Johnson O'Connor's efforts to study individual human aptitudes rather than overall intelligence. Seashore stated in 1938, "If we measure the sense of rhythm and find a very superior performance, the conclusion is not that the subject is musical; it is merely that the individual has a very superior sense of rhythm." Seashore and O'Connor felt that it was important to consider the combination of auditory aptitudes in order to determine musical proclivity. Each of the auditory traits should be considered individually as well as part of a triad.

O'Connor and the Foundation began giving Seashore's tests for Tonal and Rhythm Memory and Pitch Discrimination (along with several others, *e.g.* for Time and Timbre Discrimination, since dropped) in the 1930s. Myriad versions of the tests were produced as the Foundation's staff worked, with Seashore's help, to make the measures more reliable. One significant change in administration was the presentation of the tones via headphones worn by individual examinees, beginning in 1968, replacing speakers that broadcast to a whole roomful of test-takers; this was thought to improve examinee concentration and decrease noise interference. Over the years, the Foundation has kept up with technology related to sound quality for test administration (going from acetate recordings to long-play to reel-to-reel tape to DAT to digital sound on CD to hard drive to DVD) as well as trying various styles and manufacturers of headphones.

Some examinees have commented that our auditory tests do not sound very musical. This is a characteristic that was purposely created so that examinees with musical training do not have an advantage over others without any musical experience. The notes are produced electronically, not by any recognizable instrument, and the frequencies of the tones do not correspond to the musical scale — you will not find an E-flat or a C-sharp on the Tonal Memory test, but instead will hear notes at arbitrary frequencies. While this makes the tones somewhat less pleasant to listen to, it does improve reliability and reduces any practice effect from prior musical experience.

Tonal Memory, the aptitude

Tonal Memory, an ability to remember sequences of tones, is often thought of as the central music aptitude; after all, most people mainly associate music with melody. It is this ability that causes some to come home from a musical or a concert singing that great new song. For the music student or the professional, having this aptitude makes it much easier to learn to play something new. Once the melody has been heard once or twice, the tune has been memorized, thus when a note is played wrong, it's immediately obvious. Perhaps, more importantly, tonal memory tends to be what makes music memorable and meaningful.

Without Tonal Memory, people can enjoy listening to music, but when the performance is over, they aren't able to easily keep a particular pattern of notes in mind. If they want to memorize the music, they need to hear it more often and work harder. With this aptitude, easily remembering an arrangement can lead some to want to play it themselves or to create variations of it. Outside of music, Tonal Memory may be helpful in learning other tune sequences, like birdcalls. One examinee believed that she used it to help remember phone numbers — she was aware of the tone that each number key made when pressed. Tonal

Memory may also help people to remember foreign languages or other words as they hear them: one study found a correlation between tonal memory scores and better grades in a first-year high school French course.

Pitch Discrimination, the aptitude

Pitch Discrimination measures the ability to distinguish between different frequencies, or pitches, of sound. People with this aptitude are more likely to notice mistakes in music, whether they are their own slightly sour notes or those of the person behind them in the chorus. A precise awareness of pitch is not only helpful for a musician, but also for a choral director, music teacher, someone who builds musical instruments or sound equipment, or a piano tuner. It would be less essential in playing the piano, a fixed-pitch instrument, as compared to a violin, where the player's ear has to guide the hand.

In addition to its usefulness when playing and practicing music, Pitch Discrimination may constitute a greater sensitivity to all types of sound. Many examinees who score high in this area report that they are particular about the quality of their audio equipment and tend to be more bothered by sound distortion and feedback. Some mention that they are more sensitive to nuances in people's voices, finding that they can read people's moods or emotions based on the sound of their voice. Being able to identify regional accents may be related as well. One client reported that he can discern mechanical problems by listening — he can tell that the car's engine doesn't sound quite right. Another said she can tell when the espresso beans have been ground almost finely enough, based on the sound of the motor's purr.

Rhythm Memory, the aptitude

Rhythm Memory is similar to Tonal Memory, but relates to the ability to learn and remember rhythms or beats rather than tunes. Those with Rhythm Memory might find themselves turning up the bass on their stereos or tapping their fingers or feet along with the drum line. They might be particularly drawn to complex or syncopated rhythms, or to playing instruments like the tuba, bass, or drums that carry the rhythmic line in music.

Rhythm Memory has many uses beyond its place in music. Though we measure it with an auditory test, the sense of rhythm is not a purely auditory aptitude; it seems to have applications in sports and movement-based fields along with several aspects of writing. Many forms of dance are easier and made more rewarding for those with a good sense of rhythm, as are other physical activities and sports. Timing and cadence in writing are made manifest in poetry, dialogue, and comedic performance. Public speaking could be another outlet for this sense of rhythm. A speaker who has paid attention not just to the information being delivered, but also to how it sounds to an audience may create a more dynamic and compelling speech.

Auditory aptitudes in concert

Our recent studies of professional musicians show that they, as a group, tend to score high in all three of the current auditory aptitudes that we measure. By comparison, another study has

shown that, among our overall client population, only about one in ten people scores high in all three. As with Carlos's and Alex's scores, you can see that it's possible to have any combination of one or two high scores without having all three of the auditory aptitudes. For those scoring high on all three measures, we encourage life-long participation in music-related activities, whether in paying jobs or enjoyable hobbies or both.

Tonal Memory

musical
performance
management
criticism
teaching

singing

piano

violin

guitar

conducting

precision
technology

sound mixing,
recording

sports

Pitch Discrimination

percussion

voiceovers

dance

timpani

Rhythm Memory

acting

dialect
coach

public speaking

comedy

writing

Although our research also shows that today's professional musicians score much like our general client population on the Word Association test, those who score Subjective might thrive as specialists: solo performers intensely pursuing excellence in playing an instrument, master teachers working individually with serious and dedicated students, or even small business owners collecting jazz recordings or rebuilding antique player pianos, developing a highly specialized expertise.

Those who score Objective could settle into a more generalized and collaborative type of role, and may balk at the hours of solitary practice that contribute to making anyone proficient as a musician. These Objective types are more likely to find satisfaction doing a variety of things, and many musicians today find that, to make a living, they must do exactly that.

Jason, a high school student with all three auditory aptitudes, reported that he wanted to pursue music professionally, and had already begun to do so. He not only played in a band that performed public concerts, he also had a side job of coaching friends and others as they prepared for their auditions to music schools. He was also involved with recording and mixing music for his own band as well as those of friends. Being Objective, he already seemed to realize that just playing one instrument wasn't going to be satisfying. He recognized that he would need varying and diverse roles, which his activities already reflected.

Jason's brother Aaron, who also scored high on all three of the auditory tests, scored Subjective on the Word Association test, suggesting that he consider himself more of a specialist than a generalist like his brother. Jason mentioned during his summary that Aaron was not just at any music school, but one that only instructed in four instruments — drums, bass, guitar, and keyboard. Aaron was a drummer, primarily, and wanted to focus on just percussion and found a school that truly fit with his specialist nature. Aaron studied percussion in particular; although he worked with guitar and keyboard as well, he wanted to focus his studies on being a drummer.

Confirming auditory aptitudes in a person already pursuing music can be reassuring, but more exciting is the discovery of latent auditory potential to someone not yet seriously trained in music or other outlets for sound processing. Marianne came in for testing when she was in her early 30s. She had never really been involved in music in school so she was surprised, but pleased, to learn about her strong auditory aptitudes. "I guess this explains what drove me to start learning the guitar recently, and why it's been so much fun!" she exclaimed. She contacted us later for a follow-up discussion, and announced that she had started writing music, which also provided an outlet for another aptitude she had, Ideaphoria.

Only six months after learning about her aptitudes, she had already completed 17 songs, and had plans to start recording. She was also hoping to incorporate music and songwriting into her field of marketing and communications, perhaps by developing performance activities for team-building or helping coworkers create effective and dynamic presentations for clients.

Andrew had high scores on all three of the auditory tests. He had been working in the Naval Reserves on a project involving research on ways to communicate with porpoises under water. His auditory aptitudes had been very helpful in developing and learning a communication system. With the encouragement of his aptitude consultant, he hoped to go into active duty and work with the project full-time.

Keep your ears open

If you have high scores on any of the three auditory tests, we expect that you will probably enjoy listening to music and may like to play an instrument, sing, or be involved with music or sound in some other way. If you don't make room in your life for such pursuits, you may feel

dissatisfaction due to the lack of outlet for these aptitudes. Does this mean that you should devote yourself to a career as a professional trombonist? Not necessarily — the answer depends on many factors including your other aptitudes and how they all fit together. Even those who do not have both aptitude and love for music would do well to understand the overall symphony of their aptitudes, not just this one part.

When considering your career options, try to find a way to incorporate any auditory aptitudes that you have. If music is a true passion for you, perhaps knowledge of your auditory aptitudes will give you added confidence to pursue it further. Bear in mind, too, that you need not be the one performing to be involved with music professionally. The world of music employs lawyers, salespeople, technicians, marketing directors, engineers, librarians, writers, managers, and many more; having one of these positions in the musical domain may be far more satisfying than doing similar work in a different environment.

Even if you feel that it is too late or too impractical for you to begin a full-time career in music, you may gain immense satisfaction from participating regularly in activities involving music. Pick up that clarinet you haven't touched since middle school. Join a community chorus. Invest in a season subscription to a local theatre, or a ballet, symphony, or opera company. Learn how to play the guitar or the drums and start your own band. You might keep your day job, but take pleasure in expressing these aptitudes whenever you can.

Not everyone with auditory aptitudes may have an interest in music. Not to worry. As alluded to already, using a keen ear for the study of foreign language or speech pathology, being a diction coach or identifying songbird calls, feeling the rhythm in sports or movement and a host of other pursuits can provide aptitude expression as well. Using your aptitudes for your personal satisfaction is the key, whether at work or play.

8

Silograms

*“Oh, I never had to study. I lived in a specialty foreign language dorm at my school that had a variety of students in it. My housemates were running around with flashcards, and getting together for study groups, while I was looking for someone to go play pool with. It was great!” While we were discussing her high score on Silograms, Caroline readily identified with having this aptitude, and talked about what it meant to her. She had chosen Italian Language and Literature as her college major, and reported that she had greatly enjoyed her classes. As the words Caroline was learning were directly connected to her field of study, she reported also having an easier time recalling the words she needed to when having to translate *The Decameron* or sharing in class her analysis of a play by Dario Fo.*

Silograms, the test

The motivation for the development of the Silograms test was a perceived post-World War II need to isolate an aptitude associated with ease of learning a foreign language. It is an example of a paired-associate recall test that measures an aptitude for the rapid learning and retention of words. This method was first devised in the late 1800s, and the initial version of our test was developed in 1945 by staff member Kim Margolis. (*Silograms* is the plural of the last name spelled backwards.) Along the way, numerous methods of testing were explored and the possible effects of a poor vocabulary were corrected for as was any resemblance of the nonsense words to actual words in other languages. There was even an experimental aural version of the test in which the word pairs were read aloud; it correlated highly with the written version.

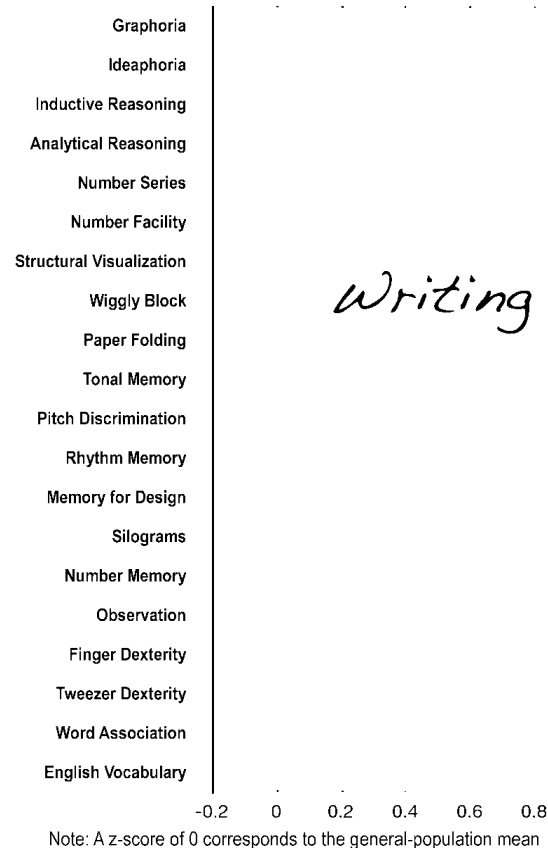
Several studies conducted by the Foundation found a strong correlation between Silograms and grades in foreign language classes. The test was also found to be among the best predictors of grades in mathematics and English.

