

BOOK REVIEW

The rationality quotient: toward a test of rational thinking, by Keith E. Stanovich, Richard F. West, and Maggie E. Toplak, Cambridge, MA: The MIT Press. 480pp. ISBN: 0262034840, 9780262034845. \$39.00 USD (hbk)

As a graduate student in the early 2000s, I was first introduced to Keith Stanovich's book, *Who is rational? studies of individual differences in reasoning* by Keith Stanovich (1999). It left an indelible mark in my research career, reinforcing and encouraging ideas to meld the behavioural decision-making literature with individual differences research. Until that time, this path had rarely been explored in the judgement and decision-making field; work was beginning to emerge, but the field was significantly embedded in paradigms that involved between-subjects designs that treated variability more as error variance than potentially meaningful individual differences. Stanovich and Richard West were early pioneers in this field, creating a space for aspiring young researchers to conduct research and begin to test the degree to which individual differences in rational thinking exist, how different types of normative violations relate to one another, and whether the assessment of these individual differences predict real-world outcomes. In their new offering, *The rationality quotient: toward a test of rational thinking*, Keith Stanovich, Richard West and Maggie Toplak significantly expand on this idea, not only summarising past work in the field, but also proposing a comprehensive new instrument to measure individual differences in rational thinking. This book highlights an impressive body of work undertaken in their laboratory, designed to address these research questions. I feel that this book will encourage researchers, both established and new to the field, to consider individual differences in rational responding as an important factor that has the ability to predict well-being across a variety of contexts, both at the personal and the societal levels.

The over-arching aim of this book is to establish the groundwork for an objective performance test of rational responding, an important component of thinking skills that is believed to be overlooked by standard IQ tests. Such an endeavour is challenging because of the multiple questions it needs to address, for instance: What is the theoretical rationale for such a test? What components to include? How to measure them? What is the phenotypic structure of rationality? *The Rationality Quotient* is comprehensive in its scope and aims to answer these questions. They present a thorough theoretical rationale for a "Comprehensive Assessment of Rational Thinking test (CART)" as a broad measure of rational thinking tendencies, as well as empirical evidence that highlights the utility of such a test.

As with the development of any psychometric test, the ultimate aim is to continually establish construct validity. Cronbach and Meehl's (1955) original conceptualisation included three major steps to (1) establish theoretical concepts and how they relate to one another, (2) develop ways to measure these concepts, and (3) assess the hypothesised relationships between these concepts. Messick (1989)

further expanded on the necessities for establishing construct validity, proposing that a test should be evaluated in terms of six criteria. First, the test must be grounded in sound theory. As a necessary first step in developing a new individual differences scale, the test developer must clearly, conceptually define the construct. Second, a test's content must reasonably match the theory of interest. After all, a psychological test can be considered a test of theory. Third, tests should exhibit structural validity; that is, the tested concepts should relate with one another in theoretically predicted ways. Fourth, a test should demonstrate theoretically relevant convergent, discriminant and predictive validity. Fifth, the test should be generalisable across different settings and groups. Finally, Messick argued that a test should establish consequential validity. In other words, what are the potential consequences of interpreting a test score, both positive and negative? If there are risks, then do the benefits of a score outweigh the potential negative consequences of inappropriate interpretations or uses of test scores? Of course, these criteria cannot be met by any single study or one research group. Instead, the development of a new test, and a corresponding evaluation of construct validity emerges as a new empirical journey undertaken by researchers and theorists from a multitude of disciplines. With this in mind, *The Rationality Quotient* aptly recognises this reality.

