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THE RELATIONSHIP BETWEEN PREFERENCE AND PERFORMANCE USING THREE PASSIVE EXOSKELETONS DURING SIMULATED AIRCRAFT MANUFACTURING TASKS

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Work-related musculoskeletal disorders (WMSDs) are the top workplace risk factors that impact the health of workers. In Kansas, there were 45,253 reported injuries/illnesses during the 2020 fiscal year. The main contributors to shoulder WMSDs are lifting one's arms and handling heavy tools at or above shoulder level. Passive shoulder exoskeletons are designed to support the arms during overhead work tasks and may aid in reducing the risk of WMSDs. However, exoskeletons are only effective if workers choose to wear them. Therefore, the objectives of this study were to quantify participants' upper-extremity muscle activity reductions as participants performed simulated aircraft manufacturing tasks using three passive exoskeletons and assess correlations between the exoskeleton efficacy and user exoskeleton preferences. To fulfill these objectives, 16 experienced local aircraft manufacturers were recruited to participate in the study. A wireless electromyography (EMG) system was used to record muscle activity levels as the participants performed the simulated work tasks with the exoskeletons. The muscle activity and exoskeleton preference data were analyzed using a multinomial logistic regression model to identify the relationship between participants' muscle activity reduction and exoskeleton preference rankings. The results indicate that the exoskeleton preferences correlated with muscle activity reductions for an overhead level task, but not for a shoulder-level task. Overall, participants preferred the exoskeleton that provided the least reduction in muscle activity. This study demonstrated that a correlation between preference and exoskeleton muscle reduction is task dependent, and, therefore, task factors in addition to user preference should be considered in exoskeleton selection.