Silograms, the aptitude

If you have this aptitude, you may find that repetitive memorization is not a burden for you when learning languages or any type of specialized words. A high score on Silograms should encourage you to explore the rich world of foreign languages and cultures. This word-learning ability can also be used in other ways that involve memorizing words: learning lines for a play, preparing to give a toast, speech, or presentation, studying up on your subject to give a tour of a school, historic site, or museum.

Along with scoring high on Ideaphoria and our English vocabulary tests, writers as an occupational group clearly score high on Silograms as well. Being able to easily learn new words, and therefore have them at the ready, would certainly aid a writer in his or her ability to be concise, compelling, or critical.

Many fields, like the social and physical sciences, medicine, architecture, and law, contain a great deal of terminology. An electrician or a mechanic has to learn the names of hundreds of tools and parts. If you scored average or low, you could still succeed as an interpreter of Japanese for a manufacturing company, as a therapist, or as a mergers and acquisitions attorney. It's just that the memorization of long lists of words might not come as easily to you. If you have an interest in languages, science, or drama, don't let an average or low score keep you from pursuing Chinese, chemistry, or Chekhov — just keep in mind that extra effort may be needed.



Silograms at school...

Study a foreign language? But what would I do with that? When someone says they plan to major in a language, a common reaction is, "Oh, so you want to be a teacher!" Focusing on a foreign language could also lead to a career in translation, linguistics, diplomacy, or international business or law. It could also be an asset in library science, the health professions, or social work. You could combine an ability for languages with an interest in a foreign culture — building a career in anthropology, intercultural communications, missions work, foreign aid, or international relations.

Distinguish yourself in a competitive job market. A marketing major with a background in Portuguese or Spanish might make a career in Latin America. A student who combines coursework in political science with the study of Mandarin might pursue a career in diplomacy or the foreign service in China. A computer science student might combine this major with a flair for language and become a language engineer who creates software that is easily adapted into Swahili or Swedish. Being bilingual could have you living and working in Italy or Thailand as a tour organizer, travel writer, or foreign correspondent.

Adding a language to any academic program could lead you in exciting new directions. Think about being an exchange student, participating in study-abroad programs, choosing

international internships, joining a cultural organization, or even just getting to know some international students. It can be fun just to try out other languages, too. Ask the Turkish girl down the hall how to say, “Hello!” or how to count to ten. You never know when you might need to be able to say “Thank you!” in Vietnamese. Being immersed in a new language and culture can lead you to personal enrichment, new friends, and new experiences.

Silograms after school...

Students are not the only ones who can take advantage of this ability and do something that involves languages. Being bilingual is an obvious asset. You could consider picking up a foreign language or returning to one you’ve studied. This could lead to more opportunities with prospective employers or allow you to tap into a population to expand your business.

If you’re looking for a change within your field, you might set your sights on working in an international setting. Business, law, banking, teaching, engineering, health care, and the sciences are practiced all over the world. Your current skills may translate.

Outside of work, you could teach an adult education class, create a small translation business for family letters or documents, tutor language or ESL students, or work at cultural events in your community. You might host a foreign exchange student or take a cultural class. Learn to tango while practicing your Spanish or choose wine pairings while conversing in German.

Being familiar with another language also makes foreign travel less stressful – you can read road signs and decipher menus, and train schedules are far less baffling! While English is certainly spoken around the world, trying to converse in the native language is a great way to break the ice. Being able to say, “*Esta sopa es deliciosa*” or “*Welche Richtung zum Zoo?*” is fun.

Silograms in action

Thomas told us that he was going to be taking the Foreign Service Exam — that very afternoon, as a matter of fact! He had always had an interest in foreign languages and cultures, and talked about his travels to various parts of the world after college. “I love just setting off with only a destination in mind and seeing what happens when I get there. It’s easy, for me anyway, to pick up the language, and interacting with the locals while speaking their language is very rewarding.”

He had dabbled in other languages in high school and college but lately had found himself drawn to the Arabic language and culture. About a year ago he decided to “stop goofing around and settle down.” His interest in foreign affairs, current events, and other cultures helped him decide on the Foreign Service. He had been studying Arabic on his own so he could demonstrate his commitment to the language and the work. His goal was to be an Arabic-language specialist. “I’m most interested in becoming involved with written translation and analysis, learning classical Arabic first then moving on to the various regional dialects.” Thomas also scored high on Pitch Discrimination and Tonal Memory; he said that he had always been good at picking up accents. “I may not know exactly what I’m saying, but I sound good.”

During a follow-up appointment, Mark said his current plan was to pursue a career in corporate contract law. We discussed strategies for studying and pointed out that because of his high score on Silograms, he should find all the required memorization fairly easy. He seemed a little surprised. “I just thought of it as something that made language classes easier. I’m glad to know that this aptitude will help me with this new path.”

Having a facility for learning new words easily can be a great asset whether your career involves international communication or keeping up with ever-changing technical lingo. Pharmacology, for instance, is rife with *Silogramesque* words. Silograms helps you learn any list of words or terminology — the ‘language’ of your field. You will be pleased to be able to recall the exact name of that paint color you want, the new medicine you are supposed to ask your doctor about, or the name of your favorite restaurant in Lisbon.



9

Memory for Design & Observation

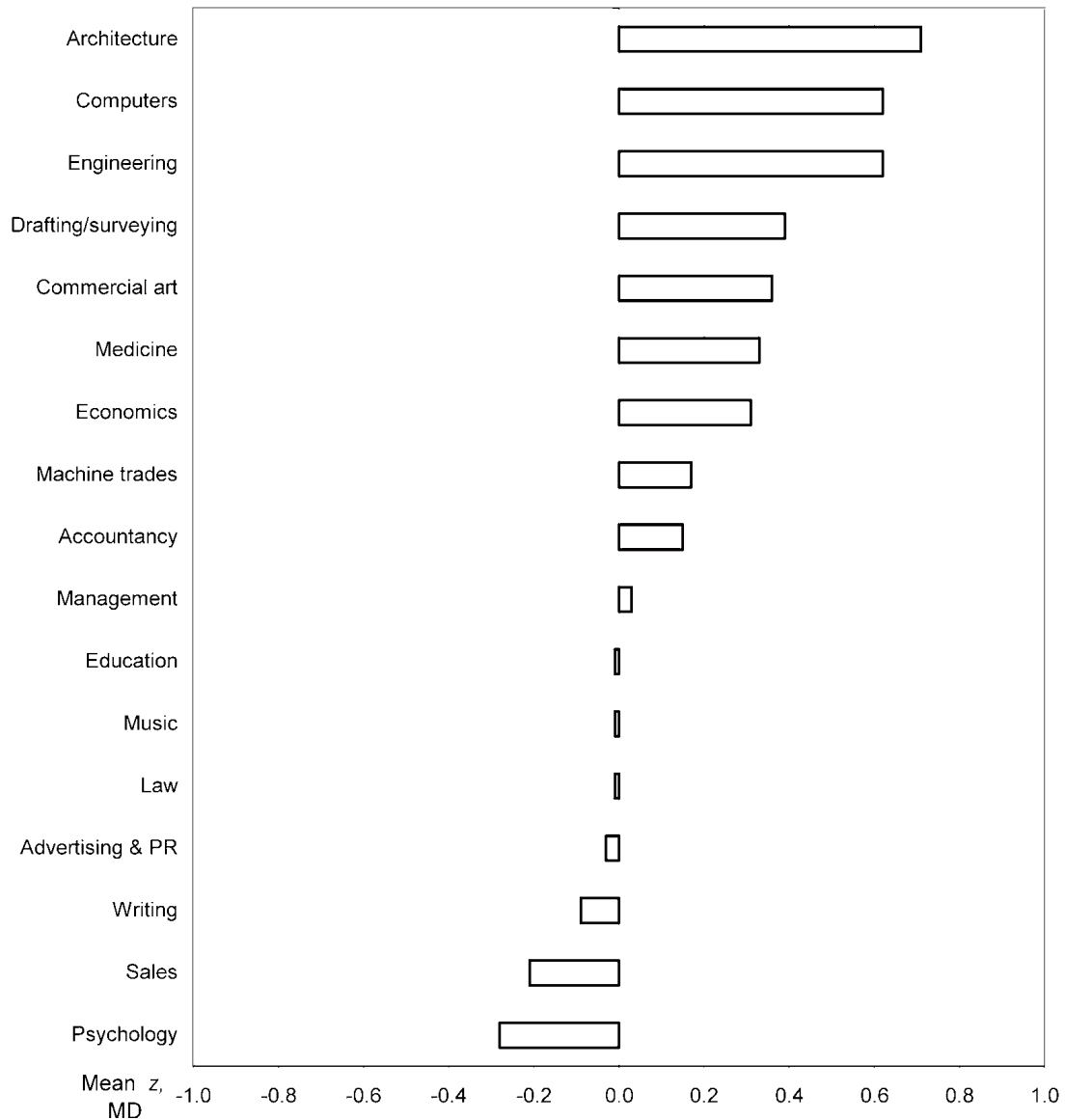
“Okay, Mr. Pierson, the lawyers have decided that we will need at least eight sketches of the crime scene, three showing the various escape routes used by the perpetrators, and a few more showing the angle of the attack.” James Pierson, a former police detective, is now a jury consultant. Previously, he had had to content himself with fighting crime by day and using his visual talents on his own time. His Memory for Design and Observation were now used daily in his new career as a criminal justice consultant who carefully constructs visual presentations of physical evidence for juries.

Memory for Design, the test

The Memory for Design test was first developed by the Foundation in 1937, based on the earlier work of Yale University’s Clark Hull. Test takers see line drawings on a screen and are then asked to reproduce the images on paper by connecting dots that represent the lines’ end points. The drawings become progressively more complex and abstract, and many remember the test as being exceptionally difficult. The distribution of scores on Memory for Design reflects this difficulty, with a noticeable difference between the scores of people with the aptitude and those without it.

Architects, design engineers, draftsmen, and physicians have scored high in Memory for Design. In a more recent study, both physical and life scientists also scored high. In 2008, researchers found that Memory for Design tends to have an influence on choice of college major: those who had studied engineering, mathematics, architecture, and computer sciences showed the highest Memory for Design scores of all the major fields listed by examinees.

Memory for Design shows some correlation with the aptitude for Structural Visualization. This is not entirely surprising, as many activities that use the three-dimensional ability, such as reading architectural drawings or interpreting x-rays, also draw on Memory for Design. It is important to note, however, that the two are distinct aptitudes. Many clients have one of these aptitudes but not the other, and there are numerous possibilities for using either on its own. Sculpting an object using a chisel or a chain saw would call on Structural Visualization more than Memory for Design. In contrast, graphic designers and calligraphers would tend to find the opposite to be true.

Performance of Examinees in Selected Occupations on Memory for Design

Note: The values in the graph represent mean z-scores on Memory for Design for selected occupations after scores were partialled for age. Technical Report 2008-2

Memory for Design, the aptitude

As Memory for Design measures the ability to quickly absorb and reproduce abstract line diagrams, those who score high on this test may have an advantage in remembering charts, graphs, electronic schematics, molecular diagrams, and other patterns or designs. People with the aptitude often notice that they are more aware of styles and trends in visual fields from fashion to architecture. Some mention being able to establish a mental map of the street system in foreign cities or easily identify painters' distinctive styles in art history class.

People often ask if Memory for Design is specifically an artistic aptitude. It can be helpful for artists, but not everyone who has design memory is artistic, and vice versa. Certainly the

ability to reproduce designs from memory on paper can be helpful for artists, but being good at free-hand drawing, painting, or other forms of art seems to involve other abilities as well.

While this aptitude may not be necessary for creative artistic endeavors, its presence does lead some people to fine arts, design, fashion, art history, or other visual fields. We encourage you to explore any interests you have in these areas. Even if you don't think of yourself as being artistically talented, learning to work with line and form, perhaps in studying textiles, doing page layout for publications or web design, being a fashion buyer, or becoming a print or map collector could allow you to express this aptitude. Being able to hold a complex visual pattern readily in your mind can make visual designs a pleasure to work with.

