

Dynamic assessment: a case of unfulfilled potential?

Julian G. Elliott (*corresponding author*)

Collingwood College

Durham University,

South Rd, Durham DH1 3LT

UK

+44 191 334 5000

joe.elliott@durham.ac.uk

orcid.org/0000-0002-9165-5875

Twitter: JulianElliott11

Elliott, J. G., Resing, W. C. M., & Beckmann, J. F. (2018).
Dynamic assessment: a case of unfulfilled potential?
Educational Review, 70(1), 7-17.
doi:10.1080/00131911.2018.1396806

Wilma C.M. Resing

Department of Developmental and Educational Psychology, Faculty of Social Sciences,

Leiden University, The Netherlands

Wassenaarseweg 52, 2333 AK, LEIDEN, NL

+31 71 527 3680

resing@fsw.leidenuniv.nl

orcid.org/0000-0003-3864-4517

Jens F. Beckmann

School of Education, Durham University, Durham, UK

Leazes Rd, Durham DH1 1TA

+44 191 334 8375

j.beckmann@durham.ac.uk

orcid.org/0000-0002-4006-9999

ABSTRACT

This paper updates a review of dynamic assessment in education, by the first author, that was published in this journal in 2003. It opens by pointing out that the original review failed to examine the important conceptual distinction between dynamic testing (DT) and dynamic assessment (DA). While both approaches seek to link assessment and intervention, the former is of particular interest for academic researchers in psychology, whose focus is upon the study of reasoning and problem-solving. In contrast, those working in the area of dynamic assessment, often having a practitioner orientation, tend to be particularly concerned to explore the ways by which assessment data can be employed to inform educational practice. It is argued that while some authors have considered the potential value of DA in assisting classification, or in predicting future performance, the primary contribution of this approach would seem to be in guiding intervention. Underpinning this is the view that DA can shed light on the operation of underlying cognitive processes that are in some way impairing learning. However, recent research has demonstrated that the belief that deficient cognitive (or executive) functions could be identified and ameliorated, and subsequently result in academic progress, has not been supported. Where gains in such processes/functions have sometimes been found in laboratory training studies, these have tended not to transfer meaningfully to classroom contexts. The review concludes by pointing out that DA continues to be supported primarily on the basis of case studies and notes that the call, expressed in 2003, for research that systematically examines the relationship between assessment and intervention has yet to be realized.

KEYWORDS: Dynamic assessment and testing; Learning potential; Cognitive education; Brain training

Imagine a form of educational assessment in which the assessor and the child collaborate to help the latter perform more capably on the test. At the outset, the assessor gauges the child's unassisted ability and, in the light of the rich information that is provided, subsequently provides the support necessary to effect improved performance. The amount of support is

carefully calibrated to ensure that it is neither too little or too great. Key to this process is the need to gain a sound understanding of the cognitive abilities of the child, their responses to challenge, and the ways that they utilise or disregard the assessor's inputs. Thus, assessment focuses both upon academic performance and the cognitive processes that are considered to underpin this. Surely, such an approach closely mirrors the nature of the multiple interactions that constantly take place between teacher and student in classrooms all over the world? Wouldn't this form of assessment provide teachers with far greater insight into the child's potential, while also pointing to the best ways to help those struggling to maximise their learning?

Compare this approach with those forms of psychological assessment that are most commonly utilised in education settings, for example, intelligence testing. Here the administration of the test is usually closely scripted and, beyond brief familiarisation of material, and recognition of the need for the assessor to establish rapport, any assistance in the problem-solving process would typically be seen as introducing error into the measurement. Scores, derived from such tests are considered to primarily indicate the current ability, rightly or wrongly, of the child. This assumes that the child fully understands what is being asked of them, and is in a position to perform to the best of their ability. The difficulties of those children who shrink from the challenges of initial failure, unfamiliar content, or the experience of a daunting interpersonal dynamic are not easily addressed by such an approach. The gap between what the child can achieve unassisted and that which s/he can accomplish with help (the *zone of proximal development*) cannot be identified.

Given the distinction between these two approaches, it is hardly surprising that many educationalists and psychologists are instinctively drawn to the merits of dynamic assessment, an umbrella term that refers to a wide range of approaches typified by the provision of instruction and feedback as part of the testing process. Fifteen years ago, the first author (Elliott, 2003) outlined the history and nature of dynamic assessment, discussed some of the educational functions that these could serve, specified a number of challenges, and offered recommendations for the future. The current paper serves as a reflection upon the progress that has been made since this time.

