Range and expert performance

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In 2019, David Epstein's book *Range: How Generalists Triumph in a Specialized World* was published.[1] I was interested to see what he said about expert performance.

Background

For years I've read research studies about "expert performance," which refers to advanced skills acquired in a specific domain. Anders Ericsson, the leading researcher in this area, argues that there is no strong evidence for natural talent.[2] He says no one has ever convincingly demonstrated an advanced skill, in a domain where there are objective measures of performance (such as competitive sports, chess and classical music), without a great deal of practice. For the highest levels of performance, in fields where there are many aspirants, typically thousands of hours of practice are required. Furthermore, much of this practice needs to be of a particular type called "deliberate practice," in which a person focuses intently on mastering a challenge at the edge of their capabilities under the regular guidance of a knowledgeable teacher or coach.

This perspective challenges the standard assumption that innate capacities enable superior performance. The expert performance perspective has been questioned by a number of researchers — and by David Epstein, a journalist.

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1 David Epstein, *Range: How Generalists Triumph in a Specialized World* (London: Macmillan, 2019).

2 An exception is some inherited physical characteristics, such as height, that are an advantage in particular sports.

In Epstein's engaging previous book *The Sports Gene,* he searched for genetic influences on elite athletic performance.[3] He questioned the expert performance perspective, and provided one example that he presented as definitive. In 2006, a young man named Donald Thomas at his first attempt at the high jump cleared a considerable height, and he went on to win the world championship the following year. This seemed a refutation of the view that world-class performance normally requires thousands of hours of deliberate practice.

Anders Ericsson and Robert Pool in their 2016 book *Peak* addressed the Thomas case.[4] Ericsson says he has made it a special project to investigate claims about outstanding performance achieved without much practice. Ericsson and Pool point out that Thomas had competed in the high jump in high school. He also spent years playing basketball, taking special pride in being able to dunk, something that relies on many of the same skills as needed for the high jump. Furthermore, Thomas hardly improved after his impressive high-jump debut, which goes against the suggestion that he had prodigious natural talent that could have been further developed through training and coaching.

It seemed to me that Ericsson and Pool had provided a powerful refutation of Epstein's example, thereby putting a major hole in his argument. It was with this background that I looked to see what Epstein would say in his new book *Range.*

There's another personal background that's relevant: my own experience in various activities. In my academic career, I've researched in a variety of fields, including stratospheric dynamics, numerical methods, astrophysics, modelling of wind power in electricity grids, environmental politics, nonviolent action, scientific controversies, plagiarism, democracy, tactics against injustice, and quite a few others. In the academic context, I'm much closer to a generalist than a specialist, though perhaps it's more accurate to say I've specialised in

3 David Epstein, *The Sports Gene: What Makes the Perfect Athlete* (London: Yellow Jersey Press, 2013).

4 Anders Ericsson and Robert Pool, *Peak: Secrets from the New Science of Expertise* (London: Bodley Head, 2016), pp. 215–219.

a wide variety of topics. Whatever the label, my background should make me sympathetic to Epstein's arguments.

Range: strong points

A key idea in *Range* is match quality: individuals have much to gain from finding an occupation or goal that matches their interests. To find a good match, it can be useful to try out a variety of possibilities, dipping in to see whether they are a good fit. If not, then move on until there's a close match between your passions and the activity. This implies not specialising too soon. If you choose your life's direction when you're young — or have it selected by your parents or others — you may end up wasting years of effort.

Range is engaging to read. Epstein provides many stories of individuals, while also describing relevant research results. For example, he tells the life story of a man who was no good at art, kept trying different occupations with total intensity before leaving them after a few months or years, and ended up going back to art, finding his own way of doing it. Epstein tells this story in some detail over several pages before finally revealing that the man in question was Vincent Van Gogh, one of the world's most famous painters, some of whose works have sold for more than $100 million. The lesson Epstein draws from this story is that it's okay to try a wide variety of career options, and you may end up doing something really important.