You might consider teaching ancient or foreign writing systems, making maps, or creating print layouts or diagrams. A geographer, geologist, surveyor, or archaeologist works with maps, scale drawings, and other visual imagery. The people in these fields are not necessarily designing the images they work with, but could benefit from recalling them easily. In today's world, all science and technology textbooks feature line drawings and diagrams to dramatize important points; having the memory to retain the shape and detail of such illustrations relates to the study of these subjects. Having a picture in mind saves the need for many descriptive words.

Observation, the test

Johnson O'Connor created the initial version of the Observation test in the 1920s as part of an effort to assess the aptitudes of meter inspectors. New inspectors were hired on the basis of their high scores on the test, and it was found to be a good predictor of success in this job. The first version of the Observation test involved a tray that was set with common objects in a specific arrangement and viewed by the examinees. They were then asked to identify changes in the objects' positions and orientations after they had been rearranged by the test administrator. Later, the test was improved by using photographs of the tray of objects. The current version, involving computer graphics, allows for even greater consistency in presentation of the images. The application and use of the original test has expanded to a variety of activities requiring attention to visual change and detail.

Observation, the aptitude

Since Observation is the ability to notice and remember small visual details, it is helpful for inspectors, detectives, appraisers, antique dealers, or anyone else who is responsible for monitoring or evaluating quality or consistency. Physicians and medical professionals score high — noticing minute changes in a patient's condition or irregularities in CT scans or x-rays is an important part of their jobs. The field of forensics seems to be an obvious outlet for this eye for detail, as tire tracks, fingerprints, handwriting samples, and ballistics reports are often used as evidence in court cases.

Many of our clients bring up day-to-day uses of this aptitude. One client remarked that he navigated around Shanghai not by reading street signs, which he couldn't understand, but by recognizing store signs — he knew where he was based on what he had observed earlier.

Another reported that she was always the one who did the last-minute reviews of the dining room at the restaurant where she worked. She had a reputation for noticing the wilted flower in an arrangement or the smudged glassware on a table. Whether the details are important, such as a ceiling crack at your house — or unimportant, like a coworker's new haircut — if you score high on Observation, you'll be more likely to notice them.

Memory for Design & Observation in action

Shelly was not surprised to learn of her high scores on Memory for Design and Observation. She had been drawn to art from a young age. Painting, photography, and illustration — she did them all. However, when she got to college, she chose a business degree, which she considered more practical. "I know I'm good at these, but I thought they only applied to fine arts. I'm excited to hear some suggestions of how to combine my visual and practical sides." She later reported she had chosen to major in design communications, a field of study geared toward graphic design, web development, and illustration. "I never imagined I'd be so engaged in my classes!"

Eric worked for a large real estate company. After two dispiriting years as a sales agent, his company suggested he come for testing to find out where he might fit better in the organization. When we discussed his high score on Observation, he remarked, "I've always been quick to spot problems at the properties I was showing." He and his boss decided a better role for him would be in doing home inspections, so they could fix the problems before the property went on the market. "My nickname at work was always Eagle-Eye Eric, and now that's my job."

Will, who scored high on both Memory for Design and Structural Visualization, had always noticed that he was great at internalizing the street plan of a new city. He chose to attend graduate school to study city and regional planning, and one of the first classes he signed up for was in computer-assisted drawing for planners. For his school projects, he would devote hours to creating accurate and attractive graphics and maps to illustrate his design plans. He eventually decided to specialize in geographic information systems, which involves the overlay of various types of data on maps and is used extensively in city planning, emergency management, demographics research, and several other disciplines. Now Will is working for a transportation research firm, using his spatial and design aptitudes as a GIS analyst and program designer.

We have heard of many different uses of both Memory for Design and Observation, some artistic, some less so. One client owned an art gallery in the Caribbean, another was the education curator at an art museum. A client with Observation interned for a prominent auction house, checking the condition and verifying the provenance of each item to be sold. A podiatrist pursued his interest in civil war history by mapping detailed and information-packed representations of battlefields and troop movements. A sports enthusiast specialized in appraising baseball card collections. The opportunities are nearly endless! We recommend that you keep your mind (and your eyes!) open for them.

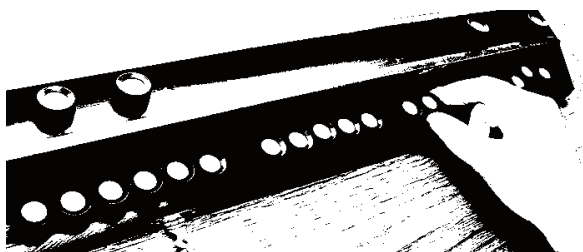
10

Color Discrimination & Color Perception

Margaret, a client who came in for testing in her mid-forties, was passionate about color. “I love choosing paint colors,” she gushed, “I could look at those samples for hours!” It was no surprise to her, then, to learn that she had an aptitude for Color Discrimination, a natural talent for recognizing the small differences between color hues.

Color Discrimination & Color Perception, the tests

The Color Discrimination test is one of the few given by the Foundation that was created by an outside company. The Farnsworth-Munsell 100 Hue Test is used by governments and industries to evaluate how precisely an individual can see colors. The measure consists of colored caps that need to be arranged in the correct sequence, with each cap being only slightly different from the others. Examinees must be able to discern the differences in order to get the caps in the right order.



We use carefully balanced daylight fluorescent lighting as a source of illumination and monitor the client's handling of the color caps. It is one of the few tests we give on which accuracy is considered more important than speed in the scoring.

We also administer a simple test for Color Perception, which identifies those who have trouble with red-green color vision. You experience this assessment when applying for a driver's license and it is used in the screening process for becoming a pilot. A red-green color deficiency is much more common in males, with around 8% of them having some degree of color deficiency, while a much smaller percentage of females is affected. Color vision is rarely a major factor in career selection, and having a “deficiency” here may even provide an advantage in certain work settings, but a normal score is required of all FBI agents, along with commercial and military pilots, sea captains, and others in jobs where color perception can be crucial.

Color Discrimination, the aptitude

Color Discrimination is the ability to see fine distinctions between very similar hues. It is helpful to painters and other artists as well as in design-related fields such as graphic arts, interior decorating, and jewelry making. It could also be an asset for people working with make-up, hair coloring, or other cosmetics. Beyond these more obvious endeavors, talent in discriminating slight differences in color could even be useful in a science laboratory for identifying different chemicals or minerals, noticing diseased tissue samples, or distinguishing between different plant and animal specimens. This aptitude would also benefit the paint mixer at a hardware store, the print supervisor at a publishing house, an animator for a film production company, the textile artist dyeing fabric, and the laboratory technician tinting your new dental crowns.

Color Discrimination in action

Helen loved fashion, design, make-up, and color. She was currently working as a make-up artist, and she was considering moving into doing special effects makeup, in which she might find herself creating realistic wounds and colorful characters instead of just pretty faces. A friend who worked as a color consultant, and who was aware of Helen's talent for selecting just the right colors, had asked for her help in determining what the "in" shades would be for the next fashion season. She left her summary discussion with a new confidence in her talent with color, and she was energized and excited about several new career options she wanted to explore.

Mark, a geography teacher, hadn't given much thought to working specifically with color, and had never even considered himself a particularly artistic person. A few months before his testing, however, he had taken a class in jewelry making and found that he loved it. A few months after his summary, he reported that he was investigating a career in gemology. He was thrilled to find that his newly discovered hobby might be the basis for a future career.

Why not add some color to your life?

You can find ways to use Color Discrimination in many fields. A businessperson might take extra time preparing the visual materials related to his work, choosing just the right shade of blue for a graphic. A marketing executive might study the psychology of color to help her create effective presentations for clients. An event manager might make sure that he's closely involved with the selection of floral arrangements and table linens in order to create a cohesive and pleasing look.

If you find that your work doesn't require you to care about colors, find outlets for this aptitude in other activities. Appreciation of the subtle shades found in nature is a great place to start, as no equipment or training is necessary to observe the changing colors of the sky as the sun sets, for example. Take up a new hobby: take an art history class and visit art exhibits, or try ceramics, knitting, or making your own clothes (especially good if you also have dexterities and/or Structural Visualization). Think about the colors you observe, how you see shades others might miss, and how you might use this talent to bring more beauty into your life.



Visual Designs I & II

What is art? Who can say? Can it be measured somehow? Everyone who thinks about it will have a different idea of what art is — to one person it's the easily recognizable Impressionist painting of a hayfield, while to another it is a blank white canvas with a red slash in the lower left hand corner. To a third person, art might mean sculpture instead of painting.

While several of the tests in our battery relate to visual abilities — Memory for Design, Observation, and Color Discrimination — we have not yet been able to identify and measure something called general artistic ability. The closest we've come is having identified two concepts of design composition that artists as a group seem to prefer. These are indicated by the two scores derived from the Visual Designs test you took, Visual Designs I and Visual Designs II. The test scales measure your innate preferences in these two areas.

In Visual Designs I, the choice is between a simple design and a more complex one. An illustration of this idea would be two canvases — one with a few short lines on it, the other having a large number of these lines. The first canvas could be called 'simple' while the other, busier with more information, could be called 'complex' in nature.

In Visual Designs II, the choice is between a regularly-patterned arrangement of lines and an irregularly-patterned one, regardless of the number of lines. A demonstration of this concept would be two canvases, one with the lines set up neatly in precise rows and columns, while the other has the lines just scattered randomly on it, with no discernible regularity of arrangement.

In a validation study, artists were separated into two categories: fine artists (different types of painters, sculptors, etc.) and commercial artists (graphic designers and architects, for example). While their art may appear to have little or nothing in common, collectively they seem to have the same opinions, at least about the two concepts presented in the test. These preferences seem to be innate, as the study also included untrained people. Studies of schoolchildren indicate that those who have had art training do not perform differently than those without such training.

We call this artistic judgment, artistic preference, or simply — style. Someone who has definite high or low scores is expressing a definite opinion, is clearly stating his or her preferences. When both scores are high, it signifies that your preferences are in line with those of the professional artists used in our norm sample. When combined with other visual aptitudes, this natural style might suggest that commercial art or design work could be something to

consider, as others working in a graphic design or architecture department would be likely to agree with your preferences.

When both scores are low, it means that the opinions expressed, while definite, are actually in contrast to the opinions of our sample of professional artists. This, of course, would not necessarily prevent one from being successful in commercial design — it simply means that a contrary sense of style is different from, in theory, the generally preferred style. That would not keep a designer from executing a client's desires, even if not in agreement with them, as personal preferences in design need not outweigh client demands.

As far as fine art, or art done for personal satisfaction, the scores — high or low, both the same, or one high and one low — really matter very little at all. Art you might do for yourself is entirely an expression of what you think art should look like. In fact, one of the things they try to teach you in art school is to determine your personal style. Without a sense of what you think art is, how would you know when a piece is finished, or how would you be able to choose one version of a photograph over another?

When people score neither high nor low, it can indicate several things: perhaps the lack of a strong opinion, or flexibility, or the ability or desire to vary the style. An artist without strong feelings about these two ideas might change his or her style depending on the subject, his or her mood, or the medium or materials used. Maybe it could be useful for a commercial artist or designer, to not have particularly strong preferences at times.

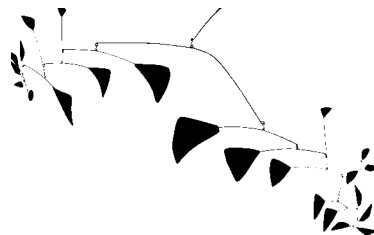
All in all, we may never be able to find one aptitude pattern that fits artists as a group. Art is personal, so however you scored, if you have an interest in painting, sculpting, making collages, welding, photography, or learning about art of any form, we encourage you to do so, because *ars longa, vita brevis!*

A man paints with his brains and not with his hands.

Michelangelo



Drawing is like making an expressive gesture with the advantage of permanence. Henri Matisse



I paint with shapes.

Alexander Calder



The Dexterity Aptitudes

Finger & Tweezer

Strolling through an exhibit on Victorian fashions, Meg marveled at the hundreds of tiny pleats and folds on one elaborate headpiece. Her friend said, “Look at that! Can you imagine being able to do that? I’d be all thumbs!” Meg replied, “I think it’d be fun, and kind of relaxing too. I’m good at that kind of hands-on precision, like when I made those miniature origami roses for my sister’s wedding bouquet last year.”

