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One of the main aims of education is facilitating or enhancing learning processes, and all “fields” in psychology and education are in one way or another related to this. A relatively young emergent field that may have relevance is that of neuroscience, focusing on the mental and biological processes involved in human development and learning. The findings of rigorous research in this field have advanced understanding of the human brain and, in consequence, have provided intriguing insights into and speculations about aspects of learning and development. It is clear that this emerging field presents opportunities, but also challenges, as researchers seek to combine evidence with educational applications.

A report from the Royal Society (2011) considered how researchers might connect the key insights of neuroscience to those of education and lifelong learning. The report drew a number of conclusions. First, that neuroscientific research suggests that individual differences in learning processes are not solely determined by environmental factors, but also by biological ones. Second, that it has become quite evident that the brain is constantly changing under the influence of learning, and retains its plasticity throughout the life span. Third, since the acquisition of knowledge and mastering one’s own learning processes further influence learning, neuroscience could play a central role in understanding the processes and procedures which enhance brain power.

The influence of neuroscience is increasingly found in schools. From ‘brain training’ within the mainstream classroom, to remedial programmes for children with developmental or acquired brain injury, neuroscientific approaches to working with children are gaining attention. In fields such as Acquired Brain Injury, there is an emergent body of literature dedicated exclusively to children and young people. Parallel to this, a range of paediatric neuropsychological assessment tools are available. Some even speak of ‘educational neuroscience’, and training programmes in ‘educational neuropsychology’ (or ‘school neuropsychology’ in the United States) are being promoted. There is also a booming business in products, programmes and supplements which claim to affect the brain in particular ways.

The purpose of this special edition is to interrogate some of the ideas in neuroscience (some of which may have gained mythical status; some of which may be well-grounded in good science) involved in educational practice, and to analyse how far we might generalise from these in the classroom. Although there is great interest in neuroscience from researchers in many different domains, and educators in particular, evidence-based information is often scarce or non-available. In the report from the Royal Society (2011) and other researchers (e.g., Busso & Pollack, 2015), we find
various allusions to the rush to apply so-called “brain-based intervention” methods or programmes, which too often have a very weak (or, in some cases, non-existent) evidence-base. Here, too often, the educational potential of neuroscience has been subjected to hyperbolical or inflated claims that are not grounded in careful scientific study. Of course, we may see inspiring developments in basic sciences on both ends of the spectrum, but the gap between good neuroscientific evidence and practical applications in education is still considerable.

As applied psychologists, and many other professionals, engage with increasing frequency with neuropsychological assessment and neuro-educative programs, and recommend particular programmes claiming to address neuropsychological or learning difficulties, we thought the time was right for a special edition of Educational and Child Psychology to address issues about ‘neuroscience in education’. The readers will see that we have kept the range of topics purposefully wide, in order to attract as full and rich a selection of papers as possible.

The first contribution to this volume (Rees et al.) focuses on potential misinterpretations of the relationship between brain plasticity and the efficacy of training programmes, drawing on examples of overstated interpretations of research outcomes in neuroscience. This contribution highlights brain changes in early development of children, and suggests that there is an urgent need for professionals to critical evaluate so-called ‘brain training’ programmes.

The second paper (Santariano) focuses more specifically on children recovering from, and living with, brain tumours. The author provides a comprehensive summary of evidence-based research in the area, looking particularly at the effects of tumours and treatment on the functioning of children in various areas of cognition, as well as in social, emotional, physical domains, including their daily environment. Santariano goes on to suggest ways in which education and mental health professionals might best support this particular population. The paper clearly shows large individual differences in brain plasticity after treatment, and offers some generalisations that may relate more broadly to the wider child population affected by acquired brain injury.

The third article (Randall & Tyldesley) provides a systematic review of the effects of a number of training programmes developed and marketed commercially that claim to enhance working memory skills in 5-12 year old children. Although the review revealed some significant near and far transfer effects for improvements to working memory, overall data were found to be inconsistent and inconclusive, at best, regarding potential improvements to academic performances. Thus the paper suggests that far more research is needed into the field of working memory enhancement for children before such programmes can be comprehensively endorsed. In fact this probably reflects an increasing body of research literature that reports no significant effects from attempts to improve working memory.
The fourth contribution (Thomas & Atkinson) focuses on the increasingly popular area of ‘mindfulness’, evaluating the neurological effects of a 6-hour-mindfulness programme developed for 8 to 9 year-old children. Although the quasi-experimental design of the study made it difficult for the authors to exclude confounding variables, it nonetheless provides some tentative evidence about the programme in terms of the improvement of attentional functioning of the children. The authors make some interesting suggestions for further research into this area.

In the fifth contribution, Stark et al. look at difficulties with the processing of numerosity in early infancy, examining predicative markers such as weak motor skills in the second year of life. Early identification seems be particularly important given that changes in processing of numerosity are evident at the neural level, long before changes are observable at the behavioural level. The question as to whether increased exposure and instruction in numerosity processing can alter mathematical abilities later in childhood remains unanswered.

Authors of the last article (Hohnen & Murphy) provide an original model outlining the optimal context for a child to learn in the classroom, based upon different convergent but complementary ideas within neuroscience. This model has been developed to better inform educational practice about neuroscientific research outcomes regarding the continuous growth and plasticity of the brain.

This issue of *Educational and Child Psychology* makes it clear that the emerging field of neuroscience, and the evidence-based integration of neuroscience within educational practice, presents a range of exciting but challenging opportunities. The challenge is to continue to develop a firm critical evaluation of what has been written, said, and constructed about educational neuroscience. While the articles contained within this edition may add to the evidence base surrounding neuroscience and education, they also ask questions: what is the best way to support children who seem to be predisposed to difficulties with numbers? Is it possible to enhance working memory? What are the challenges, as well as the opportunities, associated with brain plasticity in children? The papers presented here have made start, but the need to build scientifically sound dialogues between neuroscience researchers and practitioners in classrooms continues (Busso & Pollack, 2015; Coch et al. 2009). The evidence and reviews presented here must be regarded as tentative findings from relatively small scale studies. However, the speculations and hypotheses offered should stimulate further rigourous research in both pure and applied domains. In sum, we suggest the evidence to date is some way from convincing us that neuroscience has much that is sufficiently meaningful and reliable to provide robust grounds for educational interventions.

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References