In this short account, we do not propose to provide a detailed account of the theoretical origins, or a description of the different approaches, of dynamic assessment. In our opinion, the account provided in the 2003 paper continues to perform this function adequately. Rather, we will focus upon the progress made in relation to the functions of dynamic assessment and consider whether it has fulfilled its potential. However, prior to undertaking such analysis, it is necessary to highlight that the original paper did not sufficiently critique the tendency to treat synonymously a number of key concepts such as dynamic assessment, dynamic testing, learning ability (Guthke, 1982), cognitive modifiability (Tzuriel, 2013), trainability (Kern, 1930), intellectual change potential (Beckmann, 2001), and learning potential (Hessels, 2009). As Beckmann (2014) points out, if these terms do not all mean exactly the same thing (and opinions will differ in this respect), the establishment of the construct validity of each would need to focus on rather different criteria. As a result, it is possible that one might find oneself in a situation where, for example, dynamic tests of learning ability might prove to be more successful than dynamic tests of cognitive modifiability. Clearly, there is much conceptual work to be undertaken here.

The conceptual distinction between dynamic assessment and dynamic testing is important to highlight. This was not adequately addressed in the 2003 paper and the important differences of emphasis are often implicit, rather than explicit, in both the academic and professional literature. While both dynamic testing and dynamic assessment seek to link assessment and intervention, the focus of dynamic testing is principally with the test itself; in contrast, the primary focus of dynamic assessment is the intervention that follows. Dynamic testing is arguably of greater interest to academic and research psychologists. It represents a methodological approach to the psychometric assessment of intellectual functioning that uses systematic variations of task characteristics and /or situational characteristics in the presentation of test items with the intention to evoke intra-individual variability in test performance. Interindividual differences in intraindividual variation are seen as more adequately reflecting the dynamics in the organisation of human behaviour, including learning and cognitive flexibility (Beckmann, 2014; Guthke and Wiedl, 1996; Guthke and Beckmann, 2000; Guthke, Beckmann and Wiedl, 2003). In multiple studies, spanning many years, Resing and her colleagues (e.g. Resing and Elliott, 2011; Resing et al., 2012; Resing et al., 2016, Resing, Bakker et al., 2017; Resing, Touw et al., 2017) have utilised dynamic testing to improve our understanding of differences in the approaches and strategies

employed by children in a variety of problem-solving situations. It is important to note, however, that while such work has proven highly informative for academic psychologists and researchers, it has yet to provide significant insights that can inform individualized instruction for specific children.

In general, intervention in dynamic testing is a means to help the psychometric assessment process and to help us understand differences and commonalities in learning and problem-solving. In contrast, the focus of dynamic assessment is principally upon effecting intervention. To achieve a meaningful intervention for a given individual, dynamic assessment typically embraces a wide range of cognitive, affective and conative elements. Unsurprisingly, this latter approach generally has greater appeal to educationalists and clinicians. An illustration of this important distinction was the experience of the first author who, many years ago, travelled overseas to learn from one of the field's leading researchers. After demonstrating a sophisticated range of dynamic tests, the professor was asked how these could be used to support intervention work with children. His response was that as a research psychologist, this was no concern of his. In his opinion, any application of his measures to practitioner activity was the responsibility of educationalists.

In the rest of this paper, the primary focus will be upon the development of dynamic assessment over the past 15 years. While, work in dynamic testing should not be divorced from this consideration, the key consideration will be upon the extent to which dynamic approaches have fulfilled their promise in relation to educational practice.

Elliott (2003) posed the important question as to what should be the purpose of dynamic assessment. Was it to be primarily a means of:

- making more accurate educational classifications (e.g. gifted or intellectually disabled) that might inform programming and resourcing,
- providing superior predictions of future performance (that might assist in identifying those who would make maximum gains given further assistance), or
- providing detailed information about the individual child in ways that can help educationalists provide an individually tailored intervention matched closely to his or her particular needs

Elliot (2003) provided a detailed critique of the use of dynamic assessment for the purposes of classification and labelling. It is our opinion that the points that were made are equally relevant today and it is unnecessary to repeat these in the present paper.

Given the emphasis so often found in educational psychology upon prediction, it is not surprising that many papers in the research literature focus upon dynamic assessment's potential for superior prediction (Caffrey, Fuchs, and Fuchs, 2008). Such a focus has been strengthened by the growth of the response to intervention movement (RTI) in the United States and elsewhere. This approach seeks to identify those who are struggling, or are at risk of future failure, in key academic and behavioural domains. Rather than operating a "wait to fail" model in which clinical assessment occurs months or, as is often the case, several years later, RTI seeks to provide supportive action as soon as difficulties become apparent. The extent of the support offered at various tiers, or levels, of provision is a function of the level of progress that the child is making, rather than on the basis of a given diagnostic label.

A key challenge for RTI models has been the difficulty in determining how one can make the best-informed decisions about the amount and forms of help required for each child. It has been argued that dynamic assessment may be a relatively rapid way of making sound judgements about which tier/level is appropriate for a given child (Caffrey, Fuchs, and Fuchs, 2008; Cho et al., 2014). Spurred by the need to inform educational practice more effectively, there has been a significant shift in dynamic test content from problem-solving measures that resemble items typically found on IQ tests (e.g. Stevenson, Heiser, and Resing, 2016) to those in academic domains and the related curriculum itself (Compton et al., 2010; Cho et al., 2014) in particular, literacy (Aravena et al., 2016; Gellert and Elbro, 2017) and mathematics (Peltenburg, van den Heuvel-Panhuizen, and Doig, 2009; Seethaler et al., 2016). A further area that has received a much attention is language (King, Binger, and Kent-Walsh, 2015), including the needs of those whose first language is not that used in school and who, therefore, may score poorly on commonly used standardised test measures (e.g. Petersen and Gillam, 2015; Seethaler et al., 2016). It is likely that the predictive quality of these curricular measures will be highly domain specific (Grigorenko, 2009; Cho and Compton, 2015).