Finger Dexterity and Tweezer Dexterity, the tests

These two tests were some of the first to be developed by Johnson O’Connor in the 1920s, when he was working as an engineer at General Electric. His task was to identify workers who would be successful at assembling electrical meters. When he gave the Finger Dexterity test to prospective employees, he found a strong relationship between high scores on the test and success on the job.

It is surprising to many people that these two tests do not correlate with each other — that they are measuring two different aptitudes. While scores on the Finger Dexterity test were predictive of accuracy and speed on the assembly line, one particular part of that line required the use of tweezers. It was discovered that those with a high score on Finger Dexterity didn’t necessarily have the ability to work with small tools quickly and accurately, and so the test for Tweezer Dexterity was born. The humble dexterity tests were the inspiration for O’Connor to develop more and more aptitude tests, and eventually to create his own foundation dedicated to the study of individual differences in human ability.

The Finger Dexterity test is given on a board drilled with rows of empty holes next to a tray of loose pins. Examinees attempt to fill as many holes as they can with three pins each within the time limit. The more holes filled with exactly three pins, the higher the score on the test.

The Tweezer Dexterity test is given on a board with one hundred pins filling one hundred holes. Using a pair of tweezers, examinees move the pins one at a time over to the empty holes on the other side. The test is scored for speed and accuracy.

Finger and Tweezer Dexterity, the aptitudes

A high score on Finger Dexterity is useful in manipulating small objects with the tips of the fingers. This aptitude can be useful in activities as varied as musical performance, gardening, acupuncture, weaving, scrap-booking, model-building, pottery, magic tricks, and cooking.

Tweezer Dexterity measures the ability to use small tools with deftness and precision. Delicate surgery, art and antique restoration, acupuncture, dental hygiene, makeup artistry, administering injections, tailoring clothing, and repairing watches — these are all examples of tasks for which this aptitude would be useful. Many activities — including various medical procedures, engineering technical work, hairdressing, floral design, and jewelry making — could challenge both dexterities.

The dexterities in action

Jeff had aspired from boyhood to follow in his pediatrician father's footsteps. He had come in for testing before medical school and learned that not only did he have a wonderful aptitude pattern for medicine, but also scored very high on Tweezer Dexterity, and that surgery had been mentioned as a possible occupation. When he encountered the accelerated pace of the surgical rotation he found he was leaving his classmates in the dust. Jeff felt like he had been born with these tools in his hands and decided surgery would be his life.

Anna had a satisfying career as an elementary school teacher, and had come in for testing because she was contemplating a move into educational planning. We were discussing her various aptitudes and she related how she used the Finger Dexterity aptitude. She had grown up fly-fishing with her father and brothers, and had gotten into tying flies while in high school. She expanded her activities to include making flies for friends and other family members, and eventually she started her own business.



White House chefs & Finger Dexterity



U.S. Navy surgeon & Tweezer Dexterity

Depending on your interests and on the rest of your aptitude pattern, your scores on the dexterity tests may or may not be a factor in your career selection. In any case, if you score high in either or both of these aptitudes, consider occupations that would take advantage of these aptitudes as well as your others. If you don't end up using these aptitudes at work, try to find a dexterity-related hobby. Finding personal satisfaction "after work" by using your hands to craft something can provide an outlet for otherwise unused aptitudes, and can be a key factor in helping you enjoy all that you do.



Foresight

Seeing Possibilities

It was love at first sight. Passing by the jewelry store, Nancy stopped dead in her tracks. “I had to have that ring,” she said, “but I was afraid to ask how much it was. You can’t imagine how excited I was when the owner said they had layaway.” For the next two and a half years, on the second of every month, she popped a \$20 check in the mail, happy to know that she was one month closer to her goal. Every so often, she called to check on what she already considered to be her ring. When the day finally came for her to pick it up, the store owner remarked, “I’ve never seen anything like this. I thought for sure that you would have given up long before now.” Nancy replied, “Oh no, once I set my mind to something, I’ve got to do it.”

Foresight, the test

Examinees are presented with a simple arrangement of lines on a screen and asked to generate possibilities about what each design reminds them of or suggests to them. The Foresight test was first conceived as an alternate measure of Ideaphoria. When the results were analyzed, however, the test appeared to measure a different aptitude.

Further research found a positive relationship between performance on the test and occupations that required higher levels of education. The converse was also true. In a subsequent large-scale study, this relationship was confirmed, even when vocabulary knowledge was controlled for. Reflecting on the link between high Foresight and extended education, researchers posited that the ability to see possibilities is focused best through a long-term goal.

Foresight, the aptitude

Imagine a map — its network of highways and byways, meandering rural roads, and five-lane freeways all leading to potentially interesting destinations. Without a sense of where you want to go, it’s overwhelming. However if you know your destination is Los Angeles, then you can focus on the roads that will take you there.

If you scored high on Foresight, you see possibilities, lots and lots of possibilities. For some, the sheer number of possibilities may make it difficult to choose a direction. Having long-term goals to help focus those possibilities is very important. Imagine a policy maker who wishes to improve health care or an artist who is driven to perfect his use of color. Broad in nature, these goals form a directional orientation instead of a specific finish line to be crossed

in the distant future. Such macro-goals might be described as a set of organizing principles or a personal vision of what to work toward. If you feel that your work is advancing you in the direction of your vision, you will tend to feel more engaged and satisfied — as if you are approaching that goal every day.

Without long-term goals, you may feel a bit disoriented, uneasy, or overwhelmed, as if you are spinning your wheels. Many people have described going through a difficult period of reorientation after achieving what they had been working toward for a long time. Their drive is still there, but now a new goal must be found.

Some might have noticed a pattern in their lives: they set long-term goals, pursue them doggedly, and eventually tend to achieve what they set out to do. Imagine an Olympic athlete who is entirely focused on training for a competition date far in the future. Despite setbacks, discouragement, and even injury, she is able to find ways to continue to prepare. Her capacity to see possibilities is what others might call determination or tenacity. On the day of the race, she trains her sight on the finish line and crosses first. After the fanfare and congratulations are over, she finds herself asking, “What’s next?”

If this sounds familiar, think beyond a goal prior to reaching it. What will you pursue once that has been accomplished? With your next goal already in mind, you can immediately begin working toward its achievement instead of wondering, “What’s next?” Perhaps each objective may be part of a larger plan as well, helping you advance toward making a lasting contribution to something you see as an important issue or cause.

Joann, a 22-year-old college student, burst into laughter when she first heard about what her high score indicated. “I’m so like this! I set my sights on something and feel so purposeful while I’m striving for that goal. But once I get whatever it is, I feel a little deflated and aimless.” Her way of relating what it felt like to set, but then achieve a goal, was quite interesting. She said, “It’s not the *having* that energizes me, it’s the *getting*.”

Exploring your vision

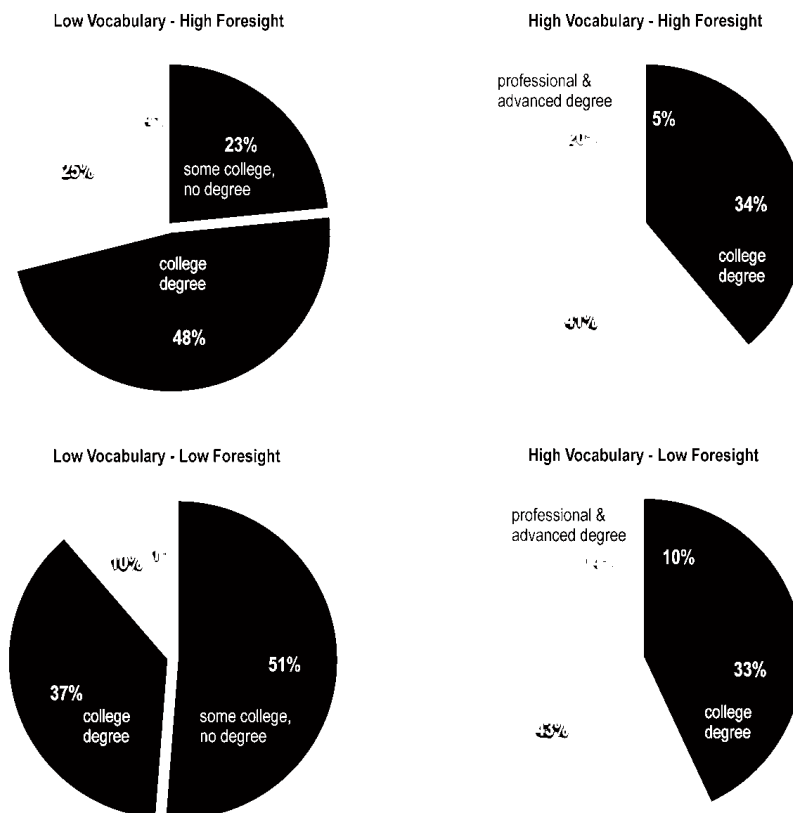
Though high Foresight suggests the need for long-term goals, it does not automatically provide them. Consider the example of a food photographer who was tested at the Foundation. After a discussion of her long-term orientation, she agreed that the rewards she experienced in her work were purely short-term. “At the end of the day I have produced beautiful pictures of beautiful food. But I find myself asking where a thousand days like this will lead me? I don’t have a good answer and, without that, I feel listless.” Thus you, too, might yearn to position your work in the context of a big picture — even if that picture is still unfocused or undeveloped.

Jason had started out working for a very small real estate agency, which he helped grow into a 12-person office through his efforts not only with sales, but also through recruiting other agents and marketing the agency. He enjoyed the process of making sales, especially being the one agent who could sell that difficult property or satisfy those very particular buyers. “Okay, so I’m the top salesperson, but in a way — so what? Where is all this leading me?” His successes were much more in the here-and-now, nothing long-term. Understanding his high

Foresight allowed him to contemplate a sales setting in which his success would depend on cultivating long-term relationships with clients, building repeat business, enjoying the persistence required to close a large deal that might be months or years in the making, moving into sales management, or even building a business of his own.

To avoid some of the frustrations that can come with not having an outlet for this aptitude, spend time thinking about what is important to you in a more general way. Are there themes that you return to in your conversations, reading, activities, and experiences? What would those closest to you describe as your strongest interests? From those interests you might be able to distill a sense of your personal vision or long-term goals. It is also important for you to remember that formulating your vision is in itself a process — one that may change direction or focus as you gain knowledge and experience.

Research Report on interaction of vocabulary & foresight on years of education



excerpt from original report, Rusty Burke — 1993

Among lawyers, doctors, and architects, those who score low on Foresight are likely to score high on vocabulary, and those who score low on vocabulary are likely to score high on Foresight. In other words, it seems that the possession of at least one of these abilities is helpful in attaining legal or medical degrees.

The study above illustrates how high Foresight individuals, even without a high score on vocabulary, are more likely to graduate from college, even pursue some graduate study than those low in Foresight. Those with the requisite high vocabulary but low in Foresight were somewhat less likely to finish college or obtain an advanced degree. Those high in both were, as expected, more likely to keep going longer in college and graduate study than those low in either area.

The “perfect fit”

As you develop your vision, it can be challenging to find work that seamlessly aligns with your goals. Remember, even small movements in the right direction can lead to satisfaction. Take the example of Tim, a young man who wanted to compose music for films. Unable to find work as a sound designer after graduation, he took a position doing database maintenance. Although he had the aptitudes to do this, he felt the work was tedious. After discussing his high score on Foresight, he began looking for creative ways to connect his ‘day job’ to his long-term goal of working in the film industry. Tim later reported that taking a tech position at a computer hardware and software store allowed him to be around tools and technology that related to music production. Though it was not the sound design position he desired, it was a move in the right direction.

Mistaken persistence?

The ability to see possibilities may aid in persistence, but this is most helpful when focused in an appropriate direction. Some of our clients have found that a high score in Foresight can, at times, mean that going after an ambitious goal can be alluring — even if that aim is not the best fit overall. A goal that also aligns with your aptitude pattern can lead to greater ultimate satisfaction with your choice.

Take the example of Sonya, a high-Foresight individual with a very low score in Structural Visualization. After graduating from high school, she continued on to a prestigious university where she majored in structural engineering. Early on, she found the coursework unimaginably difficult as well as uninteresting. Although the path seemed unnatural, she said she believed the degree would prove her intellectual capacity. Sonya persisted, employing tutors and other outside help. At the time of her testing, she had spent ten years competing in an engineering career she found stultifying. She finally realized that a change was necessary, which is what prompted her to come in for testing. After a discussion of her high score, she remarked, “Though seeing possibilities is a gift, persistence only works if it takes you to a place that is natural.”

