

# Physical Activity in Neurological Populations

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The importance of physical activity to promote health is not new. However, the importance of physical activity in people with neurological conditions is increasingly being recognised. With many of the consequences of neurological conditions including difficulties with mobility, balance and strength; it stands to reason that optimising physical activity levels can result in many physical benefits. Physical activity can have many other flow-on effects with benefits seen in reduced mortality, and enhanced community participation and quality of life (Gordon et al., 2004). We are yet to understand the full extent to which physical activity contributes to rehabilitation outcomes; however, there is a growing body of research highlighting that the intensity of activity within rehabilitation environments is often inadequate for therapeutic gains (Kuys, Brauer, & Ada, 2006; McClanachan, Gesch, Wuthapanich, Fleming, & Kuys, 2013; Polese, Scianni, Kuys, Ada, & Teixeira-Salmela, 2014). It is not surprising therefore, that levels of physical activity continue to be poor following reintegration into the community (Morris, MacGillivray, & McFarlane, 2014). It is important that, as health care professionals, we support and encourage physical activity in all our clients. To that end, this special issue of *Brain Impairment* is devoted to raising the issue of physical activity in people with neurological conditions, and addressing questions such as: Why is physical activity important? How do we measure it? How do we enhance it, and what are the benefits of increased activity? This special issue brings together experts from around the world investigating and promoting physical activity across the continuum of care in various neurological populations including stroke, traumatic brain injury, multiple sclerosis and Parkinson's disease.

The first article in this issue explores physical activity in people following a stroke from the International Classification of Functioning (ICF) framework perspective (World Health Organization, 2001). Morris introduces the concept that interventions aimed at promoting physical activity in people following stroke need to be holistic; mindful of the physical limitations that occur as a result of the stroke, the individual themselves – their self-perception, beliefs and attitudes to physical activ-

ity as well as the physical and social environments. The need for targeted individualised interventions addressing individual preferences and abilities is highlighted if we are to be successful in addressing low levels of physical activity in people following a stroke.

Measurement of physical activity is a key focus in the scientific literature. The development and increasing use of accelerometers, pedometers and other technologies including smart phones have the potential to provide more detailed and accurate measurement of physical activity. An exciting use of wearable technologies is to measure upper limb activity. With poor hemiparetic upper limb recovery common following stroke, understanding how much stroke survivors use their upper limb in real-world environments is important. The psychometric properties of accelerometry in measuring upper limb activity are reported by Hayward, Eng, Boyd, Lakhani, Bernhardt and Lang. New developments in upper limb accelerometry data analysis are starting to provide clinically relevant information to inform clinicians, stroke survivors and carers; however, these are yet to be incorporated into everyday clinical tools and practice. The next paper by Thilarajah, Clark and Williams reviews the validity, feasibility and design of currently available range of wearable technologies to measure physical activity more generally. Although there is still much to be done in terms of cost, technical expertise and accuracy across the broad spectrum of functional abilities, wearable technologies are promising and there is still further work required investigating their use in promoting physical activity behaviours. Many such devices are small, lightweight and often waterproof; enabling their use in a number of settings.

Driver, Rachel, Swank and Dubiel report a study from the United States which found that people following a traumatic brain injury had low levels of physical activity during inpatient rehabilitation. This low level of physical activity may be one of the factors contributing to low levels of cardiorespiratory fitness seen in people following a traumatic brain injury. Although other factors play a role, Hassett, Moseley and Harmer propose a model involving a vicious cycle between

deconditioning and physical inactivity in this population. They highlight the need for interventions to address reduced fitness as integral for successful community integration. Accurate measurement of indoor physical activity is an emerging area of research. Callaway, Tregloan, Williams and Clark explored home automation and communication technologies on a small group of participants who all used motorised mobility devices as their main means of mobility. Interestingly, this did not always have the positive impact that might be anticipated and this study highlights the importance of environment and that its role in promoting physical activity cannot be underestimated.

The following two articles examine intensity of physical activity in people with other neurological conditions. Gullo, Hatton, Bennett, Fleming and Shum explored predictive factors of people with multiple sclerosis undertaking low intensity of habitual physical activity. People with multiple sclerosis who engaged in higher frequency of low intensity physical activity also demonstrated greater home, social and occupation participation levels. Conversely factors associated with the least engagement in low intensity physical activity levels included years since symptom onset, fatigue and reduced positive affect. Lamont, Morris, Woolacott and Brauer report on physical activity levels of community dwelling people with Parkinson's disease. Their findings indicate the people with Parkinson's disease walk mostly at a moderate intensity, achieving a median of 6300 steps per day. Only weak relationships were found between disease severity, gait and executive function and moderate and high intensity walking activity suggesting that other factors, such as personal and social factors should be considered.

Tweedy, Beckman, Johnston and Connick bring this special issue to a conclusion and posit that long term dose of physical activity is also important to consider. They suggest that at one end of the activity spectrum, long-term participation in performance-focussed sports may provide additional benefits including higher rates of employment and social integration. Although this concept requires further prospective study, as many of

the authors in this special issue indicate, promoting long-term physical activity levels in people in neurological conditions is a complex task; one that is likely to need involvement of policy makers, governments and councils, be inclusive of a range of activities, targeted to individuals, their preferences, abilities and interests but one that is likely to have significant societal benefits.

## References

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