A further development in recent times has been an increasing use of computerised forms of dynamic assessment (McNeil, in press; Poehner, Zhang, and Lu, 2015; Resing, Tunteler, and Elliott, 2015; Zhang, Lai, Cheng, and Chen, 2017), even involving the use of 3D immersive environments (Passig, Tzurriel, and Eshel-Kedmi, 2016). One of the major contributions of computerised approaches is that these can utilise tangible materials that can lead to the capture of a mass of data (e.g., response latencies) that are not easily obtainable, or recorded, as part of the complex interpersonal dynamics of human-human testing (Resing and Elliott, 2011; Resing, Touw et al., 2017; Veerbeek et al., 2017). It will be interesting to see whether the development of what is likely to be an increasing rich area of research will succeed in resolving the fundamental questions raised in the 2003 review, and which are further addressed below. Alternatively, maybe increased use of computerisation will ultimately lead to alternative understandings concerning the value of dynamic approaches, for example, removing the need for one to one clinical work (Dumas and McNeish, 2017; McNeish and Dumas, 2017).

Attempts to validate dynamic assessment have largely sought to identify how students will progress in the future. However, in relation to prediction, the field has yet to resolve a fundamental theoretical and practical issue that was raised in Elliott (2003). Let's take a concrete example to illustrate this. Olivia is struggling in school. Her standardised test scores are low, as would be expected. Dynamic assessment indicates that she has much untapped potential. However, unless the child's environment is transformed in some meaningful fashion, her potential is unlikely to be revealed and the prediction will fail; thus, the predictive validity of dynamic assessment must be seen to be a function of the educational environment in which it operates. Of course, changing an educational environment is no easy task. It is far easier to speculate on a child's future potential than use the information from the assessment to inform subsequent practice in a meaningful fashion. As Haywood (1993) so adroitly noted:

‘... Prediction never was a particularly defensible objective. I could never understand what makes psychologists want to be fortune tellers! There should be scant satisfaction in knowing that our tests have accurately predicted that a particular child will fail in school. There are many sources

of such predictor information. What we need are instruments and approaches that can tell us *how to defeat those very predictions!* (pp. 5–6, emphasis as in original).

To some extent, RTI approaches offer the possibility of using assessment to make a difference to educational practice. Underpinning the approach is the expectation that the particular needs of students will be identified, and appropriate forms of intervention will be provided. However, RTI is essentially a way of structuring assessment and intervention; the educational practices that are used within this approach must be determined separately. So can dynamic assessment help with this? We now turn to consider whether dynamic assessment can provide educationalists with insights about any given student that can inform the nature of subsequent individualized intervention.

Elliott (2003) identified the approach of Feuerstein and colleagues (1979, 1980) as one that closely linked dynamic assessment with subsequent intervention. While the conceptual and theoretical breadth and depth of Feuerstein's work is impressive, his assessment tool, *the Learning Potential Assessment Device*, later re-termed the *Learning Propensity Assessment Device*, (LPAD) has largely failed to gain a significant foothold in education circles. It was noted in Elliott (2003) that challenges stemmed from the lack of accessibility of its language to teachers, and a lack of conceptual clarity (Büchel and Scharnhorst, 1993; Guthke and Beckmann, 2000; Sternberg and Grigorenko, 2002). Since this time, a further powerful criticism is that, over the past three decades, Feuerstein's theory and concepts, and the assessment tool derived from these have not advanced significantly in parallel with progress in psychological science. Despite these criticisms, and the relatively scarce use of his assessment tool, Feuerstein's seminal contribution to our understandings about children's ability, potential, and how we might assess these, has been highly influential to the work and orientation of many psychologists and educationalists.

The notion that dynamic assessment could identify what Feuerstein and colleagues called 'deficient cognitive processes' which could then be remediated, and ultimately result in improved academic performance, has proven attractive to many. It received extra traction from the popularity of the 'thinking skills' movement that was becoming increasingly influential in schools (Fisher, 2005; McGuinness, 1999). This interest has been boosted more

recently by the rapidly growing interest in executive functioning, a term wholly absent from the Elliott (2003) paper. Executive functioning is something of an umbrella term that is used to describe a variety of cognitive processes that are used for the completion of a task, rather than for situations which require an automatic, instinctive response. While arriving at an agreed definition of executive functioning is problematic (Cirino and Willcutt, 2017) and opinions vary on which processes should be included, core executive functions would appear to involve (a) the capacity to inhibit one's actions appropriately (to exercise impulse-control and to control one's selective attention), (b) working memory, and (c) cognitive flexibility (Beckmann, 2014; Diamond, 2012, 2013).

