Comfort Assessment of Law Enforcement Officers: Moving Toward an Alternative Carriage Method

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Health care expenditures are rising steeply in the United States with back pain being one of the costliest health problems and common reason to miss work (Cassidy et al., 2005; Gary Hart, Deyo, & Cherkin, 1995). The Bureau of Labor Statistics (BLS, 2016) identifies police officers as having "one of the highest rates of injuries and illness of all occupations" and the cost of filing for worker's compensation claims are increasing up \$28 million only in the state of California (Dolan, 2015). Over the last two decades, officer duties and responsibilities have expanded, requiring them to adopt new technologies into the patrol car and onto their uniform. Furthermore, the introduction of less lethal weapons such as the TASER, pepper spray, and the baton, has added weight to officers' duty gear, total weight being 18-22 pounds (Edmonds & Lawson, 2001; Stubbs et al., 2008). Low back pain in patrol officers is a universal issue and not limited to the United States¹ (Brown et al., 1998; Filtness, Mitsopoulos-Rubens, & Rudin-Brown, 2014; Jahani, Motevalian, & Asgari, 2002; Ramstrand & Larsen, 2012). Past research provides evidence that heavy-duty belt affect officers' discomfort while conducting occupational tasks (Donnelly et al., 2009; Holmes et al., 2013). However, it is unclear which items on the duty belt cause perceived discomfort and what could possibly be removed to help reduce the discomfort by officers. Therefore, the purpose of this study was to assess perceived discomfort based on the equipment officers carry on their duty belt, to suggest a lighter duty belt by removing some of the items of the duty belt with the intention of placing them in other areas on the body, and to assess the effectiveness of a lighter duty belt using subjective measures. The hypotheses addressed in this study were:

 H_01 : There are no significant differences in perceived discomfort between the reduced duty belt and full duty belt.

 H_02 : There are no significant differences in perceived ease of movement between the reduced duty belt and full duty belt.

Methodology

An online survey was administered at the state level. Percentages and frequency tables were employed to rank the importance of the duty gear equipment. First, a baseline duty belt was determined that included all the equipment a right-dominant hand officer would carry on his/her duty belt. Second, a lighter duty belt was determined based on officers' discomfort and duty belt configuration preferences. Survey answers were ranked, conflicted criteria were reported, and a final decision was made as to which items would be appropriate to be removed from the duty belt and placed in alternative places. Three garment treatments including a control group (CON = uniform without duty belt) were obtained as a result of the survey. A laboratory assessment of the duty belt was conducted with volunteer officers. Subjective measures were assessed using a 100 mm Visual Analog Scale and a 5-point Likert scale adapted from previous studies (ASTM,

¹ Other studies reported low back pain in officers include but not limited to articles from Iran, Turkey, Britain, Germany, Sweden, Canada, and Australia.

2011; Donnelly, Callaghan, & Durkin, 2009). Due to the non-parametric nature of the data a Kruskal-Wallis test was conducted.

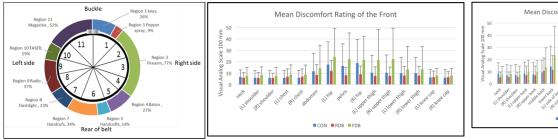
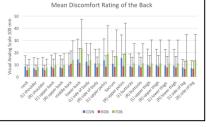
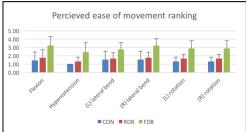


Figure 1. Clockwise from left: a) Full Duty belt configuration divided into 11 areas with each number indicating a certain area of the duty belt while worn (bottom), b) discomfort ratings of the front, c) discomfort rating of the back (0 mm no discomfort and 100 mm extreme discomfort) (N = 11), d) ranking of perceived ease of movement. (1=extremely easy, 5= extremely difficult) (N = 9)





Results

A total of 139 surveys were received. Majority of the respondents were male (n = 108, n = 108)78%), age ranging between 22 and 78 (M= 43, SD=11 years). Full Duty Belt (FDB) is depicted in figure 1. All the items except for the TASER and baton were removed from the duty belt creating the Reduced Duty Belt (RDB) treatment. For the laboratory assessment, 12 participants (9 male) volunteered to carry out functional and mobility tasks. Kruskal-Wallis test revealed that there were no statistically significant differences in the median of the perceptions of discomfort in body parts and duty gear across various duty belt conditions (see figure 1 b. and c.). Although there are differences observed in the median however, these differences are not statistically significant. One reason may be due to the scale being very broad. Another possibility is that officers' perceptions may have effected their final decision as the officers were not blinded to the treatments. Kelly (1998) argues that, to prevent injuries and manage pain using visual analog scales, it is important to consider the clinical significant differences regardless of the statistical significance. It is suggested that differences greater than 9 mm is considered to be clinically significant and if differences are greater than 20 mm the effect size is considered large (Kelly, 1998)Unlike perceived discomfort, there was a statistically significant difference in the median of perceived ease of movement for flexion ($\chi^2(2) = 10.049$, p = 0.007), hyperextension ($\chi^2(2) = 10.049$, p = 0.007), hyperextension ($\chi^2(2) = 10.049$, p = 0.007). 12.437, p = 0.002), left lateral bend ($\chi^2(2) = 9.373$, p = 0.009), right lateral bend ($\chi^2(2) = 12.112$, p = 0.002), and for both left and right rotation ($\chi^2(2) = 13.471$, p = 0.001). Ratings for the CON and RDB were low (1.4 - 1.8) similar to the results of Barker, Black, C., and Cloud, R (2010). Conclusion

This study supports the hypothesis that officers' ease of movement is negatively affected by items carried on the duty belt. Furthermore, discomfort decreased by removing certain items off the duty belt in the front and back areas. Items were removed from the FDB with the intention of putting them in alternative locations such as pockets on the vest or on the pant pockets. To fully understand the benefits of a RDB condition, a reduced duty belt with a load bearing vest with some of the items moved onto the vest could be compared to the current duty belt while making perceived discomfort and biomechanical assessments.

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