The Rationality Quotient flows from the broad theory underlying the development of the CART to empirical evidence that supports the test's external validity. Section one provides a theoretical basis for the CART development, and detailed explanation of particular theoretical subcomponents that may drive different irrational responses. Grounded in dual-process theory, the authors distinguish between assessments of rationality and intelligence, and highlight the need for tests of the former. In their theoretical conceptualisation, they propose moving towards a tripartite model of dual processes, which separates "System 2" processing, into a reflective and algorithmic mind, in addition to System 1 processes that encompass the automatic mind. According to the authors, this distinction in System 2 is vital for conceptualising individual differences in rational thought, and distinguishing it from the type of mental abilities that are assessed in intelligence tests. Whereas the algorithmic level refers to how information processing systems of the mind (e.g., perceptions, motor responses, working memory, etc.) contribute to behaviour, the reflective mind corresponds with why an individual engages in such a behaviour. The reflective system is concerned with making choices consistent with one's goals, motivations and beliefs. Rationality, in the eyes of Stanovich and colleagues, arises from effective functioning in all conceptualisations of the mind in the tripartite model. However, existing tests of intelligence heavily assess the performance and capacity of the algorithmic mind, leaving individual differences in reflective and automatic mind performance to be under-represented in traditional measures of general mental ability. It is this lack of content coverage in current intelligence tests that motivates the group to develop this new comprehensive assessment tool.

Building from this tripartite model, the authors then work towards outlining a taxonomy of thinking errors with two broad categories, expanding on an earlier theoretical taxonomy of thinking biases (Stanovich, Toplak, & West, 2008). The *miserly processing* category can be further delineated into three qualitatively

different forms, involving (a) the detection of conflicting responses (e.g., responses on the Cognitive Reflection Task; Frederick, 2005), (b) failure to override an automatic response (e.g., syllogistic reasoning problems), and (c) relying too much on the given context, which Stanovich et al. refer to as “serial associative cognition with a focal bias (e.g., framing and anchoring effects). Similarly, irrational thought that results from the second category, *mindware problems*, can arise from multiple sources, including “gaps” in knowledge that may help to rationally answer a problem, or “contaminated mindware” that may promote irrational thought, such as anti-science attitudes or superstitious thinking. Additionally, the *Rationality Quotient* takes care to distinguish these sources of thinking errors from “thinking dispositions” (e.g., Actively Open-minded Thinking; Baron, 1985; Stanovich & West, 2007). Thinking dispositions refer to relatively stable cognitive styles reflecting, for instance, one’s tendency to deliberate on problems (vs. to act impulsively), or to enjoy engaging in complex and effortful cognitive activities (i.e., Need for Cognition; Cacioppo, Petty, Feinstein, & Jarvis, 1996). These tendencies, however, are not direct measures of rationality, argues the authors, as they do not reflect maximising tendencies directly. Chapter 11 details this proposed difference, and provides detailed rationale for the inclusion of these dispositional measures. In order to gain a broader picture of an individual’s propensity to think rationally, the authors advocate for administering four supplemental scales which reflect individual differences in the tendency to (a) think flexibly (Actively Open-Minded Thinking), (b) engage in deliberative thought, (c) think about the future (Strathman, Gleicher, Boninger, & Edwards, 1994), and (d) clearly identify and describe one’s own feelings (similar to Alexithymia scales; Bagby, Parker, & Taylor, 1994).

In Section two of the *Rationality Quotient*, the authors detail the creation of the CART. The chapters in this section comprehensively detail the rationale for the inclusion of particular indicators for each subcomponent of the CART, as well as information about the psychometric properties of the tests. Scaffolding the tests off their theoretical taxonomy of biases, they propose several subtests to measure different components of rational thinking. The complete version of the CART includes 20 subtests, along with four thinking disposition scales, and takes approximately three hours to complete the entire assessment. The subtests include competencies such as the avoidance of miserly processing (e.g., belief bias, framing effects, temporal discounting), probabilistic and statistical reasoning, scientific reasoning, numeracy, expected value sensitivity and tests assessing contaminated mindware (e.g., superstitious thinking, conspiratorial beliefs). In addition to the extensive descriptions of the subtests, this section highlights the complexities involved with developing an individual difference measure that effectively assesses rationality from a broad perspective. One of the main challenges of developing such a test has been the ability to adopt paradigms that were traditionally assessed between-subjects; one must have confidence that administering them in within-subject design has the ability to elicit the same effect without changing the psychological nature of the task (e.g., changing a serial associative processing task into a response consistency task, as might happen in an anchoring paradigm; p. 149). Throughout this section, the authors discuss this important, and often under-appreciated, issue.