Another one of Epstein's stories is about the pioneering astronomer Johannes Kepler. The lesson here is a bit different. Kepler kept boring away at trying to understand the motions of the planet Mars. Rather than using the techniques of the Ptolemaic system, which were standard at the time, Kepler used a wide range of analogies, many taken from outside science, before eventually coming up with a revolutionary approach that laid the basis for later studies of planetary dynamics. The lesson Epstein takes from Kepler's efforts is that it's valuable to use analogies, including ones well outside the domain in which you're working. Epstein reports on various studies of the benefits of trying out a wide range of analogies.

Epstein refers to arenas where the goal is known and the methods of getting there are well trodden — for example sports and classical music — as "kind" learning environments. Although the struggle of

becoming an excellent performer may be arduous, what is required is known. In contrast are difficult learning environments in which what one needs to learn is not so straightforward. You need to learn something but you don't know exactly what. For these sorts of challenges, Epstein says that learning by doing is the way forward. Trying out a variety of approaches and building up experience provides a solid basis for identifying what you really want to do and as a result what you're most likely to excel in.

Grit, defined as perseverance and passion, was identified by Angela Duckworth as a crucial factor in success, with a telling example being grit scores providing a more accurate predictor of which military cadets will fail to complete West Point's gruelling "Beast Barracks" training.[5] Epstein says grit is not necessarily a good predictor of success, and that many of those who dropped out of the training were right to do so: they realised that a military life was not a good fit for them. Epstein says that grit scores are predictive mainly in narrowly selected groups, with all sorts of prerequisites. Outside these restricted domains, it's not necessarily wise to persist with an initial choice; often it's better to switch, in a search for match quality.

Epstein also tells about people who have solved problems despite not being experts in the field — or perhaps precisely because they are not experts. InnoCentive posts online highly technical problems, for example in drug synthesis, and many of the best solutions come from outsiders.

Overall, *Range* is an engaging account of how people can make contributions without a long slog in a specialised domain. It is an ode to switching careers, short-term planning, outsider thinking, and generally the advantages of not being too much of an expert.

Critical comments

Range is more about match quality than about the range of a person's interests or skills. The subtitle is *How Generalists Triumph in a*

5 Angela Duckworth, *Grit: The Power of Passion and Perseverance* (New York: Scribner, 2016). For a critical examination of grit research, see Marcus Credé, Michael C. Tynan and Peter D. Harms, "Much ado about grit: a meta-analytic synthesis of the grit literature," *Journal of Personality and Social Psychology,* vol. 113, no. 3, 2017, pp. 492–511.

Specialized World, but there is little about generalists, those individuals who are good at a *range* of activities. In highlighting match quality, Epstein seems to be emphasising the *right* specialisation. Neither "generalist" nor "specialist" are listed in the index. Though the title is a bit misleading, this can be attributed to marketing. *Match quality* might not be such an appealing title.

More seriously, Epstein misrepresents and dismisses research on expert performance. He mentions the 10,000-hour rule — the idea that 10,000 hours of practice are needed for world-class performance — without acknowledging that researchers in the field never referred to 10,000 hours as a special figure and never said it was a rule.[6] Ericsson is not mentioned by name, and the case of Donald Thomas is not mentioned either. *Range* might be considered, in part, a reply to *Peak,* but without any acknowledgement or engagement with it.

Peak provides a careful account of how the approach used in domains such as classical music — ones Epstein calls kind learning environments — can be applied to other domains where measurement of performance is less objective. Furthermore, research on expert performance shows that considerable improvements are possible using deliberate practice for periods far less than 10,000 hours. A few thousands of hours of deliberate practice, or something close to deliberate practice, are enough to make a person far better, and even hundreds of hours can enable a significant improvement.

