The Role of Genes, Environment and Deliberate Practice
In the Development of a World Class Entrepreneur

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Abstract

We are all a product of our genes and our environment. Anders Ericsson and other researchers proposed that individual differences in world-class performance in music, sports, and games were largely the result of individual differences in the amount of deliberate practice, which was defined as engagement in structured activities created specifically to improve performance in a domain.

The popular view is that there is a specific type of practice or performance that facilitates the attainment of an expert level of performance in almost any domain including entrepreneurship. But is there evidence that supports this view?

To answer this question, we conducted a review of the careers of five world-class entrepreneurs and found that deliberate practice is important, but not as important as has been argued.

Key Words- deliberate practice, entrepreneur, characteristics, traits, genetics, and environment

Introduction

A series of researchers have studied the role of nature versus nurture in developing expert performance. In a landmark article titled, “The Mundanity of Excellence,” Daniel Chambliss made the argument that the difference between an expert performer and an average performer is not that the expert makes quantitative changes in their practice, but they make qualitative changes that change the nature of the work itself. Quantitative time spent thinking and doing an activity ultimately leads to a change in thinking that results in qualitative changes in performance and results. (Chambliss, 1989)

In 2005, Nancy Andreasen, The Creating Brain, The Neuroscience of Genius, examined research studies that used neuroimaging to measure changes in areas of the brain of taxicab drivers and musicians. She concluded that deliberate practice and
performance produced structural change in the areas of the brain associated with the activity. (Andreasen, 2005 p. 157)

In 2006, Anders Ericsson released The Cambridge Handbook of Expertise and Expert Performance. This breakthrough book was the foundation research for promoting the idea of deliberate practice as the means to greatness. In 2008, Geoff Colvin released Talent Is Overrated, a book that presented the idea that great achievers, from Mozart to Tiger Woods, were a result not of great genes, but of great effort. In 2009 Daniel Coyle, in The Talent Code, announced that “Greatness isn’t born, it’s grown.”

In 2010, David Schenk, The Genius in All of Us, dispels the idea that one is born a genius and makes the case that within each of us there is the potential for greatness. In 2013, David Epstein, in his bestselling book, The Sports Gene, using the latest research from the Human Genome Project, raised the question: “Is there a gene, a special gene that results in world champion performers?”

The body of research appears to indicate that when it comes to world-class performance in any activity, nature and nurture are singularly interlaced. That is the answer but the question still remains, are world-class entrepreneurs a product of their genes or a result of thousands of hours of practice?

Our research is an attempt to answer this question by studying the lives and development of a series of “world-class entrepreneurs.” We believe famous entrepreneurs like Elon Musk are a combination of genes, environment, and deliberate practice. By reviewing and studying how these expert entrepreneurs are different from novice entrepreneurs, we plan to identify whether deliberated practice is what makes the differences between being good and being great.

**What are the Traits of a World-Class Entrepreneur?**

Behavioral neuro-scientists identify personality as a set of traits or characteristics along which people vary. When it comes to the personality of an entrepreneur, our research shows the personality of a world-class entrepreneur is composed of five traits: precocious, purpose, persistence, pride and passion.

**Five Personality Traits of World Class Entrepreneurs**

<table>
<thead>
<tr>
<th>Trait</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Precocious</td>
<td>Development of abilities or talents at an early age, a high level of functional intelligence</td>
</tr>
<tr>
<td>Purpose</td>
<td>Driven at any early age to change the world, “To ding the universe”</td>
</tr>
<tr>
<td>Persistence</td>
<td>Determined to achieve their purpose in spite of difficulty or opposition</td>
</tr>
<tr>
<td>Pride</td>
<td>To have a feeling of accomplishment, glory, high renown</td>
</tr>
<tr>
<td>Passion</td>
<td>Even if the odds are against you should still do it</td>
</tr>
</tbody>
</table>
The Mindset of a World Class Entrepreneur

The world-class entrepreneurs we studied displayed a particular mind-set: a special way of thinking and acting. Before Martin Seligman and his associates developed the concept of positive psychology, most psychologists shared the belief that personality, and success in life was primarily shaped by childhood development and intelligence. However, after Seligman’s research and Nancy Segal’s work with the Minnesota Study of Twins Reared Apart, the role of genes and inherited traits and how they interact within a dynamic environment has provided a new perspective on how risk taking, achievement and personality traits are developed. (Segal, 2000) (Segal, 2012)

The Entrepreneurs Success Formula

We suggest the “world-class entrepreneur’s success formula” can be expressed as:

\[ \text{Success} = S + C + V \]

(S) Success is determined by
(S) The biological, gene set point for risk taking +
(C) The environment/conditions and the entrepreneurial opportunities present +
(V) The voluntary activities they performed, deliberate practice and skill development

