Oxidative Stress, Motor Abilities, and Behavioral Adjustment in Children Treated for Acute Lymphoblastic Leukemia

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Advances in primary therapy for childhood acute lymphoblastic leukemia (ALL) have resulted in increased five-year survival, which currently approaches 90% (Hunger et al., 2012). Increased overall survival has led to better appreciation of therapy-related morbidity and impaired quality of life (Barr, Feeny, Furlong, Weitzman, & Torrance, 1995; Krull et al., 2008). In contrast to the recognition of childhood cancer–related neurocognitive complications, limited research exists investigating the trajectory of fine motor and visual-motor difficulties and its impact on behavior and emotional function among children with cancer. Even less understanding exists of physiologic risk profiles for neurobehavioral problems in children with leukemia. This study investigated the influence of the oxidative stress pathway on fine and visual-motor skills, as well as behavioral adjustment in children treated for ALL. Oxidative stress results from an imbalance in the production of reactive oxygen species (ROS) and antioxidant defense systems. ROS are formed as byproducts of cellular metabolism, which in excess can result in damage to cellular structures, and antioxidant systems are the body’s first line of defense against cellular injury (Roberts et al., 2010; Stenzel et al., 2010). Brain tissue is particularly vulnerable to oxidative stress because of limited antioxidant capacity, higher energy requirements, and higher concentration of lipids (Floyd, 1999).

A child’s motor system experiences rapid development during the first two to five years of life, the time when ALL most commonly occurs in children. Childhood ALL treatment increases the risk for long-term fine motor problems that include peripheral neuropathy, sensory loss, reduced deep tendon reflexes, and motor function changes. Vainionpää, Kovala, Tolonen, and Lanning (1995) were among the first to describe...