Brain-based evidence for exercise as a treatment for Multiple Sclerosis

by

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We acknowledge with respect the Lekwungen peoples on whose traditional territory the university stands and the Songhees, Esquimalt and WSANECX peoples whose historical relationships with the land continue to this day.
Multiple Sclerosis (MS) is a chronic neurological condition typically diagnosed in early adulthood that often requires lifelong treatment for symptom management. Despite pharmacological treatment, many individuals with MS continue to experience symptoms. Exercise may hold promise for MS treatment, but changes in brain structure following exercise have not been thoroughly investigated, and important cognitive and psychosocial symptoms are rarely included as primary outcome measures. This dissertation is comprised of three manuscripts that investigate the relationships between exercise, white matter microstructure, and cognitive and psychosocial symptoms in MS. Study One: The first study used a mailout questionnaire to investigate the relationship between physical activity and common MS symptoms, including fatigue, depressed mood, and perceived cognitive impairment. Results indicated that individuals with MS who reported more strenuous and/or frequent physical activity reported less fatigue, less depression, and fewer perceived memory problems. Study Two: The second study used a type of magnetic resonance imaging known as diffusion tensor imaging (DTI), along with neuropsychological measures and questionnaires to investigate whether reported physical activity, neuropsychological performance, and common self-reported MS symptoms of fatigue and depressed mood were related to brain structure in relapsing-remitting MS (RRMS). There was no evidence of a relationship between white matter microstructure and level of physical activity for individuals with
RRMS, nor was there evidence for a relationship between white matter microstructure and MS symptoms related to cognition, fatigue, and mood. *Study Three:* The third study used pre- and post-intervention DTI, neuropsychological testing and self-report questionnaires to investigate whether a 12-week exercise intervention improved white matter microstructure, cognition, or symptoms of fatigue and depressed mood in RRMS. Results indicated that following a 12 week exercise intervention, individuals with RRMS performed better on measures of information processing speed, reported fewer prospective memory problems, and reported fewer problems with fatigue. There were no increases or decreases in white matter microstructure. Together, these studies suggest that exercise may be helpful in the management of some cognitive and psychosocial MS symptoms.