If a child is experiencing significant attentional or self-regulatory difficulties it is unlikely that their learning will be optimal. It is unsurprising, therefore, that a relationship has been found between executive functioning and performance in literacy (Bull and Scerif, 2001; Borella, Carretti, and Pelgrina, 2010), mathematics (Duncan et al., 2010; Sasser, Bierman, and Heinrichs, 2015) and science (Nayfield, Fuccillo, and Greenfield, 2013). However, whether such relationships are causal is rather less clear (Jacob and Parkinson, 2015).

As noted above, it has been argued that a potential strength of dynamic assessment is that having identified cognitive (and executive) functioning difficulties, cognitive intervention programmes could be put into place to remediate these. Here, however, a mixed picture has emerged. While some (Diamond, 2012, 2013; Wass, 2015) contend that cognitive training programs are powerful means to improve executive functioning, others are less readily persuaded that such interventions will follow through to academic improvement (Cirino et al., 2017; Elliott and Resing, 2015; Redick et al., 2015). While this debate has largely taken place outside of the dynamic assessment literature, it is of crucial importance for those who believe that it is important to assess cognitive processes to better inform educational intervention. Opinions on this issue continue to be strongly divided. In one camp, are those (often psychometricians) who believe that individualised interventions in academic areas require an understanding of underlying cognitive functioning (Decker, Hale, and Flanagan, 2013). Thus, in relation to reading difficulties, Reynolds and Shaywitz (2009) argue:

“One of the major purposes of a comprehensive assessment is to derive hypotheses emerging from a student's cognitive profile that would allow the

derivation of different and more effective instruction. By eliminating an evaluation of cognitive abilities and psychological processes, we revert to a one-size-fits-all mentality where it is naively assumed that all children fail for the same reason ... At the current stage of scientific knowledge, it is only through a comprehensive evaluation of a student's cognitive and psychological abilities that we can gain insights into the underlying proximal and varied root causes of reading difficulties and then provide specific interventions that are targeted to each student's individual needs" (pp. 46-47).

Members of the other camp (e.g. Gresham, 2009; Fletcher et al., 2007; Fletcher and Vaughn, 2009; Fletcher et al., 2013) dispute the value of assessing underlying cognitive profiles of strengths and weaknesses as, other than in case study reports, there is very little evidence that such assessments can lead to differentiated forms of intervention that are effective. Fletcher, a powerful critic of cognitive profiling approaches asserts:

"Despite claims to the contrary (Hale et al., 2008) there is little evidence of Aptitude x Treatment interactions for cognitive/neuropsychological skills at the level of treatment or aptitude (Reschly and Tilley, 1999, pp. 28-29). The strongest evidence of Aptitude x Treatment interactions is when strengths and weaknesses in academic skills are used to provide differential instruction." (Fletcher, 2009, p. 506)

The evidence in support of the use of cognitive training programmes for improving educational attainment is not encouraging. Kearns and Fuchs (2013) undertook a review of 50 studies where cognitively focused instruction was employed either in isolation, or alongside academic interventions, to help children who were struggling with their learning. Few of these demonstrated that cognitive interventions were effective, and this number decreased when academic instruction was not an element in the intervention.

There does seem to be supportive evidence that specific cognitive/executive processes can be improved (at least, in the short term) by training programmes in laboratory settings (Dunning, Holmes, and Gathercole, 2013; Holmes, Gathercole, and Dunning, 2009). One would surely

anticipate that daily practice of a particular skill using very constrained laboratory tasks would ultimately improve performance in that task, in part because of the constant feedback about a narrow task, and a likely focusing of attention upon what is needed to succeed. However, it is unclear whether gains observed in the laboratory merely reflect practice effects and/or the development of a more effective test strategy (Estrada et al., 2015; Hayes, Petrov and Sederberg, 2015) that is unique to that setting.

The key problem in cognitive education or ‘brain-training’ programmes is that any gains found in laboratory studies do not appear to transfer to real-world settings, such as classrooms (Kirk et al., 2015; Redick, 2015; Simons et al., 2016). This problem is particularly common in interventions for working memory difficulties for children struggling with literacy development (Melby-Lervåg and Hulme, 2013; Banales, Kohnen and McArthur, 2015; Redick et al., 2015). However, even addressing underlying cognitive problems in real-world settings may also fail to result in academic gains (Elliott et al., 2010). Given such difficulties, and the significant opportunity costs that are often involved, it would seem preferable to use available resources and time to focus upon academic interventions (Rabiner et al., 2010; Jacob and Parkinson, 2015) as a means to inform educationalists about the nature and content of educational interventions is greatly weakened. Ultimately, advocates of dynamic assessment would then need to fall back upon its supposed benefits for improved classification and prediction – as direction wholly opposite to that which Elliott (2003) believed was most valuable for teachers, if not educational practice more widely.

