Firefighter Gloves Currently on the Market: Analysis and Future Research Directions

Elizabeth Clow, Ellen McKinney, and Rui Li, Iowa State University

Keywords: Gloves, Firefighter

Gloves are an essential component of the modern firefighter's personal protective equipment (PPE). Improvements are needed in firefighting gloves to improve dexterity, grip, flexibility, and glove thickness (Lee, et. al., 2015). Design improvements are needed for a better interface with jackets (Barker et. al, 2013; Lee, et. al., 2015). Gloves available can vary in the number of layers, materials used in each layer, and design—wristlet or gauntlet (Stull and Stull, 2007). Before research into improvements can be made, it is essential to identify the types and components of gloves available on the market today. To make a better glove, we must first understand what is available. This study is part of a larger study, seeking to quantify the protection offered by current gloves. Gloves were analyzed to identify the representative glove types and configurations to select for testing.

Method

A content analysis method was used to understand firefighting turnout gloves currently available on the market. First, the most popular brands in the market (J. Stull, personal communication, November 11, 2019) were selected for research. These manufacturers were contacted to see if they wanted to be included in the study. After that, we decided the different categories of data to collect for each gloves style produced by participating manufacturers. The data collected for each individual glove style was: the brand, the glove type, an image of the glove, whether the glove was a wristlet or a gauntlet design, if the glove was 2D or 3D, how many layers the glove was made up of, the outer shell material, the moisture barrier material, the thermal liner material, special design features, sizes that were available, and if the glove had reinforcements. Information was collected from each glove brand's website and put into a Microsoft Excel spreadsheet. The 'sort and filter' function on Microsoft Excel was used for basic descriptive analysis. For example, these filters made it easy to determine that the majority of gloves researched were 3 layers.

Results

Seven companies that carry firefighter gloves were identified: 1) Veridan, 2) Lion, 3) Gore, 4) Shelby, 5) Innotex, 6) Honeywell, and 7) Majestic Fire. Twenty-seven different glove designs currently available for purchase were found. The number of styles carried by each are identified in Figure 1.

Wristlet gloves were the most available glove design with 60% wristlet design, 36%

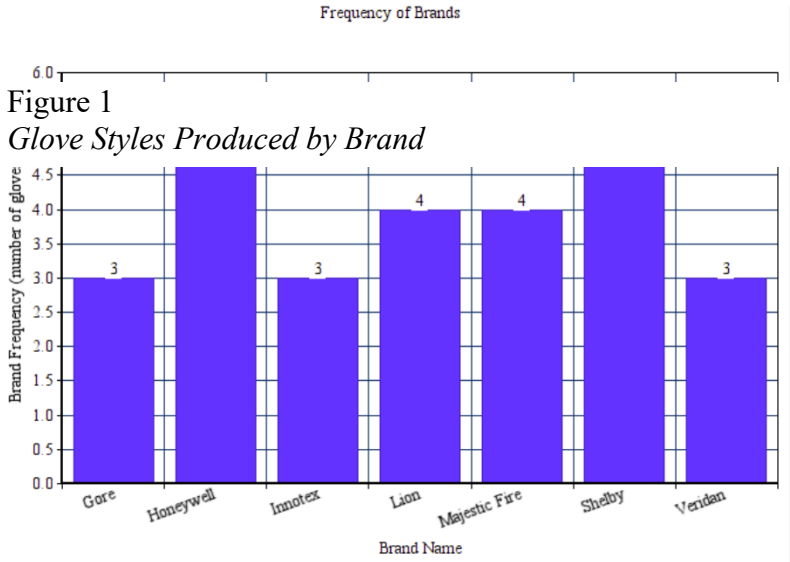
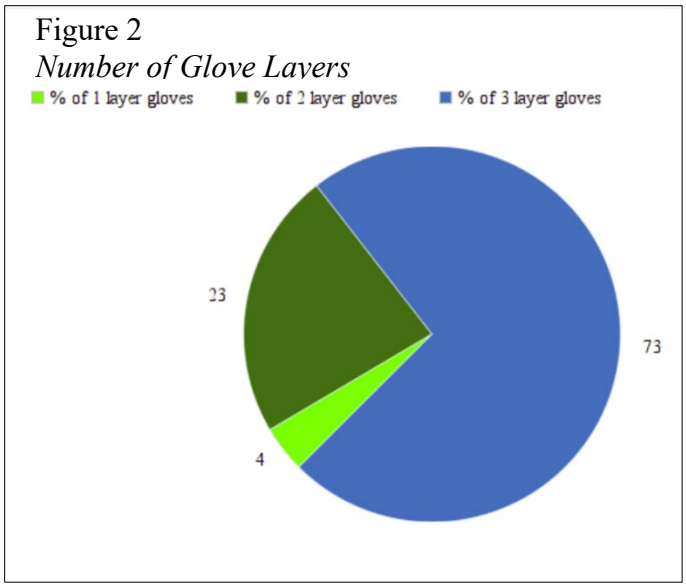