Section three shifts the discussion of the CART into an empirical examination of the test. Chapters 12 and 13 are data-intensive and focus on an abbreviated form of the CART. The creation, and subsequent validation, of an abbreviated CART is an issue of vital importance. Although more details regarding the short-form development would have been informative, overall, these chapters offer the promise for a more practical measure that would increase the opportunity for test use in experimental settings. The short-form assessment, which takes less than two hours to complete, reduces the time spent on the full version by an hour, and demonstrated comparable convergent validity with hypothesised variables of interest, such as SAT scores and Actively Open-Minded Thinking (e.g., Baron, 1985) scores. Chapter 13 offers an empirical look at the full version of the CART, providing descriptive statistics, correlations with theoretically related constructs such as thinking dispositions, and gender differences.

The *Rationality Quotient* concludes with an engaging discussion about future directions and important caveats (Chapter 14) as well as the social and practical implications of a test (Chapter 15). I found these chapters to be particularly informative with respect to measurement issues and psychometric challenges that arise when developing an assessment of this nature. Moreover, the authors acknowledge other approaches to measure individual differences in “rational thinking”, such as the Adult Decision Making Competence (Bruine de Bruin, Parker, & Fischhoff, 2007) and the Halpern Critical Thinking Assessment (Halpern, 2010). In their discussion, they compare and contrast the CART with these assessment batteries, highlighting the similarities between the measures, and how the CART may represent an extension from these tests. Further, the authors address other caveats that are equally as important. For instance, the authors raise an important issue regarding whether rational thinking measures should be considered formative (i.e., a construct in which indicators, that may or may not be associated with one another, are combined to form an index, similar to an index of socio-economic status) or reflective (i.e., a latent variable model in which variation in the latent construct is believed to “cause” variation in the indicators, similar to a personality trait). This discussion has implications for how the field conceptualises individual differences in rationality, how the tests are interpreted and its predictive validity. Importantly, the authors make a point that psychometric issues concerning the phenotypic structure of rational thinking skills should not supersede the practical and theoretical importance of the concept (p. 286). Future research and debate will accompany psychometric issues, and this should be seen as progress in order to refine the measurement of a construct that has a great deal of practical significance.

In Chapter 15, the authors discuss the broader implications of developing a rational thinking test. Ultimately, a psychological test and its components should demonstrate predictive validity. Stanovich and colleagues summarise the associations between measures related to the CART components and real-life outcomes, building their case for predictive validity of these component tasks. Although sometimes critiqued for being too artificial in nature, emerging evidence suggests that individual differences in rational thinking have real-life implications. These outcomes can be at the individual level, affecting one's financial, health or

psychosocial well-being. Even more broadly, irrational thinking may have impacts at the societal level. For example, inaccurate risk knowledge (e.g., assuming that risks and benefits are inversely related, overweighting rare events or neglecting that some risks may be dose-dependent) may lead to either an over-reaction or inaction. Inaccurate risk assessment may lead to wasting valuable and finite resources in order to eliminate a highly unlikely risk, when it could have been used to mitigate a hazard that potentially affects more individuals. In addition to the impact of incorrect risk assessment, this concluding chapter offers other examples that help illustrate the utility of assessing individual differences in rationality. Understanding how rational responding contributes to real-world instances of maladaptive behaviours offers the potential for more effective avenues by which risk communication and policy efforts designed to promote health-effacing behaviour can be developed.

This book is not merely a summary of past work or a “user’s manual” for the CART, but instead provides a space for future research in the study of individual differences in rationality to be conducted. In their discussion, the authors are honest of the limitations of the CART and provide detailed suggestions and ideas for subsequent test development. By conducting more refined psychometric analyses, replicating factor structures, fine-tuning measures when appropriate, and continuing to establish its construct validity, researchers – basic and applied alike, will potentially have an important tool to assess individual differences in rational thinking. In sum, *The Rationality Quotient* provides an excellent starting point from which researchers interested in the intersection between individual differences and behavioural decision-making may launch.

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<https://doi.org/10.1080/13546783.2017.1346521>