For the purpose of this article we wanted to focus on “world class entrepreneurs.” In our research, to identify subject for our study, we reviewed the histories of a number of highly successful entrepreneurs with the intent of selecting individuals who possessed the following qualities:

- A person who, at an early age, was motivated to start a business because of curiosity, talent, or interest.
- A person who, at an early age, saw a business as a means to create profits and to increase their self-worth.
- A person who showed early leadership skills and was the founder of a company.
- A person who failed early, but continued on persisting until they ultimately succeeded.
- A person who saw things other people could not see and built a company that nobody else was willing to build.
- A person who had a major influence on the world of business.
- A person who had appeared on the cover of Time magazine.
- A person who has achieved large financial rewards from business

After reviewing a wide number of entrepreneurs we narrowed our list to: Elon Musk, Bill Gates, Steve Jobs, Larry Page, and Sergey Brin.

Great Entrepreneurs Develop Differently

Our research showed each of our world famous entrepreneurs followed a similar pattern of development. When it came to talent identification, environment and talent...
development an expert entrepreneur followed a pattern similar to a famous artist, musician, chess player, athlete, or any expert who excelled at his or her chosen activity.

Genes, Environment, and Development - The Importance of Starting Young

In 2003, an international consortium announced the completion of the Human Genome Project. After thirteen years the project had completed a map of the human genome, namely all 23,000 regions of DNA that contain genes had been identified. The result of the project was that for the first time researchers knew where to being looking for foundations of human traits. Now scientists could identify genes that help to determine height, hair color, left or right handedness, and even hand-eye coordination. The good news was although the genomes had been mapped, the researchers underestimated the difficulty of understanding how to read and understand the genetic instructions and how genetic patterns were formed. (Epstein, 2013)

Since 2003, the scientists focused their attention on picking single genes that they expected would influence the skill level of the subject. Sport scientists placed their attention on genes that would influence athleticism and compared those genes with groups of high performing athletes and non-athletes. The research idea appeared sound, but a problem occurred when the researchers found it was possible to detect genes that influence height. It was extremely difficult, if not impossible, to determine how those genes interacted not only with other genes but also with outside factors, such as the environment and the effects of training.

Scientists moved away from the study of single genes and focused their attention on analyzing how genetic instructions influence the development of highly successful performers in all areas. The result of this change was to realize that genes do not determine physical, character, and performance traits by themselves. Genes interact with the environment based on the actions of the individual in a dynamic, transformational, synergistic process that continually changes and refines the individual’s performance.

Practice makes you better, but not perfect

Practice makes permanent. No matter how much you do it, practice may never make you an expert. But it probably will make you better.

“This question is the subject of a long-running debate in psychology,” says Fred Oswald, professor and chair of psychology at Rice University. “Why do so few people who are involved in sports such as golf, musical instruments such as the violin, or careers such as law or medicine ever reach an expert level of performance?”

For a new study published in *Psychological Science*, Oswald and colleagues reviewed 88 previous studies (more than 11,135 total participants) published through 2014 that investigated relevant research on practice predicting performance in music, games, sports, educational, and occupational domains.

Within each domain, the researchers averaged the reported results across all relevant studies and found that “deliberate practice,” defined as engagement in structured activities created specifically to improve performance in a specific field, explained 26 percent of the variance in performance for games, 21 percent for music, 18 percent for sports, 4 percent for education, and less than 1 percent for professions.
Nature vs. Nurture

“Deliberate practice was a strong overall predictor of success in many performance domains, and not surprisingly, people who report practicing a lot generally tend to perform at a higher level than people who practice less,” Oswald says.

“However, perhaps the more important contribution of our study is that no matter how strongly practice predicted performance in our findings, there was always statistical room for other personal factors to predict learning a skill and performing successfully, including basic abilities.”

Significant amounts of research have already identified basic abilities as also being important to predicting performance, but some researchers tend to minimize them and consider practice as the sole determinant of performance.

The Development of Elon Musk

Elon Musk best represents the character and traits of a world-class entrepreneur. Born in South Africa to a mother who was a Canadian-English model and a father who was a British born engineer, Elon was recognized as a child prodigy at an early age.

At the age of 12 Elon wrote the code for a computer game called Blastar and sold it for $500. At the age of 16, continuing his obsessive interest in computer game, Elon and his brother Kimball, without the knowledge of their parents, opened a video arcade. The business was set to open but was stopped by the city that refused to give the Musk brothers a variance.

From the beginning Elon wanted to be involved in things that changed the world. Elon believed that if you wanted to be involved in the technology that would change the world it was necessary to come to North America and to Silicon Valley.