If you score low...

You may prefer working in the here and now rather than trying to set your sights on something years in the future. Instead of saying, “It could be,” you might be more inclined to think, “It is.” Given that you have a preference for things that can be accomplished in a short time, when faced with what seem like long-term goals, such as getting a college degree or starting your own business, you might find it beneficial to break them into a series of smaller goals.

Breaking goals into small steps makes it easier to measure progress. You might even make a chart for yourself — at the top is the distant goal, at the bottom is where you are right now. In between think of all the steps you’ll take to reach that goal far off in your future. Make a note on the chart as you reach each step, and cross them off when you’ve achieved them. As you

complete each one, you'll be able to see your progress, and this can be very motivating. Attaining these smaller goals can even lead you to other possibilities that hadn't occurred to you at the outset.

Imagine Russell, a runner trying out for his high school track team. In the trials, he came in dead last in the sprints, but as the race length increased, he did much better. The coach figured that he was more suited to cross-country running, a two-mile race, but Russell didn't think he could run that far. Another coach told him, "Instead of trying to focus on the far-off finish line, just run to something you can see." Russell discovered he could pick out a tree, or a big rock, or a road crossing the course. Once he got to that spot, he could pick out another mark. And the next thing he knew, the mark he was focusing on was the finish line.

Strategies at work

If your work environment sometimes requires you to contemplate long-term objectives over short-term, try to develop and implement strategies to approach your work differently. Consulting with friends and colleagues could be a way to help generate possibilities on those occasions when you're feeling stuck. Use a calendar or day planner to list steps and make notes on your progress. This can help you organize your goals and provide a record of your achievements.

Another strategy is to reward yourself when you accomplish a major objective or even part of one. Just finished a grueling semester or a long project at work? Treat yourself to a nice dinner or a small present. These rewards might help make long-term goals seem less daunting and more enjoyable to work toward.

Liz, a 33-year-old paralegal, was fascinated by the knowledge of her low score on Foresight. She was currently working for a firm that handled class-action lawsuits. Such cases took years before going to court. "I sometimes feel like what's the point? This is going to go on forever. Where's the finish line? Everyone else seems to see it." Understanding her low score, and what that meant to her in the context of a career in law, helped her see that a different kind of practice, one that allowed her to shift her focus to short-term cases, would be a better fit. Real estate or other types of transactional law might be more appropriate for those who want to see results sooner rather than later.

Albert, an architect, perfectly described how his low score is beneficial when he said, "I am happy designing warehouses. I cannot imagine working on a skyscraper project; the design process could take years, and after all that time nothing would even be built. I like to see my work go from start to finish in a much shorter period of time."

One step at a time

Sometimes starting a long-term process can be intimidating, like standing at the foot of a tall mountain. You may get discouraged and not even want to begin, or wish you could just 'fast-forward' to the end because you're having trouble seeing the steps between where you are today and that distant tomorrow. Likewise, your career search and educational track may

seem, at times, like a lofty peak, dizzying to contemplate. For those who score low in Foresight, it may be encouraging to remember the Taoist saying, ‘The journey of a thousand miles begins with a single step.’

A husband and wife were tested together and she scored low in Foresight. She told the summarizer that she had been interested in beginning an MBA program, but felt discouraged just thinking about how long it would take. Her husband turned to her and said, “It’ll be two years – the time goes by whether you’re in school or not.” This perspective encouraged her, and she later reported that she had begun the program and was focusing on school one semester at a time.

Playing to your strengths

In your search for careers or college majors, try to apply this step-by-step approach. Although you may never find it natural to generate many possibilities, you can expand your horizons by reading about careers, talking to people in fields of interest, and examining any career from a variety of angles. Before rejecting a major or career due to a few negative comments from friends or after reading one discouraging article, be sure to look at several different possibilities within that field.

That lofty peak — whether it's finishing school, owning a business, or completing a marathon — *can* be conquered even if, at the outset, you have trouble seeing yourself at the summit. By building on the things you have accomplished and the knowledge you have gained, you can move toward the future in a way that's right for you.

High or low: Setting your sights on tomorrow or today

Whether visualizing the finish line or simply planting one foot in front of the other, both types of runners complete the race. High and low Foresight can both be advantageous; one makes long-term planning highly satisfying once a goal is envisioned, and the other helps in getting things done in the here and now. Wherever your score lies, make your plans so they suit your natural tendency to focus on the future or the moment. Approach school and work projects in ways that use your score to your advantage!



Word Association

the Objective & Subjective approaches

Isabella and Marko had a shared passion for wine, and though currently working in different fields, they were contemplating buying a winery. “We have this common interest,” Marko said, “but what do our abilities say about working together as a professional team?” When Isabella learned about her Objective personality score, she laughed, saying, “I’ve always been the manager, delegating and coordinating!” Marko smiled and countered, “This is where we’re different. I love the science of viticulture and I lose myself in all the research about making wine. I want to be with the wine, not the people.” Not surprisingly, Marko scored Subjective on this same test. Thus, the partnership could work well if Isabella dealt with the supervisory and administrative work while Marko concentrated on product research and development.

Word association, the test

In the early days of the Human Engineering Laboratory at General Electric, O’Connor began using a Word Association test. As he tested more and more people, an interesting pattern emerged. The majority of test takers tended to give one type of response to certain words, while a smaller number tended to give another type. The former group O’Connor termed Objective. Salespeople and those who rose in management were more likely to be from this group. The latter group, which he termed Subjective, tended to be comprised of technical engineers and others in highly specialized jobs.

The Foundation does not use our Word Association test as a traditional projective test, seeking to understand why a certain response is given. Rather, we simply look at the type of response. We believe our test provides an indication of the approach an individual will naturally take to his or her work. Those scoring Objective seem to prefer the role of the generalist, working with and through others to get something accomplished. Those scoring Subjective seem to thrive in the role of the specialist, in which individual knowledge and skill produce results. Think of a choir director, who leads a group that is working together to create beautiful harmonies. Her success depends upon the performance of others. Then imagine the soloist, who is able to concentrate on — and get credit for — his individual performance. They each make music and contribute to the success of the concert, though often in very different ways.

The Objective approach

If you scored Objective on our Word Association test, a key concept to keep in mind is collaboration. This approach suggests that you look for opportunities to work with and through others. This can happen if you work directly with clients and customers, as a member of a team, or in a managerial role. Another key concept is variety. People who score Objective often prefer jobs in which there are many tasks. Focusing too narrowly on only one aspect of work over the course of a career can be unfulfilling, as Objective generalists typically like roles in which they wear many hats.

Marlene, describing her first job as an architect, said, "It was all about sitting in front of the computer, calculating the weight-bearing capacity of beams. I was miserable!" Technically gifted, Marlene said the source of her dissatisfaction lay in the isolating nature of the work, not the tasks themselves. "There was such limited interaction with others. I found it stifling to be so narrowly focused on a tiny piece of what I knew was a larger puzzle." As we discussed her Objective score on the Word Association test, Marlene admitted that the desire to work more collaboratively had defined her professional evolution after leaving that job. "In school I had been very interested in the concept of urban renewal. Slowly I began attending planning conferences and lectures. The active development of a city seemed like such a collaborative effort, and eventually I made the shift to a planning role. I rely on my technical background now, but as a manager, I take a more general approach. Moving away from the limited focus required by my first job has made all the difference."

John reported that he'd always enjoyed teamwork on the job, in sports, and in his social activities. A recent company reorganization had put John in charge of just one client's account. Technically this was a promotion, so he was puzzled by his frustration. "Previously, I might have been working with a team developing software for an accounting firm in the morning and, after lunch, dealing with a database for a non-profit organization." During the discussion of his Objective score, he came to understand that he had been promoted away from his natural approach, including his preferences for teamwork and variety. "I realize now that I simply need more irons in the fire."

Knowledge and experience

Keep in mind that most, if not all, management positions are obtained by people who have education and experience in a particular field. Marlene was trained as an architect before moving into a planning role and John began as a computer programmer. Public health administrators have usually worked in and gained extensive knowledge of health services. Principals and school administrators most often come from teaching and other educational backgrounds. Catering or restaurant managers usually have a great deal of experience in the food industry. If you are considering management in a field that's new to you, you may want to volunteer or obtain non-management work in that field first, then start on your road to becoming a manager, director, supervisor, or officer.

Having a mentor in the workplace, attending seminars and meetings, and taking advantage of workplace enrichment programs may be ways to educate yourself further about a particular field. While some supervisory positions call for additional education, others allow you to

apply the experience and knowledge you've already gained to continue to grow and perform in your job.

Vocabulary and the Objective person

In addition to education and experience, another asset for the Objective person is a large and precise English vocabulary, a characteristic of top managers. If you're planning a career in which you'll be working with and through others, it makes sense to work on improving your vocabulary so that you can communicate with them effectively.

Opportunities for management exist in many fields. Whatever the field, a person scoring Objective most likely will be stimulated by spending time engaging with peers, working with team members, and directing others. Collaborating with others in a field that interests you and uses your prior education, experience, and aptitudes will be more likely to provide long-term satisfaction with your work.

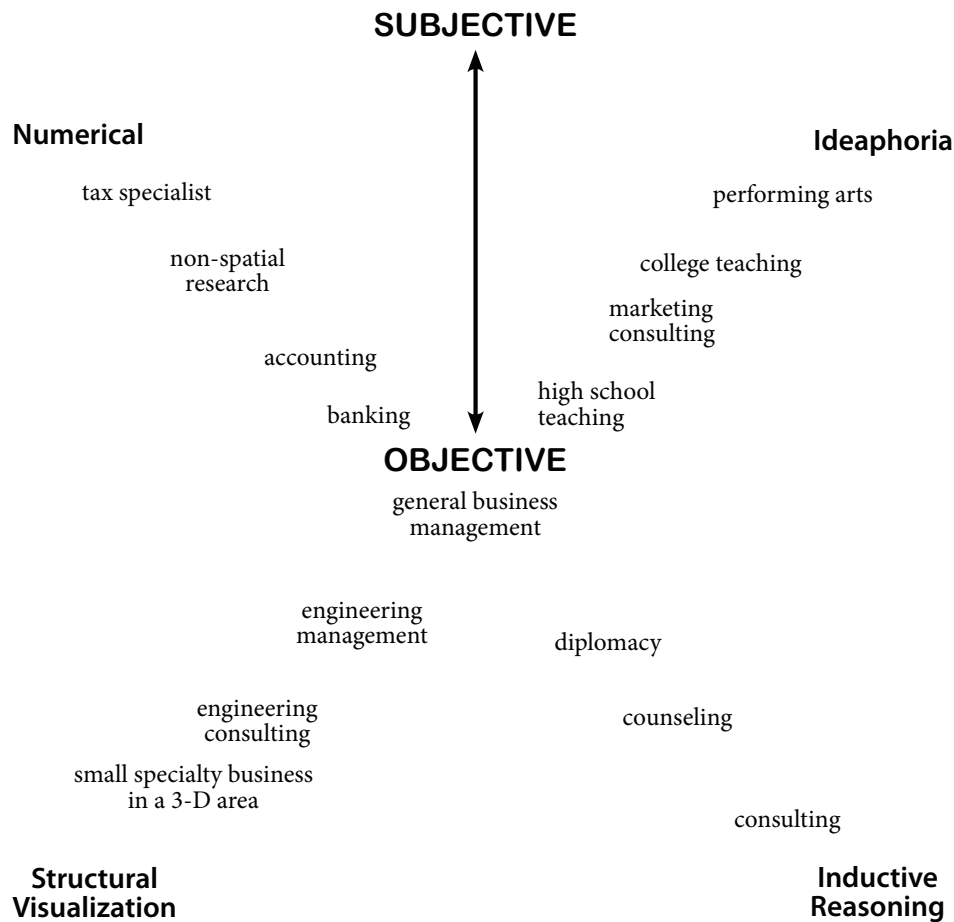
The Subjective approach

If you scored in the Subjective range, you may find you thrive in the role of a specialist, depending primarily on your own efforts for success. You may enjoy having the latitude to make decisions as you see fit or ensuring the end product you are working with bears the stamp of your own individuality. Working alone or with others, you may be most comfortable in the role of the expert, consultant, or specialist. When working with other people, look for situations in which you can mentor, advise, or consult with others, particularly to help people who have sought your expertise.