As well as *Peak,* other popularisations of expert performance research[7] emphasise that in many domains, practitioners hardly ever practise: they repeatedly carry out tasks, sometimes at high levels, but do not practise to improve. This is, to my mind, one of the most crucial implications of the research, namely that people can do a lot better by

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6 In *The Sports Gene,* Epstein gives a more nuanced treatment of research on expert performance than he does in *Range.*

7 Geoff Colvin, *Talent is Overrated: What* Really *Separates World-class Performers from Everybody Else* (New York: Penguin, 2010); Daniel Coyle, *The Talent Code. Greatness Isn't Born. It's Grown. Here's How* (New York: Bantam, 2009); David Shenk, *The Genius in All of Us: Why Everything You've Been Told about Genetics, Talent, and IQ Is Wrong* (New York: Doubleday, 2010); Matthew Syed, *Bounce: The Myth of Talent and the Power of Practice* (London: Fourth Estate, 2011).

practising, if possible under the guidance of a knowledgeable teacher. Because the sort of training that goes on in competitive sports and the performing arts is so uncommon elsewhere, in these other domains it can take surprisingly little extra practice to become significantly better than average.

A key claim in expert performance studies is that so-called "natural talent" — the quickness with which a person learns a skill, or the performance advantage some individuals display without specific training — is of little or no significance at advanced levels, after thousands of hours of deliberate practice. This is a fundamental challenge to the usual way of thinking about talent, which is that some people have it (in particular domains, anyway) and others don't. The assumption that natural talent is the basis, or limit, to performance is commonly displayed in the comment, "I'm no good at mathematics."

Epstein does not discuss the challenge of expert performance research to commonplace assumptions about talent. Instead, he gives a simplistic picture — sometimes a caricature — of the research as a launching point for his argument that in most domains finding match quality is crucial to success. In the first few pages, he compares the trajectories of Tiger Woods and Roger Federer, arguing that training from an early age is not the only way to become a world champion. He writes that Tiger

> was engaging in "deliberate practice," the only kind that counts in the now ubiquitous ten-thousand-hours rule to expertise. The "rule" represents the idea that the number of accumulated hours of highly specialized training is the sole factor in skill development, no matter the domain. (p. 5)

There are a number of misrepresentations in these two sentences. To say that deliberate practice is the "only kind that counts" is to exaggerate findings from the research. As noted, the figure of 10,000 hours was never advanced by researchers — it was popularised by Malcolm Gladwell[8] — and researchers have never said it was a rule.[9]

8 Malcolm Gladwell, *Outliers: The Story of Success* (Boston: Little, Brown, 2008).

9 See, for example, Ericsson and Pool, *Peak,* pp. 109–112, for a treatment of the misrepresentations in Gladwell's *Outliers.*

It might be known in some circles but is hardly "ubiquitous." I don't recollect anyone ever saying that deliberate practice is "the sole factor in skill development." Whether it applies to other domains is an empirical matter, not an assertion in the field.

In a few places, Epstein refers to skills being developed through experience. For example, he refers to employees in companies who face "… kind learning environments, the type where repetitive experience alone leads to improvement" (p. 139). Expert performance researchers argue to the contrary that experience — performing a task — seldom leads to significant improvement; the key is practising the task with the intent to improve. Few company employees ever do this sort of practice. They do jobs but do not practise to improve their skills at doing them.

Epstein does not cite *Peak,* nor does he mention articles reflecting the debate over innate talent that still continues. Of all the primary research on expert performance, he only cites the classic study of violinists by Ericsson et al.[10] In addition, Epstein refers to Matthew Syed's book *Bounce,*[11] but only to criticise one particular comment. In *Bounce,* called by Epstein a "ten-thousand-hours-themed bestseller," Syed criticised the rotation of British officials from one management area to another, saying it is like rotating an elite athlete from one sport to another. To counter this, Epstein refers to Britain's programme of recruiting adults to new sports. However, this does not respond to Syed's criticism of management systems, incidentally a criticism that has been made for decades by numerous critics. Nor does Epstein directly counter Syed's comments about moving high-performing athletes from one sport to another.

