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The Effect of Head Posture on the Kinematics of the Spine During Lifting and Lowering Tasks

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Abstract : Head posture is paramount to retaining gaze and balance in many activities; its control is thus important in many activities. However, little information is available about the effects of head movement restriction on other spine segment kinematics and movement patterns during lifting and lowering tasks. The aim of this study was to examine the effects of head movement restriction on relative angles and their derivatives using the stepwise segmentation approach during lifting and lowering tasks. Ten healthy men lifted and lowered a box using two styles (stoop and squat), with two loads (i.e., 10 and 20% of body weight); they performed these tasks with two instructed head postures (1. Flexing the neck to keep contact between chin and chest over the task cycle; 2. No instruction, free head posture). The spine was divided into five segments, tracked by six cluster markers (C7, T3, T6, T9, T12, and L5). Relative angles between spine segments and their derivatives (first and second) were analyzed by a stepwise segmentation approach to consider the effect of each segment on the whole spine. Accordingly, head posture significantly affected the derivatives of the relative angles and manifested latency in spine segments movement, i.e., cephalad-to-caudad or caudad-to-cephalad patterns. The relative angles for C7-T3 and T3-T6 increased over the cycle of all lifting and lowering tasks; nevertheless, in lower segments increased significantly when the spine moved into upright standing. However, these effects were clearer during lifting than lowering. Conclusively, the neck flexion can unevenly increase the flexion angles of spine segments from cervical to lumbar over lifting and lowering tasks; furthermore, stepwise segmentation reveals potential for assessing the segmental contribution in spine ROM and movement patterns.

Keywords : head movement restriction, spine kinematics, lifting, lowering, stepwise segmentation
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