After several years of working for a wind turbine manufacturer in Vermont, Mason moved to Brazil to work as an alternative energy consultant. "I took \$2000, my laptop, and my dog," he recounts glowingly. The stories of the first contracts he won are the stories of one man with a technical mind building solutions in the natural world. But as demand for his expertise grew, the story of one man became that of six, then seven, and finally twenty-four.

After settling the business into a refurbished barn near São Paulo, Mason's role underwent a definitive shift. "I became less and less the creative engineer and more and more the harried manager." Though he had hired capable individuals, he found himself struggling to delegate and couldn't relinquish control of projects when it became necessary to do so. As business boomed, Mason grew increasingly dissatisfied. "The later, more collaborative projects didn't have the feel of the first ones. Despite the company's success, I wasn't happy."

Though Mason had certainly walked an independent path typical of a Subjective person, he gradually forfeited the role of the technical expert he had first enjoyed. Nevertheless, his score did not suggest he dismantle the business he had worked so long to create. "It looks as if what's needed in my case is a good operations manager so that I can again concentrate my efforts on producing technical plans. Building alternative energy systems has always been the heart of the business for me. Having to manage so many other things felt like a distraction."



Pay attention to your interests when choosing a career direction. Think about your hobbies, desired lifestyle, values, and even your dreams, since those who score Subjective are often happiest when they have some personal connection to the work they do. Taking a hobby and “making it your job” is not necessary for achieving satisfaction in your work, but that idea emphasizes the importance of using your aptitudes in work for which you have a passion. That passion is what makes one Subjective person become an expert in medieval music while another studies the Aztec civilization, or gives one an interest in honeybees and drives another to research the effects of video gaming on social development.

Amanda had grown up wanting to be a teacher. Her mother was an elementary school teacher and her father had his own business creating and leading development seminars for financial professionals. She came in for testing in high school and was relieved to learn that one of the suggested careers was teaching. Both of her parents were at the summary, and during the discussion of her score on the Word Association test, her mother made the connection between the idea of the Objective teacher vs. the idea of the Subjective teacher. “I deal with 25 kids all day, teaching them many subjects, and I love the variety that my days have. Your father, on the other hand, has a more narrowly-focused role and works with a targeted group of professionals.”

Amanda, scoring Subjective, was able to understand that a focused and more well-defined role in teaching would be something to work toward. It came up in conversation that one of her cousins was autistic and that Amanda had had some experience interacting with him in a teacher-student way. “Last summer we were all at the lake, and Ryan was asking me about photography and about my camera. I showed him how it worked, and a little about the idea of composition, and we went on a hike just to take some pictures.” She had become more interested in the idea of working with autistic teenagers, certainly an example of a very specialized area of teaching.

In nearly every profession there are opportunities to become an expert. Because you score Subjective, we encourage you to work toward creating a specialized role for yourself in a field of interest that, of course, corresponds to your aptitudes.

Vocabulary and the Subjective person

Being able to communicate effectively will help you demonstrate your proficiency and make a difference in your chosen field. As you progress in your career, you will build up a specialized vocabulary related to your area of expertise, but remember to work on your general vocabulary as well so that others will recognize you as the well-informed expert that you are.

A note about teaching

Teaching is often suggested for someone who scores Subjective. You may prefer to work with small groups of committed and motivated pupils or teach advanced-level students. You may even function at your best when tutoring or doing some type of one-to-one teaching. An important concept to remember is to teach from an area of expertise, and while that can certainly be as a college professor lecturing a large group, it can also be as an educator/performer at a national park, as a dance or drama coach, or even as a trainer of seeing eye dogs. It is your individualist’s role rather than that of a classroom manager that matters. Objective teachers, on the other side of the scoring distribution, will find stimulation managing others in a school or work setting, even graduating to become a program director or principal or headmaster or provost.

The Intermediate score

Those whose scores are not clearly Objective or Subjective, for which we use the term Intermediate, may identify with aspects of either category. If you score this way, we believe that you should seek a foundation of specialized knowledge on which to base your career. It is relatively easy to move from the role of the specialist to that of the generalist, but it is much harder to go the other way. A professional violinist can move into management of a concert hall, but that concert hall manager can’t just become a professional musician. A professor of Shakespearean tragedies could branch out into teaching additional English courses or head up a faculty committee without getting another degree, while most English teachers wouldn’t be Shakespearean experts without needing additional education. Thus, for purposes of planning

their education and training, Intermediate scorers should consider themselves Subjective and specialize.

Many professions, such as law or accounting, call on extensive specialized training before joining a dynamic work environment where managing groups of other professionals or persuading the outside public becomes crucial to career development. Scoring Intermediate can suit this transition just fine.

However you score, you will want to incorporate this knowledge into your career planning. Choosing jobs based on being allowed to work the way that comes naturally to you will ensure that not only does your work take advantage of your other strengths, but that it also is satisfying on this more personal level. Remember, in almost every field there are Objective, generalist roles and Subjective, specialized roles. Understanding which approach suits you can help you make decisions about school and about job opportunities as you progress through your working life.

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English Vocabulary

Words are the basic unit of communication — the means by which we make ourselves understood — the means by which we reach out to others and interact with people in our environment. From greeting your neighbor in the street, to finding a restaurant review on the internet, to writing your resume, words color both how we present ourselves to the world and how we perceive those around us. O'Connor began testing for vocabulary because he found, as he expressed it, "...an extensive knowledge of the exact meanings of English words accompanies outstanding success in this country more often than any other single characteristic which...the Johnson O'Connor Research Foundation has been able to isolate and measure."

Unlike the innate aptitudes we describe, vocabulary is an expression of learning, a reflection of how you have interacted with and absorbed information in the world around you. The Foundation looks at your vocabulary score as a gauge of your relative general knowledge. Thus, a high score indicates someone with an active curiosity about and connection to ideas beyond their own direct experience. Someone with a low level of vocabulary may have the same drives to connect and to communicate, but their particular approach may not take them as far and will be less effective.

Words are tools for thought. The more words you are able to understand and use appropriately, the more expressive you can be. You will also be more likely to make yourself understood. A strong vocabulary is not the mark of an elite mind — it is the mark of a flexible communicator. Someone who has a low vocabulary is literally often at a loss for words. They may find themselves inhibited in their communication both by their lack of clear expression and by their own self-imposed critic: "I'm not good at saying what I think, so why bother?" They are often unable, sometimes to the point of frustration, to express their feelings and develop their thoughts to their satisfaction. Alternatively, they may mistakenly feel that their low vocabulary is perfectly sufficient for their circle of acquaintances and their own aspirations. Don't let this happen to you! Learning in general, and the habit of learning new words in particular, opens doors to you that you may otherwise miss.

For the introduction to Johnson O'Connor's final book on vocabulary development, David Ransom, now our Foundation President, wrote, *"In counseling those who take the aptitude worksamples, the Laboratory puts great emphasis on vocabulary. Whatever a person's pattern of aptitudes, if he fails in precise articulation of ideas, he is likely to be considered less competent to perform a task than is a person who, although perhaps not naturally as adept, has a better vocabulary and is thus able to express himself more convincingly. This superior word knowledge does not necessarily cause a frequent verbal flaunting of unusual words, rather such words reflect a good thinking vocabulary, well-honed tools for thought."*

Laws of vocabulary learning

During testing, you heard a short lecture in which Johnson O'Connor discussed his laws of vocabulary learning. First, he said words in our language could be ordered in terms of their relative difficulty. Common words are those known by most if not all speakers of the language. A 'difficult' word is one that is known and thoroughly understood by few people. For example, the meaning of '*guess*' is unknown to only 1 percent of native speakers of English. '*Conjecture*', a synonym, is unknown to 23 percent. Another synonym, '*inference*', is more difficult. Its meaning is more specialized and it is accurately recognized by only 9 percent of the population. An even more obscure word, '*illation*' is unknown to 98 percent of us.

The second law of vocabulary learning is that, as individuals, we each learn words following this seemingly universal gradation. As we approach the limit of our experience within the language, we know and are able to use appropriately most of the words in English up to that level. Beyond this frontier are words we have never encountered before and, most significantly, words we have met only a few times, and so have not fully acquired.

In a study of high school students, the Foundation compared their performance on our vocabulary test with their verbal SAT scores. First, there was a strong correlation between rankings on the two tests: those who scored high on one scored high on the other as well. Second, it was possible to rank the words on our test in terms of their relative difficulty given the SAT score of those who knew their meanings. The words could be ranked in terms of how many of the students could use them appropriately:

FIRST LEVEL known to most of both groups	SECOND LEVEL known to 3/4 of the high scorers & unknown to most of the low scorers	THIRD LEVEL known to 1/2 to 3/4 of the high scorers, unknown to most low	FOURTH LEVEL unknown to most of both groups
allay	beseches	celibate	scurrilous
thriftily	scrupulous	predilection	refulgent
severed	acrimonious	straggled	largesse
clamor	inveigled	girded	temerarious
bleak	conversant	magnanimity	intransigent
lenient	razed	sullies	enervating
unsophisticated	ameliorated	imperturbable	indued
illusion	transcends	heterogeneous	polyglot
potion	fetid	affronted	desuetude
arrogance	atypical	protract	propitiated
tantalizing	elucidate	seethes	samovar
appraised	ostracized	calumny	distract

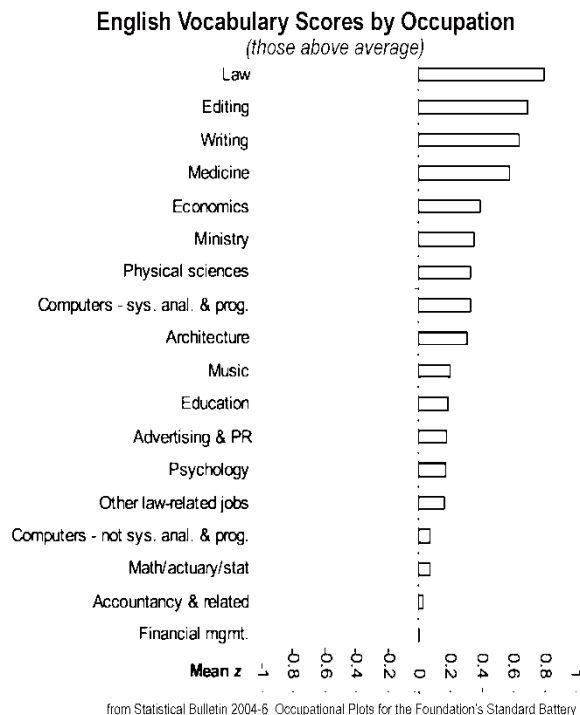
The increasing level of difficulty from level to level is clear. Students progress from an understanding of simple words to gradual acquisition of more difficult terms. All of us come across words that we feel we recognize, but that confuse us – these are words we have not fully acquired. We might feel defensive: "I think I know what that word means, but I'm not sure, so I'll avoid using it." Worse, they may be words we use incorrectly and so we convey our thoughts inaccurately.

O'Connor's third law of vocabulary learning is that it is usually most effective to put energy into learning new words that are just at our upper limit of vocabulary knowledge, as such words are more familiar to us and seem more applicable to our lives. Imagine a lawyer poring over a contract with a client. The client must be able to understand the lawyer's terms and usage in order to make an informed decision before signing a commitment. Misuse or misunderstanding of a word will lead to miscommunication.

Johnson O'Connor called this limit of our vocabulary the 'Frontier of Knowledge.' The word frontier means more than just edge or boundary — a frontier marks the beginning of the unknown, and hence a challenge: a challenge to go further, to acquire territory, to learn more. People with strong vocabularies tend to be curious. They not only enjoy reading, they enjoy learning about new ideas and subjects. People with strong language skills tend to read from a wide variety of topics: fiction, politics, history, art, science, sports, popular culture — wherever their interests may take them. The advantage of this curiosity in terms of vocabulary development is clear. By reading in a variety of disciplines, you are more likely to encounter the same words in different contexts, broadening your understanding of how a word can be used and, thus, your potential for successful communication. This breadth of general knowledge seems to be a characteristic of successful people in a variety of different occupations.

Studies of the vocabulary levels of business executives (one done in the early years of the Foundation and another done almost fifty years later) demonstrate that an extensive vocabulary is positively correlated with success in business. It is not too much to say that fifty years from now the same will likely be true. These studies looked at company presidents and executives, and found that as a group their average vocabulary levels were higher than were those of the norms used in our research. In fact, only twelve percent — instead of 50% — scored below the average of those with similar levels of education.