There are, of course, many practitioners whose work has been positively influenced by the ideas underpinning dynamic assessment (Green et al., 2005). At the very least, it has sensitised many to the inherent problems of traditional standardized, unassisted testing. However, as Elliott (2003) pointed out, case study reports of educational (school) psychologists testifying to its value (e.g. Lidz and Elliott, 2000) are hardly sufficient for the validation of the approach. Rather, what was, and is, needed, was systematic and controlled studies that compare the differential impact of interventions based upon particular dynamic versus static (i.e. traditional) approaches. Of course, here, the focus was upon dynamic assessment, rather than dynamic testing, although this distinction was not carefully drawn at that time.

In seeking to establish validity, however, it is important to understand that (a) dynamic testing/assessment cannot be validated as a general test concept; (b) measures that utilise dynamic approaches need to be validated in their own right; (c) as with any test evaluation, the validation of such measures has to start with a clear definition of the target construct, target population and envisioned purpose of their use; (d) precise definition should lay the foundation for a qualitative – rather than a simplistic quantitative – focus. This examines whether the dynamic test under scrutiny can better predict construct-relevant behaviour (operationalized via an appropriate criterion) than competing traditional approaches, and (e) incremental validity can be achieved via an increase in the sensitivity of a prediction without sacrificing its specificity (Beckmann, 2014, p. 314). Essentially, this means that the test can become more effective in identifying those experiencing a particular difficulty, while at the same time not reduce its capacity to identify those who do not experience such a problem (Beckmann, 2006).

In relation to dynamic assessment, Elliott (2003) argued that:

“... future studies need to examine the extent to which dynamic assessments can: (a) result in recommendations for intervention that are (b) meaningful to, and will be employed by, practitioners (parents, teachers, therapists) and which (c) subsequently demonstrate meaningful gains that are unlikely to have been achieved in their absence. Such studies will be complex and problematic yet may be necessary if the claims of advocates of the approach are to be taken up on a widespread basis (p. 24).

Unfortunately, no such studies have been published in the intervening period, and the take up of dynamic approaches by educational psychologists continues to be low (Hill, 2015). Sadly, the perceived potential of learning potential (dynamic) assessment continues to remain unfulfilled.

References

Aravena, S., Tijms, J., Snellings, P., and van der Molen, M. W. 2016. “Predicting Responsiveness to Intervention in Dyslexia Using Dynamic Assessment.” *Learning and Individual Differences*, 49, 209-215.

- Banales, E., Kohnen, S., and McArthur, G. 2015. "Can Verbal Working Memory Training Improve Reading?" *Cognitive Neuropsychology*, 32(3-4), 104-132.
- Beckmann, J. F. 2001. *Zur Validierung des Konstrukts des Intellektuellen Veränderungspotentials*_[On the Validation of the Construct of Intellectual Change Potential]. Berlin: Logos.
- Beckmann, J. F. 2006. "Superiority: Always and Everywhere? – On Some Misconceptions in the Validation of Dynamic Testing." *Educational and Child Psychology*, 23, 35-49.
- Beckmann, J.F. 2014. "The Umbrella That is Too Wide and Yet Too Small: Why Dynamic Testing Has Still Not Delivered on the Promise That Was Never Made." *Journal of Cognitive Education and Psychology*, 13(3), 308-323.
- Borella, E., Carretti, B., and Pelgrina, S. 2010. "The Specific Role of Inhibition in Reading Comprehension in Good and Poor Comprehenders,." *Journal of Learning Disabilities*, 43, 541–552.
- Büchel, F. P., and Scharnhorst, U. 1993. The Learning Potential Assessment Device (LPAD): Discussion of Theoretical and Methodological Problems, In *Learning Potential Assessment*, edited by J. H. M. Hamers, K. Sijtsma and A. J. M. Ruissenaars, 83-111. Amsterdam: Swets and Zeitlinger.
- Bull, R., and Scerif, G. 2001. "Executive Functioning as a Predictor of Children's Mathematics Ability: Inhibition, Switching and Working Memory." *Developmental Neuropsychology*, 19(3), 273-293.
- Caffrey, E., Fuchs, D., and Fuchs, L. S. 2008. "The Predictive Validity of Dynamic Assessment: A Review." *The Journal of Special Education*, 41(4), 254-270.
- Cho, E., and Compton, D.L. 2015. "Construct and Incremental Validity of Dynamic Assessment of Decoding Within and Across Domains." *Learning and Individual Differences*, 37, 183–196.
- Cho, E., Compton, D. L., Fuchs, D., Fuchs, L. S., and Bouton, B. 2014. "Examining the Predictive Validity of a Dynamic Assessment of Decoding to Forecast Response to Tier 2 Intervention." *Journal of Learning Disabilities*, 47(5), 409-423.
- Cirino, P. T., Miciak J., Gerst, E., Barnes, M. A., Vaughn, S., Child, A., Huston-Warren, E. 2017. "Executive Function, Self-regulated Learning, and Reading Comprehension: Training Studies." *Journal of Learning Disabilities*, 50, 450–467.