In interviews, Elon made it clear that although he had always been fascinated by the video game business, he realized that he could not change the world doing that as a career. Instead of video games Elon reported that he firmly believed that the Internet, renewable energy and space were three areas that offered the greatest opportunity to have the greatest impact. Musk’s entrepreneurial interest in electric cars, solar energy and rockets seemed to be not only extreme but also somewhat as a fantasy to his friends. But, Elon was insistent and wanted the world to know that he was in pursuit of a master plan and had been thinking about these ideas starting in college. His intent was to make technologies real, were important and useful for the future. (Vance, 2014 p. 54-55)

The Development of Bill Gates

Bill Gates appeared to have no physical advantages over his classmates. Bill was the smallest boy in his seventh grade class and although he excelled in math and science he, unlike Elon, had not found a special interest.

Our research showed that if one wants to develop a world-class performer in any area, the best age to start is when the person becomes interested in the activity. None of our top entrepreneurs were forced by their parents to start a business or to spend time studying about a subject that later became the foundation for their business. Whatever the young entrepreneurs wanted to do, they were allowed to do it and were strongly supported by their parents.
Bill Gates, as a seventh grader, at age 13, wrote his first computer program. As an eighth grader, Bill took a job at a new company in Seattle called the Computer Center Corporation. After school, Bill caught a bus to the company where he often worked until late at night. When the company failed, Bill, at age 15, started a computer programming business with a fellow student named Paul Allen. By the time Bill graduated from high school he had not only put in over 10,000 hours of study, but had started a business and found his future business partner for creating Microsoft. (Wallace and Erickson, 1993)

Timeline: Deliberate Practice of Five World Famous Entrepreneurs

<table>
<thead>
<tr>
<th>Entrepreneur</th>
<th>Talent Age</th>
<th>Environment</th>
<th>Partner</th>
<th>Company</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bill Gates</td>
<td>9 years</td>
<td>Computer Club</td>
<td>Paul Allen</td>
<td>Microsoft</td>
</tr>
<tr>
<td>Steve Jobs</td>
<td>11 years</td>
<td>Computer Club</td>
<td>Steve Wozniak</td>
<td>Apple</td>
</tr>
<tr>
<td>Larry Page</td>
<td>9 years</td>
<td>Computer Family</td>
<td>Sergey Brin</td>
<td>Google</td>
</tr>
<tr>
<td>Sergey Brin</td>
<td>9 years</td>
<td>Computer Games</td>
<td>Larry Page</td>
<td>Google</td>
</tr>
<tr>
<td>Elon Musk</td>
<td>12 years</td>
<td>Computer Games</td>
<td>Kimball Musk</td>
<td>Tesla, SpaceX, Solar City</td>
</tr>
</tbody>
</table>

Gene Complexity and Interaction

There is good scientific reason to think that talent matters in a wide variety of domains, from sports, to music, to art, to chess, to mathematics, to science. Cognitive activities, the ability to think and solve complex problems, are a product of the mind, and the mind is a product of genes working together within a special environment. Experts are made as a result of the interaction between genes, an enriched environment and hours of practice. Anders Ericsson, famous for his research on deliberate practice and the idea of 10,000 hours of practice, wrote in 2007, “New research shows that outstanding performance is the product of years of deliberate practice and coaching, not of any innate talent or skill.” (Ericsson, 2007)

There is no denying that practice is a key factor in developing expertise. Practice does matter. No one has ever achieved excellence without practice. But, it would be a logical error to assume that practice alone creates a world-class performer.

Dr. Gary Marcus, a well-known expert in cognitive science, in explaining the role of genes and talent used an analogy comparing the growth of trees and the growth of great musicians. “The trees that grow the tallest aren’t just the one ones that get the most water, they are also the ones with the best genes, the one’s that can most efficiently build new structure by metabolizing sun and light. Great musicians like the tallest plants, need optimal conditions and ideal environments.” (Marcus, 2013 p. 98)

Genes matter. In sports there is a common saying, “You can’t teach speed.” You can improve speed but at the Discovery High Performance Center at the Sports Science Institute of South Africa, they tested over 10,000 boys and never found a boy who was slow become fast. It was found that the slow kids never catch up to the fast kids in sprint speed. Research on Jamaican sprinters and Kenyan distance runners indicates that there are more than hours of practice that leads to world-class performances. (Epstein, 2013)
The Complexity of Genes and Effective Motivation

Research has shown there are two kinds of motives for engaging in any activity: internal and instrumental. A person who undertakes a difficult task because he or she wants to become an expert or the “best at something” is following an internal motive. If a person undertakes the work of becoming an expert performer to earn large sums of money, awards, recognition and fame, that’s an instrumental motive, since the relationship between fame and doing an activity is because of an inherent interest, curiosity or passion.

