Upper Limb Aiming and Eye-tracking in the Subclinical Neck Pain Population

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Abstract

One of the most common burdens that affects 30-50% of the population each year is neck pain (Hogg-Johnson et al, 2008). A common sub category of neck pain is subclinical neck pain (SCNP), defined as recurrent mild-moderate neck pain in which the patient has not been treated (Lee et al., 2005). A study conducted by Daligadu et al., demonstrated that those with SCNP have altered cerebellar processing possibly due to altered afferent sensory information from the neck (Daligadu et al, 2013). This could lead to decreased muscular endurance, range of motion and cervical kinesthesia (Daligadu et al, 2013). Goal directed upper limb movement utilizes processes such as feedforward and feedback processing, which are processed mainly in the cerebellum, to detect and accurately reach a target. The process of accurate movement planning and execution requires the central nervous system (CNS) to closely monitor movement planning and amend the execution of movement through pre-planned strategies and visual feedback (Mackrous & Proteau, 2016).

The goal of this study is to determine the visual contribution to a goal directed aiming protocol, (using Eye Link II eye tracking system), and pilot the task on both SCNP and control participants. The pilot study recruited 4 right-handed students between the age of 18-30 years; 2 SCNP participants and 2 control participants. The goal was to have 12 participants in each group but data collection was halted due to Covid-19. Each participant completed a goal directed vertical aiming task, which comprised of 4 blocks of 30 trials. Participants were instructed to utilize a light or heavy stylus to complete the movement (in random order). Various results are estimated from the study. Firstly, SCNP group had longer movement times and this was evident with greater time to and after peak velocity. Secondly, a faster reaction time is seen in SCNP group. Quicker reaction time indicates that those with SCNP do not rely on planning movements, rather they spent more time after peak velocity to allow for more visual processing to guide their limb to the target. Furthermore, we expect eye data to reveal SCNP participants to have a faster saccade reaction time and longer fixation duration. These preliminary results suggest that the brain may adopt different reaching strategies when sensory feedback from the neck is altered.