

Should neuroconstructivism guide developmental research?

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In her recent paper, Usha Goswami [1] argues in favour of developmental studies of developmental dyslexia, a point that has been well appreciated for at least 20 years [2,3]. She also argues in favour of a certain class of theories of dyslexia, namely theories involving a phonological deficit arising from auditory processing problems, a view that has met with some success [4]. More surprising is the reason provided for these two claims: that they follow from a theoretical framework called neuroconstructivism [5]. Here, I express my concern that such an argument might be interpreted as a call to replace empirical verification with theoretical conformity.

There are good reasons to agree with Goswami on many points, in particular on the importance of longitudinal designs. For instance, one classic controversy has been whether phonological awareness is a prerequisite for or a consequence of reading acquisition. Longitudinal studies starting before schooling have established that some aspects of phonological awareness exist prior to reading, predict future reading skill, and are already poorer in future dyslexics, thereby demonstrating that the phonological deficit hypothesis is not circular [2]. Similarly, supporters of visual theories of dyslexia would be well advised to carry out longitudinal studies to assess whether certain dyslexics' visual deficits are indeed a cause of poor reading, or a consequence of less training of their visual attention during reading acquisition.

Despite the consensus on the usefulness of longitudinal studies, cross-sectional studies are not, for all that, worthless, nor do they rely on a flawed, 'static' view of cognitive development. They should simply be taken for what they are worth, describing the state of the cognitive system at a given time. At a fraction of the cost of longitudinal studies, they are an efficient way to test new hypotheses, before eventually selecting the most relevant measures for longitudinal studies.

With so many good scientific reasons to appreciate developmental designs, why invoke neuroconstructivism? Of course, one is entitled to have a particular theoretical perspective and to use it to generate hypotheses; however, this one can be seen as ideologically loaded, insofar as it places certain beliefs beyond empirical verification. Constructivism, without empirical justification, placed at its core the belief that the human mind can have little innate structure beyond sensation [6,7]. Its modern version, neuroconstructivism, shares the same core belief, further suggesting that this has

been proven by neuroscience [8,9], a view that many neuroscientists would find odd [10].

From the core constructivist axiom a theorem follows: that no cognitive module in the adult mind can have originated in the newborn mind, but must have been acquired through interaction with the environment. A logical corollary is that a cognitive module cannot be congenitally disrupted [11]. Applied to developmental dyslexia, it follows that the theory that it is due to a *specific* (i.e. non auditory-based) phonological deficit must be wrong. Hence Goswami's conclusion that 'only a phonological deficit arising from low-level auditory processing problems meets the criteria for a neuroconstructivist approach' (p. 534). But should scientific theories be evaluated according to their conformity with neuroconstructivism, or on their ability to account for empirical data?

There is increasing evidence that specific phonological deficits are developmentally and neurologically plausible [12], and might indeed exist [13,14]. Furthermore, auditory theories are undermined by the finding that no more than 40% of dyslexics have any auditory deficit (including in supra-segmental processing), far less than those with phonological problems [15,16]. Supporters of auditory theories suggest that all dyslexics have auditory deficits in infancy, but a large proportion might outgrow these deficits so that they are no longer measurable at the time of reading acquisition. This hypothesis should be tested by assessing the auditory processing of at-risk dyslexic and control infants, and following up, within each individual, the consequences until reading acquisition (another example of the importance of longitudinal studies). Whatever the outcome, it would be unwise to disregard empirical evidence on the grounds that it contradicts one's theoretical preconceptions.

One advantage of neuroconstructivism may be the emphasis on certain important methodological principles, like developmental designs. Nonetheless I have demonstrated here that similar conclusions simply follow from a normal scientific assessment of the questions facing the field. On the downside, the core beliefs of neuroconstructivism unduly restrict the space of possible models and invite the disregard of valid data that doesn't fit the framework. Abstention might therefore be preferable. If the tenets of neuroconstructivism are correct, they will be proved and do not need asserting.

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