Syed offered a telling anecdote. As a champion table tennis player — something Epstein does not mention — Syed participated in a charity tennis match with a leading tennis player, Michael Stich. After playing for a while, Syed asked Stich to serve in professional style (rather than with the friendly serves used in the charity display). The

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10 K. Anders Ericsson, Ralf Th. Krampe and Clemens Tesch-Römer, "The role of deliberate practice in the acquisition of expert performance," *Psychological Review,* Volume 100, Number 3, 1993, pages 363–406.

11 Matthew Syed, *Bounce: The Myth of Talent and the Power of Practice* (London: Fourth Estate, 2011).

ball whizzed past Syed before he could respond, despite reaction times in table tennis being shorter than in tennis. Syed did not have the intuitive skills, built up through practice, of interpreting his opponent's moves. Epstein doesn't mention this anecdote, nor indeed any other evidence presented by Syed, but simply uses one comment taken out of context as a launching point for his own agenda of advocating a search for match quality.

The curious thing is that searching for match quality is compatible with research on expert performance. People who willing to commit hundreds or thousands of hours to intense practice need to be suitably motivated. Ericsson and Pool discuss the importance of motivation and describe a typical trajectory of an early starter as initially undertaking an activity because it is fun and then developing a commitment to improvement, often stimulated by encouragement from parents or others. Those like Tiger Woods — one of Epstein's initial examples — who are driven by parents from an early age are not necessarily typical of high-level performers. A search for match quality is a search for an activity to which a person can commit fully and, with this commitment, use deliberate practice, or a close relation to it, as the path towards achievement.

Deliberate practice is hard work. Ericsson comments that most professionals who practise diligently nearly every day do not find it pleasant. This is compatible with research reviewed by Epstein on the value of slow and effortful learning.[12]

Relatively few individuals spend years in any form of deliberate practice. One of the benefits of putting in significant effort is learning how to apply oneself. Thus, deliberate practice in one domain provides understanding of *how* to practise to acquire advanced skills, an understanding that can be applied in other domains. In this way, deliberate practice in any field, even one not pursued, provides a foundation for engaging with a new field of endeavour.

However, Epstein gives little mention of the effort required *after* a person finds their ideal match. The implication seems to be that the match is all-important and, except for areas with "kind learning

12 Another popular treatment of research on learning is Benedict Carey, *How We Learn: The Surprising Truth about When, Where, and Why It Happens* (New York: Random House, 2014).

environments," practice is secondary. An alternative would be to argue that both are necessary. This would allow a search for match quality and the effort involved in practice to be complementary, or synergistic, rather than alternatives.

As noted, one of Epstein's examples is the famous painter Vincent Van Gogh who, in Epstein's telling, moved from one area to another in an apparently ceaseless effort to find something he really wanted to do. But is Van Gogh's art really superior to that of others, as implied by the sky-high prices paid for his paintings? A different perspective is offered by Albert-László Barabási in his book *The Formula: The Universal Laws of Success.*[13] Barabási argues that in fields where evaluation of performance is subjective, the key to success is networks. Success derives less from the quality of what you do and more from the response of audiences. Barabási looks specifically at the art world and provides an illuminating account of the rise to fame of Leonardo da Vinci's painting *The Mona Lisa.* It languished unheralded for centuries until it was stolen, which made it the subject of great attention, and its fame then compounded over the years: fame leads to more fame. Barabási argues that success in art has more to do with the dynamics of networks than with the quality of the art itself. In this context, the success of Van Gogh has less to do with his struggles to find a niche for his passions and more to do with how others responded to his work. Note also that we don't hear stories of painters who had varied backgrounds and then produced works that are unknown today.

Most of Epstein's stories are of successes, of individuals who eventually became recognised for their contributions. These anecdotes are presented engagingly and they strongly make points, but whether the points apply more generally remains to be seen, because failures aren't presented.

