

Case Study of Human Factors and Ergonomics in the Design and Use of Harness-Embedded Costumes in the Entertainment Industry

Authors : Marielle Hanley, Brandon Takahashi, Gerry Hanley, Gabriella Hancock

Abstract : Safety harnesses and their protocols are very common within the construction industry, and the Occupational Safety and Health Administration has provided extensive guidelines with protocols being constantly updated to ensure the highest level of safety within construction sites. There is also extensive research on harnesses that are meant to keep people in place in moving vehicles, such as seatbelts. Though this research is comprehensive in these areas, the findings and recommendations are not generally applicable to other industry sectors where harnesses are used, such as the entertainment industry. The focus of this case study is on the design and use of harnesses used by theme park employees wearing elaborate costumes in parades and performances. The key factors of posture, kinesthetic factors, and harness engineering interact in significantly different ways when the user is performing repetitive choreography with 20 to 40 lbs. of apparatus connected to harnesses that need to be hidden from the audience's view. Human factors and ergonomic analysis take into account the required performers' behaviors, the physical and mental preparation and posture of the performer, the design of the harness-embedded costume, and the environmental conditions during the performance (e.g., wind) that can determine the physical stresses placed on the harness and performer. The uniqueness and expense of elaborate costumes frequently result in one or two costumes created for production, and a variety of different performers need to fit into the same costume. Consequently, the harnesses should be adjustable if they are to minimize the physical and cognitive loads on the performer, but they are frequently more a "one-size fits all". The complexity of human and technology interactions produces a range of detrimental outcomes, from muscle strains to nerve damage, mental and physical fatigue, and reduced motivation to perform at peak levels. Based on observations conducted over four years for this case study, a number of recommendations to institutionalize the human factors and ergonomic analyses can significantly improve the safety, reliability, and quality of performances with harness-embedded costumes in the entertainment industry. Human factors and ergonomic analyses can be integrated into the engineering design of the performance costumes with embedded harnesses, the conditioning and training of the performers using the costumes, the choreography of the performances within the staged setting and the maintenance of the harness-embedded costumes. By applying human factors and ergonomic methodologies in the entertainment industry, the industry management and support staff can significantly reduce the risks of injury, improve the longevity of unique performers, increase the longevity of the harness-embedded costumes, and produce the desired entertainment value for audiences.

Keywords : ergonomics in entertainment industry, harness-embedded costumes, performer safety, injury prevention

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