A 2004 study examined the aptitude testing results of employed or previously employed clients from 1989 to 2001, slightly more than 25,000 individuals. The chart to the right shows the relative performance of the professions on our vocabulary test. The mean-z (zero baseline) represents the mean of the general testing population, or the 50th percentile on our test. Values above or below that baseline show how that professional group performed, comparatively. The results shown here illustrate how a stronger command of English vocabulary is common in careers that require longer training, more formal schooling, and more communicative interaction with the world.



How to improve *your* vocabulary

The Foundation has identified four basic steps to building your vocabulary:

1. Be Aware of Words

It is obvious when a word is totally unknown to you, but you have to be especially aware of words that seem familiar but whose precise meanings aren't quite clear to you. Instead of skipping over these words, pay close attention to them, because a broad vocabulary is important, but a *precise* vocabulary is equally so. Chances are, if a word stands out from its context, it's because you don't have a firm grasp of its meaning. Just because you recognize a word doesn't mean you will be able to use it correctly.

Consider Joe, who missed the following words on our vocabulary test.

PARAGON: *Joe thought this meant "a geometric shape," perhaps because of its similarity to words like "octagon" or "polygon." In reality, it means a perfect example.*

INFAMOUS: *Joe chose the definition "obscure" since the prefix 'in' can often signify the opposite, as in "frequent" and "infrequent." The correct answer is having a bad reputation.*

TIRESOME: *Joe circled "untiring," perhaps basing his answer on the common meaning of the word "tire." This word relates to the concept of "tire," but it means causing fatigue or boredom.*

You can see how the items he missed are all part of his frontier of knowledge. His choices, while incorrect, were somewhat logical, showing that at least he had some familiarity with them. Had he seen them in context, he might have made a better guess at their meanings, but still would not have actually known them. We test knowledge of precise meanings by divorcing the words from their context.

The broader and more exact your vocabulary becomes, the easier it will be to then connect new words with words you already know. Your learning pace should increase as your vocabulary grows!

A researcher and editor of O'Connor's works had this to say:

"Learning is most rapid for that group of words of similar difficulty which lies between the known and the unknown; one seems to learn each new word by association with those already known."

2. Read, Write, Listen

What should you read? Whatever interests you and makes you want to read! If you like sports, read the sports page, a sports magazine, or comments or biographies by or about a favorite athlete. If you like decorating, read decorating magazines and books, or watch the shows and read the websites of the shows you watch. If you like art or music, read about your favorite musicians or artists; take an art history or music appreciation class. Read poetry, join a book club or create your own. Reading online counts, too. Get out there and read! You are doing it right now...

Many of the opportunities for reading can also be opportunities for writing. Contribute regularly to a discussion-board in an area of interest – be it parenting, gadgets, restaurants or movies, community activities, crafts, sports, or other hobbies. Start your own online column about whatever you are interested in, or contribute thoughtful responses to those of others. When you are writing, you have to be keenly aware of your vocabulary and how you're using the words you know.

Listen to radio or online discussions. Attend lectures, book readings, or seminars. At book clubs and poetry readings, really notice an author's diction, how he or she uses words. Ask your friends for recommendations of new authors. Listen to recorded books if you are traveling. Every form of art or entertainment presents opportunities to learn.

3. Use a Dictionary

Invest in an unabridged dictionary for work, home, or your mobile device. Whatever you choose to use, have it with you at all times so that you can look up a word you don't know when you come across it. Set a goal for a number of words you want to learn each week or each month. Daily effort will bring better results than weekly study but anything is better than nothing.

Highlight the words that you look up. This is your personal dictionary — write in it, and use it as a study guide. In the case of an online dictionary or your mobile device, keep a separate document to record the words you have looked up. Read the entire entry for the word; many words have more than one meaning, and the first may not be the one you need. Reading other meanings will help you understand the different ways in which the word is used. If you have time, look up the word's synonyms and compare and contrast the meanings of similar words.

4. Study and Review Regularly

Once you have begun looking up words and you know which ones to study, vocabulary building is simply a matter of reviewing the words regularly until they are fixed in your memory. If you have a free moment while traveling, waiting on a friend, or when you are early for an appointment, you can use the time to review your list. Flash cards and notebooks are great to have along, too, and your dictionary itself can be a study guide.

Consider workbooks or computer programs to help you with your learning. Such programs present you with words generally considered important to know and will use words in several sentences. They usually have exercises that test what you have learned. These types of activities can supplement the word awareness and usage habits you are forming. Look into any potential book or program to see if too many words are beyond your frontier of knowledge. If you only *recognize* many of the words but don't really *know* them, then you might not choose it as a learning tool. Keep in mind that any one book or program is not going to give you a complete list of words at your frontier of knowledge.

Vocabulary Wordbooks

Our Wordbook series is a graded set of vocabulary exercises that will help you activate your word learning. Your level in the Wordbook series is indicated by your Vocabulary Scale score.

You will notice that there is a blank line under your vocabulary score. We encourage you to contact your local Johnson O'Connor office, at any time, to schedule an appointment to retest your vocabulary free of charge. This can be a useful motivator whether you are pursuing further study or applying for a new job. Wordbooks are available for purchase from our offices and through our website, where you will also find a vocabulary level pretest.

The Wordbooks follow the principles of 'learning at your frontier of knowledge:'

1. Know your level
2. Understand the precise meaning of a word
3. See the word used in different situations
4. Practice and review - use the words in different ways
5. Master a set of words before moving on to the next level

Learning throughout one's life

For adults, it is common for the rate of our vocabulary development to slow over time, not because we lose our faculties as we age (which we do, alas), but because we get busy. Students have an advantage in vocabulary acquisition: their 'job' is learning. They have a team of experts encouraging them to read, think, and talk about a variety of subjects every day: science, history, literature, and so on. When we get out of school, we tend to lose that habit of encounter; we read what we like, or we don't read at all, and our exposure to new words and concepts risks becoming narrower and narrower. In addition, there are new demands on an adult's attention — employment, family, friends, social responsibilities. While some adults use this new reality as an excuse for not improving their command of the language ("I don't have time to read"), it seems clear that learning and expression become more and more important. Doing your best in your job, communicating effectively with family members, and pursuing your own interests demand that your vocabulary be up to the task.

Aptitudes and learning style

Your aptitudes influence how you interact with the world. Your vocabulary, and the way you communicate, should reflect who you are. Let your innate abilities help you learn new words.

If you scored high in Inductive Reasoning, your natural tendency might be to guess at the meaning of a new word from its context. Have you heard or seen a similar word before? Is the meaning of the word reflected in the rest of the sentence or passage? While most times you can get the sense of a word from the writing or in conversation, always look up the word to confirm or correct your conjecture.

The most exciting phrase to hear in science is not 'eureka' (I found it!), but 'That's funny. . .'
Isaac Asimov

If Analytical Reasoning, Silograms, and/or Number Series are your strengths, take a scientific approach. Try to decipher the meaning of a word from its constituents: prefix, root, or suffix. The etymology — the history of a word — can also give you more information. By knowing its root, you can soon learn to recognize other related words. Create an organized system for your word study: set a schedule, either ten minutes a day, or two words a

You ask what is the use of classification, arrangement, systematization? I answer you: order and simplification are the first steps toward mastery of a subject...

Thomas Mann

day, for example. Start a vocabulary log in which you record the new words you encounter. Keep track over the course of a week or month and challenge yourself to acquire a certain number of words in a year. Make sure you revisit your lists to keep those words active as you learn new ones.

If you have auditory aptitudes, speak new words aloud as you come across them. You might find you prefer listening to audio books. Unabridged versions usually provide the best source for vocabulary study. The inflection and emotion the actors put into the reading can help you understand the meanings of unfamiliar words. Perhaps you can keep audio notes on new

Words have weight, sound and appearance; it is only by considering these that you can write a sentence that is good to look at and good to listen to.

William Somerset Maugham

vocabulary words or watch TV with a notebook by your side. Use the new words in conversation so you can practice the pronunciation and context. This practice will help to develop your 'ear' when coming across new words in written form.

For spatial and visual thinkers, those with Memory for Design, Observation, Artistic Judgment or Structural Visualization, you may find that using pictures with the words provides a concrete way to absorb them. If you are learning technical jargon, for example the anatomy of the human body or the parts of an air conditioning system, labeled charts can help you visualize the terms. Here is a great trick for learning a foreign language: try using sticky notes to label items with their terms — work with a dictionary and label everything in your house (pets may prove difficult). You can also draw pictures, doodles or charts that will help you remember the meaning of a new word. Read the novel and then watch the movie (and then read the novel again!). Visualizing the context and scene in which new words occur may help you remember them more effectively.

Education is all a matter of building bridges.

Ralph Ellison

If you scored high in Ideaphoria, you will want to find active ways to use new words in conversation or writing. Keep a journal of interesting words you come across. You might simply record it into your smart phone to keep your list. Try this exercise: once a week, write new sentences with the words you just learned. Join a book group so you can share your ideas with others. Be sure to review your earlier efforts periodically.

One forgets words as one forgets names. One's vocabulary needs constant fertilizing or it will die.

Evelyn Waugh

If you already scored high on our Vocabulary test, congratulations! You are probably already following many of the suggestions above. Your challenge is to broaden your usage rather than increase the number of words you recognize. Develop a curiosity for synonyms and antonyms. How many different ways can you find to express the same idea? In which contexts are they appropriate? Words at the higher levels tend to have more delicate shades of meaning.

If you scored low — get motivated! Successful communication is a product of active effort. First, reactivate words you used to know or those bordering your frontier of knowledge. Make sure you expose yourself to a variety of topics and media. Start with what is easy and familiar — newspapers, magazines, or websites. Then seek out longer articles or books related to your hobbies or professional interests. Choose a pace that is comfortable for you, whether it is a word a day or a word a week. Vocabulary learning is exercise. Always do a bit every day, and keep stretching further.

The only place success comes before work is in the dictionary.

Vince Lombardi

The path to success

With our testing program based on our continuing research, we have provided you with an objective assessment of your aptitudes so that you can make informed choices about your educational and occupational path. In addition, you have received an assessment of your current level of English vocabulary. Johnson O'Connor believed that both sets of information are of equal importance. Your aptitudes may be the result of inheritance and early development, and will color the approach you take to the world. Your vocabulary level, your ability to communicate effectively with those around you, is something *you* must attend to. Making concerted attempts to better your vocabulary is a profitable investment. Daily concentrated effort can bring about rapid improvement in your ability to communicate and can benefit you in school, at work, and socially. It will enable you to understand others' ideas better and to have the satisfaction of getting your thoughts and ideas across more effectively.



*An exact and extensive vocabulary is
an important concomitant of success.*

Johnson O'Connor



Interests & Aptitudes

Britt, a dropout of the Rhode Island School of Design, traveled the length of South America, to Puerto Montt, where contiguous land shatters into a myriad of islands. There he became involved with a small community that practices the ancient art of boat building, and remained to learn their craft. He is now considered a master.

Jenna studied biology before going to school to become a pastry chef. After a brief apprenticeship in croissant making, she decided to focus on wedding cakes. From a small kitchen in Napa, she now turns out architectural wonders of vanilla chiffon and passion fruit for wine country weddings.

The choices Britt and Jenna made were molded first by an understanding of their strengths. In plotting your own course, consider your aptitudes the primary foundation. Yet once a working knowledge of your natural gifts is in place, it is important to look at other factors that will influence your way.

You may find it surprising to know that Britt and Jenna share very similar aptitude patterns. From this common point of origin, most would agree they created very different lives. What might account for this difference?

Choosing your way

Though there are many answers to the question of how people choose their path in life, interests often play a defining role in how aptitudes are used. While not as stable as aptitudes, they can help determine if a field is right for you. A professor of bioengineering and a toy designer might share similar aptitude patterns, but their careers are surely fueled by very different passions.

Consider Lyn's experience. Ready for a career change, she was thinking of obtaining an advanced degree with the goal of becoming a college professor. She could not decide whether to teach business, a subject in which she already had an educational background and work experience, or something in the humanities, to which she had always felt more drawn. "Picture yourself talking about business for several hours every day," her aptitude consultant suggested. "Do you care enough about business to be excited about doing that?" The question was something of a revelation to Lyn, as she realized that she would very quickly tire of

spending so much time with a subject about which her feelings were lackluster. Though teaching business had seemed like a logical and natural choice, her conflicting interests inspired her to look in another direction.