In his 2009 book, Born to Run, Christopher McDougall studied the motivation and success of ultra-marathon distance runners, who routinely ran races of more than 75 miles. McDougall’s research showed that after a short-burst of success, the sport of running extreme distances declined dramatically. McDougall’s answer was that the American approach of trying to attract and develop runners by offering prizes and awards was not effective. Long distance runners are driven by internal not instrumental motives. McDougal’s simple and direct conclusion may accurately pinpoint the motivation of our “great entrepreneurs.” Perhaps, it is the person who wants to “ding the universe” or wants to “change the world” who has the passion and incentive to become the top entrepreneur. (McDougall, 2009)

The Importance of Purpose

This theme of intent, the inner motivation to do something important, appeared in the story of each of our chosen entrepreneurs. Internal motives seemed to drive our entrepreneurs. As a child Larry Page said that he wanted to become an inventor because, “I really wanted to change the world.” (Levy, p. 11) Steve Jobs presented the importance of passion and hard work in a speech at the D5 Conference in 2007.

“People say you have to have a lot of passion for what you’re doing and it’s totally true. And the reason is because it’s so hard that if you don’t, any rational person would give up. It’s really hard. And you have to do it over a sustained period of time. So if you don’t love it, if you’re not having fun doing it, you don’t really love it, you’re going to give up. And that’s what happens to most people, actually. If you really looked at the one’s being ‘successful’ in the eyes of society and the ones that didn’t, often times it’s the ones who were successful, loved what they did so they could persevere when it go really tough. And the ones that didn’t love it quit because they’re sane, right? Who would want to put up with this stuff if you don’t love it? So it’s a lot of hard work and it’s a lot of worrying constantly and if you don’t love it, you’re going to fail.” (Beahm, 2008 p. 78)

The Development Process of a World Class Entrepreneur

Ericsson was right. Practice does matter but the environment and the combination of genes that drives a person to “want to be great” also matter. Gates, Jobs, Page and Brin were developed in the culture of the Silicon Valley. Richard Branson was molded by the competitive challenge of the music industry. A great person in any profession or sport needs optimal conditions, ideal genes, and an ideal environment.
Findings

Persistence is very important. You should not give up you should continue working on your idea unless you are forced to give up.

You shouldn’t do things differently just because they are different. You should do things differently to make things better.

Your motivation should be involved in something that you think would have a significant impact on the world.

You need to take major risks to achieve major goals.

You need to lead by example. Start and growing a business is not only about the innovation but also the drive and determination of the people who do it as about the product they sell.

You need to work hard. All of the world-class entrepreneurs put in more than 80 hours per week. By working longer, smarter and harder they were not only following Ericsson’s 10,000 hour rule they were greatly exceeding it.

Genes play an important part in the development of an expert.

Genes alone cannot explain the development of an expert.

Learning how to play the game through deliberate practice and experience, play, deliberate practice and hours of experience alone do not account for the development of an expert.

Genes can accelerate the learning ability of an expert whereas a novice shows little or no improvement from the same training.

People have both internal and instrumental motives for doing what they do but internal motives are essential for become a top performer.

There is such a thing as “entrepreneurs,” without the learning and collection of a specialized set of skills that is driven by an interaction between genes, culture, and a specific environment no one is born an entrepreneur.
What Is the Answer?

In the last line of his world-changing book, On the Origin of Species, Charles Darwin says of his revelation that all variation he sees springs from a common ancestry. Nature, from simple beginnings, has created an endless variation of endlessly fascinating in form and function.

When it comes to human beings, each is unique with their own set of genes and their own attitude towards life. Genetic scientists and neuro-biologists will continue to study the nature versus nurture problem. Presently, there is no one training program, environment, or set of genes that can account for the accomplishments of our selected “great entrepreneurs.

Bill Gates was reported to claim that he was “lucky to be born with certain skills.” Steve Jobs, said that he had long thought his personality was entirely the result of his life experiences, until as an adult, he discovered an unknown, full sister, Monica Simpson. After meeting and talking with her Jobs was amazed to discover that although Monica had been raised in a different family she was similar to him. Jobs observed they were both intense in their artistry, observant of their surroundings, sensitive, and strong-willed. “I used to be way over on the nurture side.” Jobs told the New York Times in 1997, “but I’ve swung way over to the nature side.” (Issacson 2011 p.285)

The next Bill Gates will not build the first computer operating system. The next Steve Jobs will not create the first iPod. The next Larry Page won’t develop the world’s fastest search engine and the next Elon Musk won’t develop a space vehicle that can return to earth. But, the next famous entrepreneur will be someone with similar characteristics to these world class experts and will be internally driven by their passion to expend thousands of hours in becoming someone who will ‘ding the universe.”

At the end of the day, the one significant quality shown by each of the world-class entrepreneurs was the attribute of hard work. Elon Musk believed that it was possible for ordinary people to become extra ordinary and they could do this by working 80 to 100 hours every week. (Vance, 2015) Each of the world-class entrepreneurs in our study rose to the top with one main idea in mind.

“I am going to beat the competition by outworking them. That’s all there is to it.”
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