Figure 1
Glove Styles Produced by Brand

gauntlet design, and 1% convertible between wristlet and gauntlet designs. The majority of gloves (73%) were 3-layer gloves, with an outer shell, moisture barrier, and thermal liner (Figure 2). The outer shell of 3-layer gloves was either made out of Kevlar® (16%), or leather (84%). The moisture barrier of 3-layer gloves was made out of a Crosstech® insert (47%), a Pyrotect® insert (15%), or another/unnamed moisture barrier (37%). The thermal liner of 3 layer gloves was made out of a Kevlar®/Nomex® combination (32%), Kovenex® (11%), a Wool and Aramid Inner Liner combination (11%), and other materials (47%).

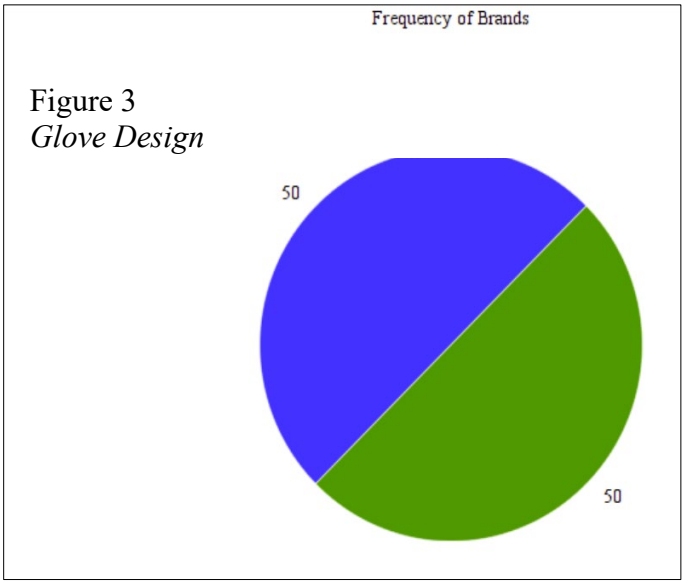
Figure 2
Number of Glove Layers



Half (50%) gloves had a 3D design (Figure 3). However 50 % of gloves were made in a flat, 2D design. Most of the 2-layer gloves were 2D, while the 3-layer gloves were a mostly even mix of 2D and 3D gloves, and the only 1 layer glove was a 2D glove.

Additionally, gloves featured a variety of design features including abrasion and flame resistant materials, an enhancement grip for wet and dry conditions, a water resistant back, and thermal protection over knuckles.

Figure 3
Glove Design



Discussion

Many of the same brands had similar design structures. For example, the 2 gloves from the Gore brand were both 2D three layer gloves, and had an outer shell that was made out of Tanned Cowhide. The two Honeywell gloves were both 3D three layer gloves, and they both had a crosstech moisture barrier. The 4 Majestic fire gloves were all three layers, had a leather outer shell, and Porelle® FR moisture barrier. All 5 of the Shelby brand gloves were made out of three layers. Both of the Veridian gloves were three layer gloves.

Conclusion

There seems to be a market for both wristlet and gauntlet designs, therefore both types were selected for the study. Based on the findings, testing focused on 3-layer gloves. Gloves were be selected to represent both leather and Kevlar® outer layers, as well as the variety of

proprietary thermal liners and lining combinations. Both 2D and 3D glove designs were selected for inclusion in the testing.

References

Barker, J., Boorady, L. M., Lee, Y. A., Lin, S. H., Cho, E., & Ashdown, S. P. (2013). Exploration of firefighter turnout gear Part 1: Identifying male firefighter user needs. *Journal of Textile and Apparel, Technology and Management, 8*(1).

Lee, J. Y., Park, J., Park, H., Coca, A., Kim, J. H., Taylor, N. A., Son, S. Y. & Tochihara, Y. (2015). What do firefighters desire from the next generation of personal protective equipment? Outcomes from an international survey. *Industrial Health, 53*(5), 434-444.

Stull, J. O. & Stull, G. G. (2007, July 19). Understanding and selecting firefighter gloves. https://www.firerescue1.com/fire-products/gloves/articles/understanding-and-selecting-firefighter-gloves-iBiHBnADCLIs3nPF/