While investigating occupations or jobs, take time to reflect. Does this intrigue me? Do I want to know more about this? Do I feel a spark of enthusiasm? If the answer is “No” then you might want to move on. An aptitude for a particular career doesn’t automatically create a corresponding interest. Someone can have the pattern of an architect, but that doesn’t mean he or she will be interested in that work. The occupations you discussed in your summary are a starting point, but the list is by no means comprehensive and is not intended to limit your options. Knowledge of your aptitudes, combined with personal factors such as interests, goals, values, and beliefs can help you create a direction uniquely satisfying to you.

Discovering Interests

Even with a thorough understanding of their natural gifts, many people are still at a loss as to what impassions them. They may feel that as adults they don’t have as many interests as they did when they were younger. If you feel this way, consider aptitude testing a map for exploration. You might start by investigating activities associated with your aptitudes. Specifically consider the kind of activities that cluster around a high score. If you scored high in Structural Visualization, you might try your hand at working on an engine, making a soufflé, or studying anatomy. If you scored high in Ideaphoria, try teaching someone something that you know about or participate in a fundraiser. New activities may provide clues to what enthuses you. For most, testing in no way precludes trying on things for size.

To “discover” new areas of interest, the following questions may be helpful: what kinds of things do you do in your spare time? Is there any subject matter that you regularly return to in conversation? Is there a similar thread running through the titles of the books that line your shelves? What sorts of television shows and movies do you regularly watch? What types of websites are bookmarked on your computer? Do you subscribe to any magazines or blogs? You might even ask friends and relatives what you seem to return to in conversations over and over — this could indicate a serious interest for you. Whether you’re fascinated by the natural world, love chocolate, adore motorcycles or politics or jewelry, how might your interests combine with your natural gifts? Tuning in to why you do what you do in your free time can be a way to understand yourself and your aptitudes, and it can actually help you make educational and career choices.

A recent client mentioned she had found it helpful to keep a list of situations in which she felt unusually engaged. After collecting a dozen such incidences, she was surprised to discover a strong pattern emerge that gave her a more definite sense of her interests. Thus, both new and past experiences can help you assemble a more precise sense of your passion.

Interest with Aptitude

“An interest based on your aptitudes is not a passing interest...” wrote Dean Trembly in his book *Learning to Use Your Aptitudes*. It is not uncommon to see a person with Structural

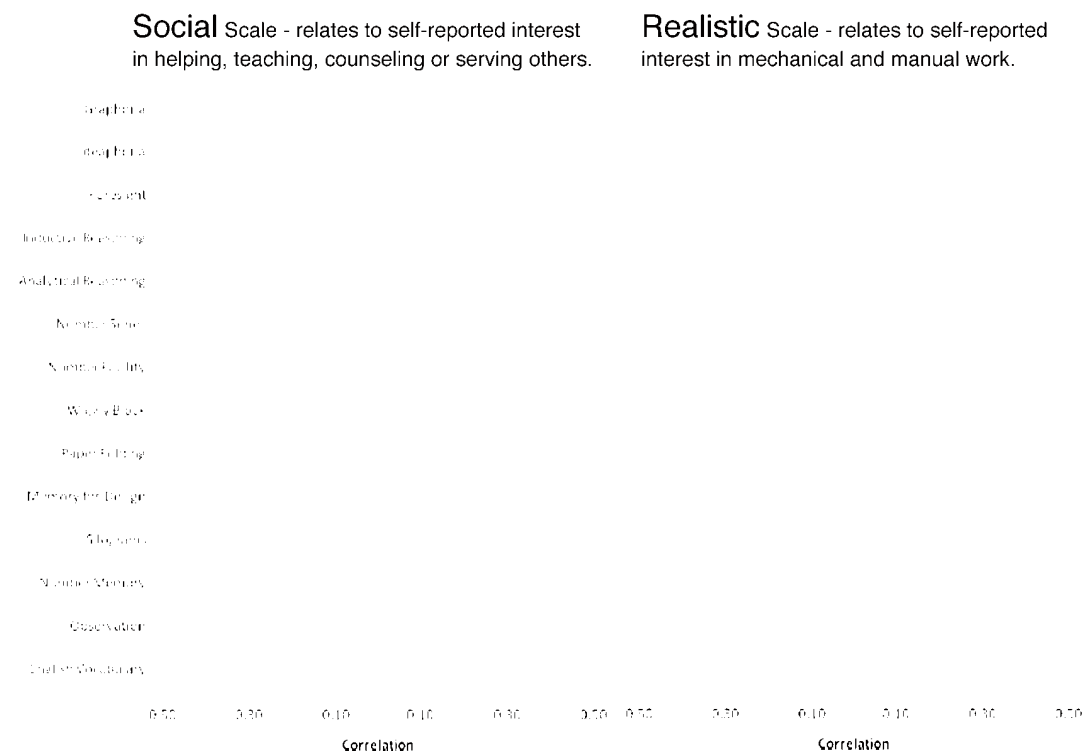
Visualization have spatial hobbies like home renovation or furniture making. Someone who scores high in Inductive Reasoning might devour mystery stories or be fascinated by historical research. And, of course, there are musical and artistic hobbies enjoyed by people with those aptitudes. Look to your long-term hobbies and activities for ideas, but make sure your aptitudes are factored into the equation.

Emily's family owned a successful nursery and landscaping business. She had always worked there after school and said she greatly enjoyed being around trees and plants, helping people make their yards more beautiful. She had the aptitudes used by landscape architects and designers, and was excited to see that she had the aptitudes for what she loved to do. "I always assumed that I was good at garden design because that's what I did for my parents." In one sense, Emily was fortunate — her interests and aptitudes meshed nicely.

We can measure your aptitudes with our tests, but interests are based on your self report — sometimes related to your abilities, sometimes not. We may drift in and out of interests in more subjects than we have time or aptitudes to pursue as careers. Thinking about what you do for fun, you might be able to see parallels between your aptitudes and your interests and hobbies, and vice versa. This can also be a way to generate occupational choices to consider.

Self-Directed Search® (*Interest exercise administered during our aptitude testing program*)

Sample of correlations with JOCRF aptitude test scores as reported in Statistical Bulletin 2011-12.



Practical vs. Possible

Many people have an area of passion, be it auto racing, politics, ballet, or playing video games, which they've never thought to associate seriously with a career choice. They might look at the people who do earn a living in these areas as the lucky ones with "dream jobs" available only to a few people. If you have such a passion, don't be afraid to look for a career associated with it. True, not many people get to be President of the United States, but the President daily works and communicates with advisors, political journalists, campaign strategists, social secretaries, and a retinue of others who work on the political stage. One of these other positions might feed your passion for politics while using your aptitudes and could lead to an exceptionally satisfying career. And who knows — that experience might lead you into your own political campaign one day. Similarly, every glamorous or rarefied professional is involved with an industry that employs many people behind the scenes, and one of these positions connected to something you love might prove to be your own dream job.

You may feel, as well, that some of the suggestions we offered you are not possible in terms of the education required or the competition you would face. We don't take that into account when making our research-based suggestions — what's there is what we understand to be appropriate based on our knowledge. View any ideas that may not seem, to you, to be serious contenders for your career path as examples of how aptitudes *can* be used. It's up to you to decide what's a good fit. Ultimately your occupation should not only fit your aptitudes, but also the other factors you'll use to evaluate any potential choices.

Interest without Aptitude

Jessica had a longstanding interest in being a doctor but was surprised to learn that her aptitudes did not suggest medicine. As the idea of becoming a doctor was not just a passing whim, she wanted to understand what accounted for the discrepancy between her aptitudes and interests.

If you are also wrestling with such a discrepancy, it can be helpful to examine what lies at the heart of your interests. What is it that attracts you to an activity or field? Is what you like central or peripheral to the work?

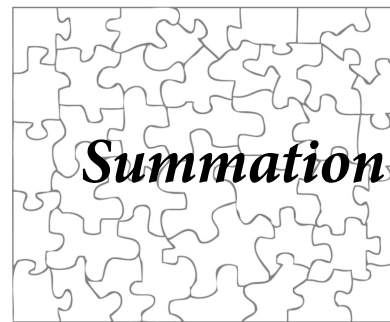
During a discussion of her pattern, Jessica realized that her interest in medicine was essentially born of the desire to be in a helping field. Though she was initially disappointed with her results, she quickly came to see that what she loved most about medicine was transferable. She was encouraged to consider other helping fields that would be more in line with her strengths. We discussed with her ideas such as public health, counseling, and teaching, which could all be considered helping occupations.

After learning about his low scores in the auditory aptitudes, George confessed that he had recently taken up the violin. He'd been attending class for the last six months and felt quite certain he had little natural aptitude. "I have no argument with the results," he said brightly. "But I enjoy using a different part of my brain and even like the feel of the violin in my hands. I recently had the opportunity to play for a few friends, and although I am far from good, it was fun to share what I had learned."

An interest unsupported by aptitudes might be successfully pursued as a hobby. “I think my relationship to music would be very different if my livelihood depended on it. My lack of ability would be a problem in a situation in which I needed to compete. Playing once a week, in a relaxed situation, enhances my life.”

Long ago (*Unsolved Business Problems*, 1940) Johnson O'Connor said as much: “The question is never does one score high enough in tonal memory to warrant music as a diversion, but does one score relatively higher in something else which might lead more surely to genuine accomplishment.”

Although a non-spatial person could certainly find physics fascinating or feel an attraction to architecture, the difference between being interested in a subject and actually working in the field can be substantial. So, by all means try new things, whether they relate to your natural abilities or not. Investigate new occupations, even if you do so just to help you understand your own aptitudes better. As you research occupations and activities that *relate* to your aptitudes, you may be in for pleasant and rewarding surprises. You will find doors in your imagination opening to new possibilities. A career that uses your aptitudes but also ties into a direction you really like would be an optimum fit.



What may have seemed like a lot of work for us in putting this book together may become for you, if you have read this far, a pleasant goad to making some changes or gaining confidence in what you do with your life. We have striven to blend interesting examples of how our examinees have made use of the testing information in their personal growth with informative examples of research findings — illustrated by the graphs and charts you find here — to support what we say about aptitudes.

Along with our testing program to provide aptitude analysis, we remain a committed research foundation with professionals in psychometrics working in the background to prepare norms, design and implement tests, and validate what test scores relate to in the now very wide world of work. Augmenting this research effort, we now also fund some outside research using new methodologies beyond our present technical grasp. If you check our website you will find mention of some brain scanning research that shows promise in identifying a physical presence in the brain reflecting performance on our aptitude tests. A prominent researcher in the field, Dr. Richard Haier, has overseen some of this research, while warning us that some day a mere brain scan will predict particular abilities an individual has. Science fiction, from *Brave New World* to *The Terminator* and ever beyond, can and should scare us, but if the analogy instead is drawn from progress in health care and educational development, then let the future come! In the meantime, we will extend a hand to help and to explore, following our founder's fecund vision but leading it into new dimensions.

We realize our approach is to suggest that you make the most of certain advantages your pattern of scores can suggest — it is not just cheerleading you to work hard at whatever you think you want. In an aptitude pattern, low scores often figure prominently in career or educational choice, so don't worry about how many aptitudes you might have, just consider how to make your combination of scores work for you. Put in your hard work where you are generally toward the front of the pack. Then you aren't so much climbing a mountain as you are skiing down the backside. The recent military recruiting slogan, "Be all you can be" captures the spirit.

Hard work and determination remain, of course, a big part of success. The vocabulary chapter imparted this in its argument for increasing your general knowledge to make fullest use of your aptitudes.

Presumably you focused on those chapters discussing key aptitudes you possess, but most also mention ways to adjust and even take advantage of those where you happen to score low.

Check them out as well. If you enjoy what you find here, we are pleased. If you have something to share or comments to make, you might want to call on us at our site on Facebook. What you read in this book may be amended by the time a sibling or friend is tested. It is a work in progress. Over time it will have new information to impart, new studies to illustrate, new examples to share.

David Owen Ransom
President
JOCRF • HEL • JOCRSC

November 4, 2011



*Some members of the Writing Committee
at work on this book in our Boston office
last spring.*

*In our conference room at our
Chicago building, researchers
meet with our Windy City
testing staff.*



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