Altering Course: The Impact of Pediatric Brain Injury on Normal Brain Development
An interview with Elisabeth Wilde, Ph.D.

Interest and concern over pediatric brain injury has increased given rising public awareness of sports related concussion. Researchers from many disciplines are trying to determine from many angles how these injuries may affect the young developing brain. Dr. Elisabeth Wilde, an Associate Professor and Director of Research for Physical Medicine and Rehabilitation at the University of Utah and Baylor College of Medicine, has focused her work on applying advanced imaging techniques to understand the subtle and long-term effects of mild pediatric traumatic brain injury (mTBI), and the effect this may have on cognitive and behavioral development. “Advanced imaging can be really helpful,” Dr. Wilde says, “because it allows us to appreciate what is happening in terms of the developmental context” in which these injuries occur. She cautions, however, that children do not recover at the same rate as adults, and the presence or absence of lesions observed on conventional imaging may not always correlate with behavioral outcomes.

In one of her recent studies, Dr. Wilde and colleagues examined cortical thickness in children who sustained brain injuries from ages 8-17, and compared them with a control group of children with orthopedic injuries. Participants were scanned at both 3- and 18-months post-injury, and evaluated on a measure of behavioral regulation and emotional control (the Behavior Rating Inventory of Executive Function or BRIEF). What they found at the 3-month interval were cortical thickness differences in medial and dorsolateral prefrontal areas and temporal lobes, but at 18-months found these differences had attenuated in just the dorsolateral prefrontal regions. Dr. Wilde says that when these findings are taken out of context, it would appear some form of plasticity is assisting in recovery. However, in reality the observed frontal lobe changes in those with mild TBI indicate they were in fact failing to undergo expected cortical thickness decreases typically found in healthy maturation. Within the context of development, this is viewed as a pathological process that can at least in part begin to explain the cognitive and behavioral changes observed in children with TBI.

As part of this same project, Dr. Wilde and her colleagues also found relationships between symptom endorsement on the BRIEF and medial frontal regions in those who failed to undergo the expected maturational cortical thinning. Conventional imaging may miss these findings, when taken in the context of normal development, as this process could underlie the behavioral changes observed in individuals who sustain an early mTBI.

Advanced imaging techniques also include approximating localized cortical gyrification, which quantifies patterns of folding across the hemispheres. Using this methodology in a new study (currently under review), Dr. Wilde and her group examined the brains of adolescents who were injured when they were very young (e.g., as toddlers) compared with a typically developing group. They were surprised to find large differences between the groups, with an overall lower gyrification index in medial frontal, dorsolateral frontal, and parietal lobes in the control group. This was contrary to their initial expectation that TBI would somehow alter gryrification in an abnormal or reduced way. The finding has encouraged them to, again, consider the context of normal development, what it means, and how it may be perturbed by subtle brain insults, such as mild TBI.

For more about Dr. Wilde’s research in pediatric traumatic brain injury and imaging, click the following link for the full interview.

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