As noted, one of Epstein's examples is the pioneering astronomer Johannes Kepler, who persisted in using a wide range of analogies to understand the path of the planet Mars. Epstein uses Kepler's story to highlight the value of drawing ideas from a wide range of areas, rather than sticking to a narrow field. The story could also be used in a different way, to show the importance of persistence in tackling a single

13 Albert-László Barabási, *The Formula: The Universal Laws of Success* (New York: Little, Brown, 2018).

challenge. However, this would clash with Epstein's lauding of people who switch fields in search of match quality. Maybe, though, Kepler found a quality match early in his life. Epstein doesn't mention match quality in relation to Kepler. Yet another way that Kepler's story could be spun is as showing the value of practice. Kepler, according to Epstein, used one analogy after another in his quest for an explanation of Mars' path in the sky. In doing this, he might be considered to be developing a skill. It wasn't deliberate practice because Kepler had no teacher or adviser in his efforts, but nonetheless through his own efforts he became more skilled at using analogies from a range of areas to try to solve the problem.

In a chapter titled "The outsider advantage," Epstein tells about technical problems that specialists couldn't solve and that were opened up to the public with an invitation to offer solutions, sometimes with a reward. In quite a few cases, individuals from completely different fields and careers came up with solutions. This is impressive, but we don't know how typical these cases are. Epstein does note that specialists are able to address most challenges in their domains, so gaining insights from outsiders is complementary to relying on specialist expertise.

Epstein tells the story of Jill Viles who had a theory about gene mutations. Although she was not a professional scientist, her strikingly original ideas were confirmed. Epstein presents Viles's story as an example of the advantage outsiders have for solving challenging problems. Another way, though, to interpret her story is as the success of a specialist. Through her intense personal interest in a topic, Viles became highly knowledgeable while remaining outside the professional field. Contrary to the subtitle of *Range,* Viles was not a generalist who triumphed in a world of specialists, but rather a non-credentialed specialist who triumphed in a world of credentialed experts.[14]

Epstein doesn't give all that much attention to shortcomings of experts, especially those who are linked to "establishments," namely

14 Some citizen campaigners, without professional training, can develop sophisticated understandings of technical matters, as in the case of AIDS activists: Steven Epstein, *Impure Science: AIDS, Activism, and the Politics of Knowledge* (Berkeley: University of California Press, 1996).

powerful and wealthy groups. Experts gain their status and income from ties with establishments. For example, chemists have careers working for governments, corporations or universities. Going against the interests of their employers can bust careers, as revealed by what happens to dissidents. Most scientists are problem solvers and do not question the source of the problems.[15] For example, the dominant approach to crop pests is pesticides, and those scientists who investigate the health hazards of pesticides may suffer reprisals, while those who study organic agriculture have fewer career opportunities. Similarly, experts have much to gain by investigating drugs that can be patented, whereas non-patentable substances are neglected.

These shortcomings of systems of expertise linked to establishments are not easily addressed by outsiders, because outsiders are a threat. The instances that Epstein tells about involve a narrow band of problems whose solutions are welcomed because they are not a threat to the relevant establishments. This can be presented as a success of outsiders, and appropriately so, but it obscures the many more cases in which outsiders are seen as a threat by both experts and their paymasters.[16]

Edward de Bono developed the concept of lateral thinking, of taking ideas from one domain as a way of creatively thinking about problems in another domain. Epstein in his chapter on lateral thinking says, "Lateral thinking is a term coined in the 1960s …" (p. 193) and lists de Bono's book *Lateral Thinking* in the notes, but does not refer to his work otherwise. De Bono has written dozens of books extending the idea of lateral thinking and providing practical techniques for creativity.[17] According to de Bono, creativity is a skill that can be improved by practising particular techniques. Taking de Bono seriously

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15 Jeff Schmidt, *Disciplined Minds: A Critical Look at Salaried Professionals and the Soul-Battering System that Shapes their Lives* (Lanham, MD: Rowman & Littlefield, 2000).

16 This is an area I've studied. See for example Brian Martin (ed.). *Confronting the Experts* (Albany: State University of New York Press, 1996); Brian Martin, "Suppression of dissent in science," *Research in Social Problems and Public Policy,* vol. 7, 1999, pp. 105–135.