- Cirino, P. T., and Willcutt, E. G. 2017. "An Introduction to the Special Issue: Contributions of Executive Function to Academic Skills." *Journal of Learning Disabilities*, 50(4), 355-358.
- Compton, D. L., Fuchs, D., Fuchs, L. S., Bouton, B., Gilbert, J. K., Barquero, L. A., and Crouch, R. C. 2010. "Selecting At-risk First-grade Readers for Early Interventions: Eliminating False Positives and Exploring the Promise of a Two-stage Gated Screening Process." *Journal of Educational Psychology*, 102, 327–341.
- Decker, S. L., Hale, J. B. and Flanagan, D. P. 2013. "Professional Practice Issues in the Assessment of Cognitive Functioning for Educational Applications." *Psychology in the School*, 50, 300–313
- Diamond, A. 2012. "Activities and Programs that Improve Children's Executive Functions." *Current Directions in Psychological Sciences*, 21, 335–341.
- Diamond, A. 2013. "Executive Functions." *Annual Review of Psychology*, 64, 135-168.
- Dumas, D. G., and McNeish, D. M. 2017. "Dynamic Measurement Modeling: Using Nonlinear Growth Models to Estimate Student Learning Capacity." *Educational Researcher*, 46(6), 284-292.
- Duncan, G.J., Dowsett, C.J., Claessens, A., Magnuson, K., Huston, A.C., et al. 2007. "School Readiness and Later Achievement." *Developmental Psychology*, 43, 1428-1446.
- Dunning, D. L., Holmes, J., and Gathercole, S. E. 2013. "Does Working Memory Training Lead to Generalized Improvements in Children With Low Working Memory? A randomized Controlled Trial." *Developmental Science*, 16, 915–925.
- Elliott, J.G. 2003. "Dynamic Assessment in Educational Settings: Realising Potential." *Educational Review*, 55, 15-32.
- Elliott, J. G., Gathercole, S. E., Alloway, T. P., Kirkwood, H., and Holmes, J. 2010. "An Evaluation of a Classroom-based Intervention to Help Overcome Working Memory Difficulties." *Journal of Cognitive Education and Psychology*, 9, 227-250.
- Elliott, J.G. and Resing, W.C.M. 2015. "Can Intelligence Testing Inform Educational Intervention for Children with Reading Disability?" *Journal of Intelligence*, 3(4), 137-157.
- Estrada, E., Ferrer, E., Abad, F. J., Román, F. J., and Colom, R. 2015. "A General Factor of Intelligence Fails to Account for Changes in Tests' Scores After Cognitive Practice: A Longitudinal Multi-group Latent-variable Study." *Intelligence*, 50, 93-99.

- Feuerstein, R., Rand, Y. and Hoffman, M. B. 1979. *The Dynamic Assessment of Retarded Performers: The Learning Potential Assessment Device, Theory, Instruments and Techniques*. Baltimore: University Park Press.
- Feuerstein, R., Rand, Y. and Hoffman, M. B. and Miller, R. 1980. *Instrumental Enrichment: An Intervention Program for Cognitive Modifiability*. Baltimore: University Park Press.
- Fisher, R. 2005. *Teaching Children to Think*. London: Nelson Thornes.
- Fletcher, J. M. 2009. "Dyslexia: The Evolution of a Scientific Concept." *Journal of the International Neuropsychological Society*, 15, 501-508.
- Fletcher, J. M., Stuebing, K. K., Morris, R.D., and Lyon, G.R. 2013. Classification and Definition of Learning Disabilities: A Hybrid Model. In *Handbook of learning disabilities, second edition*, edited by H.L. Swanson, K.R. Harris, and S. Graham, 33-50. New York: Guilford Press.
- Fletcher, J. M., Lyon, G. R., Fuchs, L. S., and Barnes, M. A. 2007. *Learning Disabilities*. New York, NY: Guilford.
- Fletcher, J. M., and Vaughn, S. 2009. "Response to Intervention: Preventing and Remediating Academic Difficulties." *Child Development Perspectives*, 3, 30-37.
- Gellert, A. S., and Elbro, C. 2017. "Does a Dynamic Test of Phonological Awareness Predict Early Reading Difficulties? A Longitudinal Study From Kindergarten Through Grade 1." *Journal of Learning Disabilities*, 50(3), 227-237.
- Green, T. D., McIntosh, A. S., Cook-Morales, V. J., and Robinson-Zanartu, C. (2005). "From Old Schools to Tomorrow's Schools: Psychoeducational Assessment of African American students." *Remedial and Special Education*, 26(2), 82-92.
- Gresham, F. M. 2009. Using Response to Intervention for Identification of Specific Learning Disabilities. In *Behavioral Interventions in Schools: Evidence-based Positive Strategies*, edited by A. Akin-Little, S. G. Little, M. A. Bray and T. J. Kehl, 205-220. Washington, DC: American Psychological Association.
- Grigorenko, E. L. 2009. "Dynamic Assessment and Response to Intervention: Two Sides of One Coin." *Journal of Learning Disabilities*, 42, 111-132.
- Guthke, J. 1982. "The Learning Test Concept - An Alternative to the Traditional Static Intelligence Test." *The German Journal of Psychology*, 6, 306-324.
- Guthke, J., and Wiedl, K.-H. 1996. *Dynamisches Testen. Zur Psychodiagnostik der Intraindividuellen Variabilität* [Dynamic Testing: On the Psycho-diagnostic of Intraindividual Variability]. Göttingen: Hogrefe.

