The subjective experience of power mobility

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This commentary is on the review by Livingstone and Field on pages 317–327 of this issue.

Increasingly clinicians are turning to synthesized sources of literature to gain an understanding of the state of the research evidence in relevant areas of clinical practice. While quantitative meta-analyses and systematic reviews have become prolific in health care literature, qualitative syntheses are only beginning to emerge.1 The paper by Livingstone and Field2 highlights the value of qualitative synthesis for providing a greater depth of understanding of the complex issues that characterize clinical practice in pediatric rehabilitation and developmental medicine. By engaging in a systematic process for identification of relevant literature, and evaluation and synthesis of results, Livingstone and Field have provided a useful summary of the state of evidence regarding subjective child and family experiences with power mobility.

Quantitative research conducted with children with mobility impairments suggests that power mobility can increase self-initiated movement and enhance overall child development.3 Information about the subjective experience of family perspectives can also inform the outcomes measured in clinical studies. This synthesis offers insight into the impacts of effective mobility – specifically, power mobility – that are meaningful to children and families. Future research in this area could examine the effects of power mobility on identified outcomes that have not been adequately explored in previous research. These include the impact of effective mobility on meaningful participation in self-selected activities, confidence, and self-esteem; and how power mobility, or effective mobility in general, affects the quality of social relationships. The effectiveness of various interventions in reducing barriers to power mobility use could also be evaluated.

REFERENCES

Wiring the preterm brain: contribution of new meta-analytic approaches

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This commentary is on the review by Li et al. on pages 328–338 of this issue.

Preterm birth is one of the largest single conditions in the Global Burden of Disease analysis, a composite metric capturing both mortality and morbidity of diseases.1 This is due to the high mortality associated with preterm birth and to the considerable risk of lifelong impairments, the most frequent of which are neurodevelopmental disorders. Most severe outcomes are secondary to clear damage to the preterm brain, such as periventricular leukomalacia or...
parenchymal hemorrhage. However, abnormal long-term neuropsychiatric outcomes are also increasingly reported in the absence of obvious damage to the developing brain. As an example, preterm birth was recently found to be significantly associated, in a monotonous manner, with the increased risk of psychiatric hospitalization in adulthood across a range of psychiatric disorders.

Recent advances in neuroimaging have increased our capabilities to detect and quantitatively assess more subtle abnormalities of the preterm brain, and in particular those affecting the white matter. Studies applying advanced neuroimaging to explore brain structure, function, and metabolism have shown atypical developmental trajectories in very preterm infants that remain till adulthood. It is still unclear however, whether this atypical development is directly determined by the initial insult or whether the preterm brain is simply more susceptible to both injury and maldevelopment. What seems more widely accepted is that brain developmental abnormalities in preterm infants, involving but not limited to the white matter) consistently result in reduced growth of the cerebral cortex; this is due to a disruption of neural connectivity rather than to a reduced number of cortical neurons, as supported by numerous diffusion imaging studies.

Diffusion magnetic resonance imaging (MRI), provides invaluable in vivo information on the microstructure and organization of white matter by measuring the random motion of water molecules. The most commonly studied diffusion metric is fractional anisotropy, which describes the degree of anisotropy of diffusion, with highest values found in highly organized white matter bundles (e.g. the corpus callosum). Fractional anisotropy increases with increasing postmenstrual age, reflecting the ongoing processes of organization, myelination, and changes in brain water content. A recent study has systematically reviewed the existing literature on diffusion MRI in preterm infants, still emphasizing the need for further studies involving infants of all gestational ages to elucidate the relationship between gestational age and diffusion metrics, and also to establish the utility of tractography as a predictor.

An attempt to move forward in this direction has been undertaken by Li et al., who explored fractional anisotropy changes in preterm individuals by reviewing and quantitatively appraising current knowledge on brain diffusion in individuals born preterm. They used a coordinate-based meta-analytic method, the activation likelihood estimate, summarizing all the studies that provided the coordinates of peak activations. They looked at the anatomical regions with significant fractional anisotropy differences between preterm infants and term-born controls finding that changes in fractional anisotropy, and particularly in the corpus callosum, are correlated to the functional difficulties of preterm individuals. Indeed these results are of great relevance and support the use of more quantitative meta-analytic approaches to objectively summarize information from heterogeneous studies. It is of note, however, that even more reliable findings would be obtained by methods taking advantage of the complete statistical power of the images, the so-called image-based meta-analysis, which would allow for the application of models fully accounting for intrastudy and interstudy variations. This would be easily obtainable, should the neuroimaging community agree on an effective mechanism for sharing image data, including whole-brain images of both effect estimates and their standard errors. Such studies, merging massive volumes of multicentric data, would lay the foundations for the use of advanced neuroimaging not only as a diagnostic and prognostic tool, but also as an instrument to understand the mechanisms and closely monitor the efficacy of novel neurodevelopmental interventions.

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