17 For example, Edward De Bono, *Serious Creativity: Using the Power of Lateral Thinking to Create New Ideas* (London: Harper Collins, 1992).

means recognising that the principles underlying development of expert performance can be applied to creativity.

In another chapter, Epstein describes research by Philip Tetlock about making predictions.[18] Various commentators and field experts make all sorts of predictions: that the stock market will go up or down, that wars will occur or not, or that certain politicians will win elections. Tetlock was able to pin down individuals making predictions and discovered that most of them were little better than chance. Usually, experts were not better at forecasting than non-experts. What this suggests is that experts may be good in their field of expertise, but making accurate predictions is a different skill.

Tetlock also discovered that a small percentage of people are very good at forecasting. They tend to have wide-ranging interests, be good at practical statistics, and not be deeply knowledgeable about the topic they make forecasts about.

Epstein begins his chapter about this topic by telling about ecologist Paul Ehrlich's famous (or notorious) book *The Population Bomb* that warned of impending global mass starvation, a prediction soundly disproved by subsequent events. He then goes on to tell about Tetlock's research, which shows that generalists — or at least some generalists, especially the ones Tetlock calls superforecasters — are better than specialists at making accurate predictions.

There's another way to think about this. Superforecasters are skilled in a particular domain, making accurate predictions, and it is plausible that they develop their skills with practice. They make lots of near-term predictions and can learn from their mistakes. This is another area where the principles underlying acquisition of skills may be relevant, but are not mentioned by Epstein.

Final comments

David Epstein's book *Range* is a fascinating survey of the potential for making a contribution by not specialising: by searching to find match quality, by using analogies from a variety of areas, by solving problems that specialists can't, and by making forecasts. In making this case,

18 A recent book: Philip E. Tetlock and Dan Gardner, *Superforecasting: The Art and Science of Prediction* (New York: Crown, 2015).

Epstein unnecessarily minimises the importance of practice. It is illuminating to examine the blurb on the back cover of the paperback:

> The essential and exhilarating exploration into how to be successful in the twenty-first century.
>
> From the "10,000-hours rule" to the power of Tiger parenting, we have been taught that success in any field requires early specialization and many hours of deliberate practice. And, worse, that if you dabble or delay, you'll never catch up with those who got a head start.
>
> This is completely wrong.
>
> Studying the world's most successful athletes, artists, musicians, inventors and scientists, Epstein discovered that in most fields — especially those that are complex and unpredictable — generalists, not specialists, are primed to excel. In this landmark book, David Epstein shows that the way to excel is by sampling widely, gaining a breadth of experiences, taking detours, experimenting relentlessly, juggling many interests — in other words, by developing range.

Book blurbs are intended to attract readers, so some exaggeration, especially of the significance of the book, is understandable.[19] Even so, the blurb for *Range* is revealing.

• The "10,000 hours rule" is cited, even though expert performance researchers never cited 10,000 hours or said it was a rule.

• Supposedly, "we have been taught" about what is required for success in any field. I'm not aware of any studies of what children or adults have been taught about this. Very few individuals commit themselves to years of deliberate practice, and most of them are in restricted domains (classical music, competitive sports, chess). To refer to what's required of "success in any field" is wrong and misleading.

• Contrary to the statement that "if you dabble or delay, you'll never catch up," one of the findings from studies of expert performance is that you can improve at any age.[20]

• The blurb states that "in most fields … generalists, not specialists, are poised to excel." Epstein doesn't establish this.

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19 Most book blurbs are written by the author, or at least approved by the author.

20 Epstein refers to the "cult of the head start," but gives little evidence about how many people are obsessed with getting a head start via early training.

Consider surgeons, auditors, bus drivers or childcare workers: are generalists poised to succeed?

The disappointing aspect of *Range* is that most of Epstein's examples are compatible with research on expert performance, but he doesn't acknowledge this possibility.

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