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Ergonomic Analysis of Tracked Stair Chairs Show Stair-PRO's Ability to Alleviate the Risk of Operator Injury

Industry Situation

Firefighters and emergency medical services (EMS) personnel must perform a wide array of potentially hazardous emergency rescue procedures that often include the use of specially designed rescue and/or transport equipment. One common procedure involves manually transporting a patient down flights of stairs using a stair chair. Unfortunately, the physical strain of maneuvering patients in this environment contributes to a high number of back injuries being reported in the EMS industry.¹

Testing Rationale

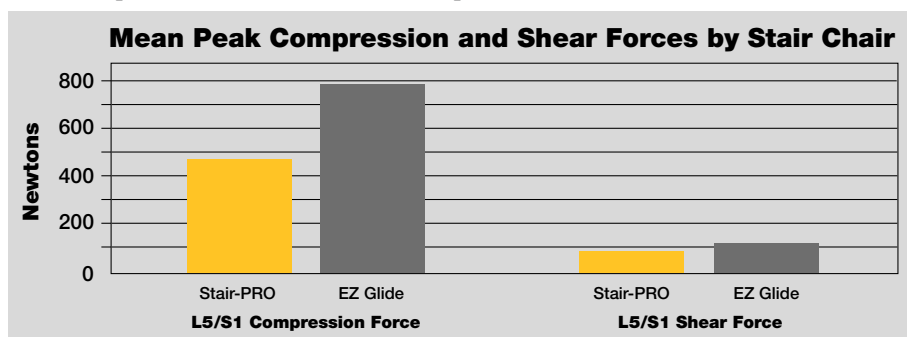
Mechanical loading of the spine is a common means to identify the possibility of developing a low-back injury. Peak spinal compression forms the foundation for many of today's advanced ergonomic investigations.² Experts also agree that shear loading on the spine is an important factor to consider when assessing the potential of back injuries.³ Previous studies have shown that using a tracked stair chair reduces the risk of injury to medics and patients during stairway transport.^{6,7} A scientific analysis of peak spinal compression and shear loading comparing two commercially available tracked stair chairs can determine if one chair exhibits biomechanical advantages over the other.

Methodology

Independent ergonomic experts studied paramedics transporting a 211 pound patient down a flight of stairs using the Stryker Stair-PRO and a competitor's EZ Glide stair chair. The simulated task included initiating the stairs from the top of the staircase and the decent of one flight of stairs. Four video cameras captured the postures of each subject, while a Lumbar Motion Monitor (LMM) digitally measured the three-dimensional trunk position and motion of the lumbar and thoracic sections of the spine. Compression and shear analyses at the L5/S1 joint were calculated using hand forces, body postures, and LMM motion data.⁴

Results

Scientific comparison of the two widely available tracked stair chairs, determined that Stair-PRO operators experience significantly lower L5/S1 compression and shear forces (approximately 40 percent and 34 percent, respectively) when compared to the EZ Glide⁵ (see chart). Additionally, it was determined that the follower experienced significantly lower compression and shear forces as compared to the leader on both chairs.⁵



Conclusion

Subtle differences in product design can have a measurable impact on product efficacy. Using the Stryker Stair-PRO when descending stairs reduces operator back strain more than other tracked chairs tested.^{5,6,7}



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