Intelligence xxx (2013) xxx–xxx

Contents lists available at SciVerse ScienceDirect

Intelligence

Deliberate practice: Is that all it takes to become an expert?☆

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ARTICLE INFO

Article history:
Received 7 February 2013
Received in revised form 15 March 2013
Accepted 5 April 2013
Available online xxxx

Keywords:
Expert performance
Expertise
Deliberate practice
Talent

ABSTRACT

Twenty years ago, Ericsson, Krampe, and Tesch-Römer (1993) proposed that expert performance reflects a long period of *deliberate practice* rather than innate ability, or "talent". Ericsson et al. found that elite musicians had accumulated thousands of hours more deliberate practice than less accomplished musicians, and concluded that their theoretical framework could provide "a sufficient account of the major facts about the nature and scarcity of exceptional performance" (p. 392). The deliberate practice view has since gained popularity as a theoretical account of expert performance, but here we show that deliberate practice is not sufficient to explain individual differences in performance in the two most widely studied domains in expertise research—chess and music. For researchers interested in advancing the science of expert performance, the task now is to develop and rigorously test theories that take into account as many potentially relevant explanatory constructs as possible.

1. Introduction

Psychologists have been interested in how people become experts in music, the arts, science, games, sports, and professions for as long as psychology has been a field. Sir Francis Galton (1869) analyzed genealogical records of scientists, musicians, writers, poets, painters, athletes, and other men of "eminence" and found that they tended to be biologically related. He noted, for example, that there were over twenty eminent musicians in the Bach family. Acknowledging a role for "zeal" and "an adequate power of doing a great deal of very laborious work" (p. 37), Galton nonetheless concluded that "genius" arises from innate ability. John Watson (1930), the founder of behaviorism, famously captured the opposing view. Watson wrote:

> Give me a dozen healthy infants, well-formed, and my own specified world to bring them up in and I'll guarantee to take any one at random and train him to become any type of specialist I might select—doctor, lawyer, artist, merchant-chief and, yes, even beggar-man and thief, regardless of his talents… (p. 104).

Watson added that "practicing more intensively than others…is probably the most reasonable explanation we have today not only for success in any line, but even for genius" (p. 212). Thus the pendulum has swung between nature and nurture—the view that experts are "born" and the view that they are "made."

More recently, K. Anders Ericsson and his colleagues (Ericsson et al., 1993) sided with Watson when they proposed that expert performance–consistently performing at a superior

☆ This work is a collaboration between two research groups: the first through fourth authors, and the fifth and sixth authors. We are very grateful to David Lane, Lauren Harris, and Tom Carr for comments, and to Ramey Soukup for assistance in preparing the manuscript. We thank Rashika Vankataraman and staff for their care in copy editing and typesetting the article.

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0160-2896/$ – see front matter © 2013 Elsevier Inc. All rights reserved.
http://dx.doi.org/10.1016/j.intell.2013.04.001

level in a domain–reflects a long period of *deliberate practice* rather than innate ability, or "talent". Ericsson et al. defined deliberate practice as engagement in highly structured activities that are created specifically to improve performance in a domain through immediate feedback, that require a high level of concentration, and that are not inherently enjoyable. Ericsson et al. distinguished deliberate practice from two other forms of domain-specific experience–*work* and *play*–as follows:

> Work includes public performance, competitions, services rendered for pay, and other activities directly motivated by external rewards. Play includes activities that have no explicit goal and that are inherently enjoyable. Deliberate practice includes activities that have been specially designed to improve the current level of performance (p. 368).

To test their theory, Ericsson et al. (1993) asked violinists at a West Berlin music academy to rate various activities on relevance to improving violin performance, on effort, and on enjoyableness. They also asked the violinists to provide estimates of the time they devoted to the activities. Ericsson et al. found that the students whom the faculty had nominated as the "best" violinists had accumulated an average of over 10,000 h of deliberate practice by age 20, which was about 2500 h more than the average for the "good" violinists and about 5000 h more than the average for a "teacher" group (see Ericsson, 2006). In a second study, Ericsson et al. (1993) found that "expert" pianists had similarly accumulated an average of over 10,000 h of deliberate practice by age 20, compared to about 2000 h for "amateur" pianists.

