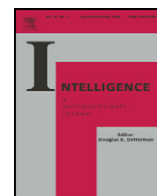




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Intelligence



Addressing the recommended research agenda instead of repeating prior arguments

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ABSTRACT

Perhaps because of the long history of the debate, Ericsson (this issue) largely failed to address the main arguments in my proposed research agenda (Simonton, this issue). Instead, he focused on responding to earlier questions in that controversy. Consequently, the agenda was here translated into a series of specific empirical questions that capture the key features of the hypothesized structural model. Although this model is recursive, it is possible to test for non-recursive specifications if future research shows that it is necessary. Yet at present, it seems most reasonable to assume that both cognitive abilities and dispositional traits are antecedents to creative performance. Because the variables in both of these sets have substantial heredities, the causal basis remains for a genetic contribution to creative achievement.

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Very little of Ericsson's (this issue) response to my article (Simonton, this issue) directly deals with the specific questions that I had introduced in the latter essay. Instead, he addresses matters that have been raised in prior discussions of the general topic, points of contention that I did not even discuss because they have no involvement whatsoever in my argument. Most notably, Ericsson devotes considerable effort to attacking the theory of emergence despite the fact that I specifically pointed out that my argument only assumed regular additive inheritance (Simonton, this issue; see also Simonton, 2008). Hence, his criticism of inferences drawn from twin studies proves completely irrelevant to my proposed research agenda. Empirical data might someday invalidate emergent theory without compromising one iota the central points made in my article. Modern behavioral genetic research is not entirely dependent on twin data anyway.

Ericsson's diversion from the main thrust of my paper is perhaps not surprising given that he and I have been debating the expert-performance approach to understanding outstanding creativity for almost 20 years—and not just in print. Along with Robert J. Sternberg and Ellen Winner, I was among the minority dissenters at the international conference on “Acquisition of

Expert Performance” that Ericsson helped organize in 1995 (the source for Ericsson, 1996; see Simonton, 1996). Besides disagreeing with the majority position, I found myself in the most surprising position of defending behavior genetics in a breakfast discussion with Herbert Simon, Ericsson's doctoral mentor (surprising because most of my own empirical research had focused on environmental influences!). The debate continued in 2006 when Ericsson invited me to give a departmental colloquium on the issue at Florida State University. Five years later, in 2011, Ericsson and I went mano-a-mano in a public debate on “10,000 hours: Does Practice Make Perfect?” held at Pomona College—a heated debate that got substantial pre-warming in our dinner conversation preceding the event. Thus, my insider impression upon reading his current article is that he was more interested in continuing those past controversies than confronting my current, more novel argument (see also Ericsson, in press; Simonton, 2000, 2013).

Perhaps Ericsson also decided to ignore this new argument because it is exceedingly complex, maybe even more complex than the notion of multiplicative inheritance. So-called “talent” for exceptional creativity in a particular domain is not a single coherent and fixed entity. A specific talent for mathematics or for music is not presumed to exist. Instead, talent is defined using one portion of the “reduced form equations” that specify the relation between the endogenous variables of creative

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performance (CP) and deliberate practice (DP) and the exogenous variables of genetic factors (GF, latent) and environmental factors (EF, observed), with cognitive ability (CA) and dispositional traits (DT) as intervening variables (acronyms here and following from Simonton, this issue). The coefficients for these reduced form equations then indicate how the genetic factors, controlling for the environmental factors, contribute to creative performance through the available compound or indirect paths. The sum of these compound paths, the components previously adjusted for the heritabilities, then represents the total genetic contribution to creative performance (see Simonton, 2008, for the computational complications). Because CP, DT, CA, DT, GF, and EF each represents sets of variables, these developmental pathways between GF and GP or DT are multiple, some compound paths mediated by cognitive abilities and others by dispositional traits, some impinging on DP as a second-level mediator and others impacting directly on CP. Accordingly, two creators can exhibit the same overall magnitude of performance by a given criterion (e.g., journal citations for scientists or juried showings for artists) without having anywhere near the same genetic constitution (see also Johnson & Bouchard, *in press*, for more detailed discussion of potential genetic niceties).

Hence, when Ericsson (this issue) mentioned the relatively low IQs of Richard Feynman, James Watson, and William Shockley, he is utterly missing the point. Long ago it was shown that intelligence was just one of many factors that predicted achieved eminence (Cox, 1926). Determination, drive, persistence, and like motivational variables could compensate for less than superlative intelligence (but still well above average given that the three named scientists would all be considered intellectually gifted). Whenever a given effect has multiple causes, then tradeoffs between those causes become commonplace. Someone can be low on one predictor but higher on another predictor. Structural equations routinely work this way.

Rather than explicate this multivariate structural equation model any further, perhaps a better strategy is to formulate an explicit series of basic empirical questions implicated by the recommended research agenda. The questions are four in number:

1. Even after adjusting for measure reliability, do individual differences in the quantity and quality of deliberate practice explain 100% of the variance in creative performance? If the answer is negative, then Ericsson's position is problematic from the start.
2. Is 100% of the reliable variance in creative performance still explained after introducing the relevant and reliable variance in individual differences regarding antecedent cognitive abilities and dispositional traits? If the answer is negative, then a portion of the supposed predictive power of deliberate practice may be spurious (ironically, see Simon, 1954). For instance, a part of the raw cross-sectional variance in deliberate practice may just represent individual differences in motivation, a factor that affects performance just as much as practice if not more. Practice serves as a proxy measure for that motivational component.
3. What explains cross-sectional variance in deliberate practice? Are there any individual difference variables besides motivation, which Ericsson seems willing to accept? Specifically, are there any cognitive abilities or dispositional traits, particularly either highly stable characteristics or attributes

that are assessed prior to the onset of practice or performance measurements? What about general intelligence or conscientiousness?

4. Do any of the variables provided in response to the previous question have reasonably high genetic loadings? To the extent that these antecedents have substantial heritability coefficients, then some "nature" must participate along with the "nurture." The additional explanatory variance cannot be just swept under the rug because it is theoretically inconvenient (Simonton, 2013). Given how rare it is to find any basic ability or trait with zero heritability, the response to this question is highly likely to be affirmative, again disconfirming Ericsson's position.

To be sure, these four questions are all contingent on the recursive model sketched out in Fig. 1 (Simonton, this issue). Ericsson (this issue) argues that the process might be non-recursive, dispositional traits associated with performance representing the consequences rather than the antecedents. This hypothesis is certainly worth pursuing in future empirical research. Yet the evidence collected so far casts considerable doubt on this conjecture. For instance, openness to experience not only has a strong positive association with creative achievement, it is also strongly heritable and highly stable across the life span (especially those facets most strongly associated with creativity; McCrae & Greenberg, *in press*). Cross-sectional variance vastly exceeds longitudinal variance. Furthermore, it is extremely difficult to understand how deliberate practice can account for the nitty-gritty details of this association, such as the critical connection between creative thought and cognitive disinhibition, a strong correlate of openness (Carson, *in press*). Thus, at this point far more evidence supports DT → CP than CP → DT. Ultimately, this question must be empirically addressed as part of the overall research agenda.

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