- Guthke, J., and Beckmann, J. F. 2000. Learning Test Concept and Dynamic Assessment. In *Experience of Mediated Learning: An Impact of Feuerstein's Theory in Education and Psychology*, edited by A. Kozulin and B. Y. Rand, 175-190. Oxford: Elsevier Science.
- Guthke, J., Beckmann, J. F., and Wiedl, K. H. 2003. Dynamik im Dynamischen Testen [Dynamics in dynamic testing]. *Psychologische Rundschau*, 54, 225-232.
- Hale, J. B., Fiorello, C. A., Miller, J. A., Wenrich, K., Teodori, A. M., and Henzel, J. 2008. WISC-IV Assessment and Intervention Strategies for Children with Specific Learning Difficulties. In *WISC-IV Clinical Assessment and Intervention*, edited by A. Prifitera, D. H. Saklofske and L. G. Weiss, 109-171. New York: Elsevier.
- Hayes, T. R., Petrov, A. A., and Sederberg, P. B. 2015. "Do We Really Become Smarter When Our Fluid-intelligence Test Scores Improve?" *Intelligence*, 48, 1-14.
- Haywood, H. C. 1993. *Interactive Assessment: Assessment of Learning Potential, School Learning, and Adaptive Behavior*. Ninth Annual Learning Disorders Conference, Harvard University, Graduate School of Education, Cambridge, MA.
- Hill, J. 2015. "How Useful is Dynamic Assessment as an Approach to Service Delivery Within Educational Psychology?" *Educational Psychology in Practice*, 31(2), 127-136.
- Hessels, M. G. P. 2009. "Estimation of the Predictive Validity of the HART by Means of a Dynamic Test of Geography." *Journal of Cognitive Education and Psychology*, 8(1), 5-21
- Holmes, J., Gathercole, S. E., and Dunning, D. L. 2009. "Adaptive Training Leads to Sustained Enhancement of Poor Working Memory in Children." *Developmental Science*, 12, 9–15.
- Jacob, R., and Parkinson, J. 2015. "The Potential for School-based Interventions That Target Executive Function to Improve Academic Achievement: A Review." *Review of Educational Research*, 85, 512–552.
- Kearns, D., and Fuchs, D. 2013. "Does Cognitively Focused Instruction Improve the Academic Performance of Low-achieving Students?" *Exceptional Children*, 79(3), 263-290.
- Kern, B. 1930. *Wirkungsformen der Übung* [Effect Patterns of Practice]. Münster: Helios.
- King, M. R., Binger, C., and Kent-Walsh, J. 2015. "Using Dynamic Assessment to Evaluate the Expressive Syntax of Children who Use Augmentative and Alternative Communication." *Augmentative and Alternative Communication*, 31(1), 1-14.

- Kirk, H. E., Gray, K., Riby, D. M., and Cornish, K. M. 2015. "Cognitive Training as a Resolution for Early Executive Function Difficulties in Children with Intellectual Disabilities." *Research in Developmental Disabilities*, 38, 145-160.
- Lidz, C. and Elliott, J. (Eds.) 2000. *Dynamic Assessment: Prevailing Models and Applications*. New York: J.A.I. Press.
- McGuiness, C. 1999. From Thinking Skills to Thinking Classrooms: A Review and Evaluation of Approaches for Developing Pupils' Thinking. *Research Report 115*, London: HMSO.
- McNeil, L. in press. "Understanding and Addressing the Challenges of Learning Computer-mediated Dynamic Assessment: A Teacher Education Study." *Language Teaching Research*,
- McNeish D., and Dumas D. 2017. "Non-linear Growth Models as Measurement Models: A Second-order Growth Curve Model for Measuring Potential." *Multivariate Behavioral Research*, 52 (1), 61–85.
- Melby-Lervåg, M., and Hulme, C. 2013. "Is Working Memory Training Effective? A Meta-analytic Review." *Developmental Psychology*, 49, 270–291.
- Nayfield, I., Fuccillo, J., and Greenfield, D.B. 2013. "Executive Functions in Early Learning: Extending the Relationship Between Executive Functions and School Readiness to Science." *Learning and Individual Differences* 26, 81–88.
- Passig, D., Tzuriel, D., and Eshel-Kedmi, G. 2016. "Improving Children's Cognitive Modifiability by Dynamic Assessment in 3D Immersive Virtual Reality Environments." *Computers and Education*, 95, 296–308.
- Peltenburg, M., van den Heuvel-Panhuizen, M., and Doig, B. 2009. "Mathematical Power of Special-needs Pupils: An ICT-based Dynamic Assessment Format to Reveal Weak Pupils' Learning Potential." *British Journal of Educational Technology*, 40(2), 273-284.
- Petersen, D. B., and Gillam, R. B. 2015. "Predicting Reading Ability for Bilingual Latino Children Using Dynamic Assessment." *Journal of Learning Disabilities*, 48(1), 3-21.
- Poehner, M.E., Zhang, J., and Lu, X. 2015. "Computerized Dynamic Assessment (CDA): Diagnosing L2 Development According to Learner Responsiveness to Mediation." *Language Testing*, 32, 337–357.