Applying their framework to several domains, Ericsson et al. (1993) concluded that "high levels of deliberate practice are necessary to attain expert level performance" (p. 392)—and in the next sentence added the following:

> Our theoretical framework can *also provide a sufficient account* of the major facts about the nature and scarcity of exceptional performance. Our account does not depend on scarcity of innate ability (talent).... We attribute the dramatic differences in performance between experts and amateurs–novices to similarly large differences in the recorded amounts of deliberate practice (p. 392, emphasis added).

Ericsson et al. (1993) similarly explained that "individual differences in ultimate performance can largely be accounted for by differential amounts of past and current levels of practice" (p. 392) and that "the differences between expert performers and normal adults reflect a life-long period of deliberate effort to improve performance in a specific domain" (p. 400).

Ericsson et al. (1993) allowed that genes may contribute to individual differences in people's willingness to engage in deliberate practice over a long period of time, and thus may indirectly contribute to individual differences in performance, but as the preceding quotations make clear, they explicitly rejected the view that innate *ability* can account for why some people become experts and others fail to do so. Ericsson, Nandagopal, and Roring (2005) recently reiterated this perspective when they wrote that

> individual differences in genetically determined capacities and fixed structures required for the development of elite performance appear to be quite limited, perhaps even restricted, to a small number of physical characteristics, such as height and body size. The expert-performance framework attempts to explain the large individual differences in performance in terms of individual differences in sustained deliberate practice (p. 305).

Similarly, Ericsson (2007) argued that "it is possible to account for the development of elite performance among healthy children without recourse to unique talent (genetic endowment)—excepting the innate determinants of body size" (p. 4) and that "distinctive characteristics of elite performers are adaptations to extended and intense practice activities that selectively activate dormant genes that all healthy children's DNA contain" (p. 4). Ericsson, Prietula, and Cokely (2007) wrote more simply that "The *only* innate differences that turn out to be significant–and they matter primarily in sports–are height and body size" (p. 116, emphasis added).

1.1. Impact and criticisms of the deliberate practice view

As two of us noted in a recent *New York Times* op-ed (Hambrick & Meinz, 2011a), Ericsson and colleagues' research has captured the popular imagination, perhaps because of its meritocratic appeal—the implication that nearly anyone can become an expert with enough hard work. In his bestselling book *Outliers*, the writer Malcolm Gladwell (2008) summarized Ericsson et al.'s (1993) findings and then described the opportunity to practice as the major theme of the biographies of Bill Gates and The Beatles. Ericsson and colleagues' research is discussed in a number of other popular books, including Daniel Levitin's (2006) *This is Your Brain on Music*, Geoff Colvin's (2010) *Talent is Overrated*, Daniel Pink's (2009) Drive, Daniel Coyle's (2009) *The Talent Code*, David Shenk's (2010) *The Genius in All of Us*, Matthew Syed's (2010) *Bounce*, and David Brooks' (2011) *The Social Animal*.

The Ericsson et al. (1993) article has been cited in the scientific literature over a thousand times (source: Web of Science), making it a "citation classic" many times over, and Ericsson and colleagues have been praised for advancing scientific understanding of expert performance. Freeman (2007) observed that "The field of gifted and talented research is in serious need of scientific work of this calibre, as distinct from theories, models and anecdotes" (p. 65), and Kaufman (2007) commented that "The expert performance approach championed by Ericsson et al. provides a scientific way forward for research on giftedness, and offers exciting new ways to further our understanding of the determinants of high ability within a particular domain of expertise" (p. 71).

At the same time, Ericsson and colleagues' view has been roundly criticized on conceptual and methodological grounds. Gardner (1995) commented that the deliberate practice view "requires a blindness to ordinary experience" (p. 802), and Sternberg (1996) observed that "Most people who want to become experts–whether as violinists, skiers, physicists, or whatever–do not make it. They drop out along the way" (p. 350). Schneider (1998) questioned "the basic assumption that progress in a given domain is solely a function of deliberate practice" (p. 424), and Detterman, Gabriel, and Ruthsatz (1998) predicted that deliberate practice "will not equalize outcome despite the best of intentions" (p. 412). Anderson

Please cite this article as: Hambrick, D.Z., et al., Deliberate practice: Is that all it takes to become an expert? *Intelligence* (2013), http://dx.doi.org/10.1016/j.intell.2013.04.001