- Rabiner, D.L., Murray, D.W., Skinner, A.T., and Malone, P.S. 2010. "A Randomized Trial of Two Promising Computer-based Interventions for Students with Attention Difficulties." *Journal of Abnormal Child Psychology*, 38, 131-142.
- Redick, T. S. 2015. "Working Memory Training and Interpreting Interactions in Intelligence Interventions." *Intelligence*, 50, 14-20.
- Redick, T.S., Shipstead, Z., Wiemmers, E.A., Melby-Lervåg, M., and Hulme, C. 2015. "What's Working in Working Memory Training? An Educational Perspective." *Educational Psychology Review*, 27(4), 617–633.
- Reschly, D. J., and Tilley, W. D. 1999. Reform Trends and System Design Alternatives. In *Special Education in Transition: Functional Assessment and Noncategorical Programming*, edited by D. J. Reschly, W. D. Tilley and J. P. Grimes, 19-48. Longmont, CO: Sopris West.
- Resing, W.C.M., Bakker, M., Pronk, C.M., and Elliott, J. G. 2016. "Dynamic Testing and Transfer: An Examination of Children's Problem-solving Strategies." *Learning and Individual Differences*. 49, 110-119.
- Resing, W.C.M., Bakker, M., Pronk, C.M., and Elliott, J. G. 2017. "Progression Paths in Children's Problem Solving: The Influence of Dynamic Testing, Initial Variability and Working-memory." *Journal of Experimental Child Psychology*, 153, 83-109.
- Resing, W.C., and Elliott, J.G. 2011. "Dynamic Testing with Tangible Electronics: Measuring Children's Change in Strategy Use with a Series Completion Task." *British Journal of Educational Psychology*, 81, 579-605.
- Resing, W. C., Touw, K. W., Veerbeek, J., and Elliott, J. G. 2017. "Progress in the Inductive Strategy-use of Children from Different Ethnic Backgrounds: A Study Employing Dynamic Testing." *Educational Psychology*, 37(2), 173-191.
- Resing, W.C., Xenidou-Dervou, I., Steijn, W.M.P., and Elliott, J.G. 2012. "A 'Picture' of Children's Potential for Learning: Looking into Strategy Changes and Working Memory by Dynamic Testing." *Learning and Individual Differences*, 22, 144-150.
- Reynolds, C. R., and Shaywitz, S. E. 2009. "Response to Intervention: Prevention and Remediation, Perhaps. Diagnosis, No." *Child Development Perspectives*, 3, 44-47.
- Sasser, T.R., Bierman, K.L., and Heinrichs, B. 2015. "Executive Functioning and School Adjustment: The Mediation Role of Pre-kindergarten Learning-related Behaviors." *Early Childhood Research Quarterly*, 30, 70-79.

- Seethaler, P. M., Fuchs, L. S., Fuchs, D., and Compton, D. L. 2016. "Does the Value of Dynamic Assessment in Predicting End-of-first-grade Mathematics Performance Differ as a Function of English Language Proficiency?" *The Elementary School Journal*, 117(2), 171-191.
- Simons, D. J., Boot, W. R., Charness, N., Gathercole, S. E., Chabris, C. F., Hambrick, D. Z., and Stine-Morrow, E. A. 2016. "Do 'Brain-Training' Programs Work?" *Psychological Science in the Public Interest*, 17(3), 103-186.
- Sternberg, R. J., and Grigorenko, E. L. 2002. *Dynamic Testing: The Nature and Measurement of Learning Potential*. Cambridge: Cambridge University Press.
- Stevenson, C. E., Heiser, W. J., and Resing, W. C. 2016. "Dynamic Testing: Assessing Cognitive Potential of Children with Culturally Diverse Backgrounds." *Learning and Individual Differences*, 47, 27-36.
- Tzuriel, D. 2013. "Mediated Learning Experience and Cognitive Modifiability." *Journal of Cognitive Education and Psychology*, 12(1), 59-80.
- Veerbeek, J., Verhaegh, J., Elliott, J. G., and Resing, W. C. 2017. "Process-oriented Measurement Using Electronic Tangibles." *Journal of Education and Learning*, 6(2), 155.
- Zhang, R. C., Lai, H. M., Cheng, P. W., and Chen, C. P. 2017. "Longitudinal Effect of a Computer-based Graduated Prompting Assessment on Students' Academic Performance." *Computers and Education*, 110, 181-194.