



## D6 The Effect of Fabric Tension on Knife and Tool Damage

Patrick H. Geoghegan, PhD\*, Aston University, Birmingham B4 7ET, UNITED KINGDOM; Debra J. Carr, PhD, Aston University, Birmingham B4 7ET, UNITED KINGDOM; Sarah V. Hainsworth, PhD, Aston University, Birmingham B4 7RT, UNITED KINGDOM

**Learning Overview:** After attending this presentation, attendees will understand how fabric tension can affect the damage caused by the penetration of knives during stabbing and slashing events.

**Impact on the Forensic Science Community:** This presentation will impact the forensic science community by providing new data that can be used to better understand the effect of fabric tension on the damage patterns left during a knife attack.

Knife crime continues to be a major challenge in the United Kingdom where access to guns is heavily reduced compared to the United States. In 2019, by May 14 there had already been 100 fatal stabbings in the United Kingdom, not counting the events that caused life-changing injuries.<sup>1</sup> However, this issue is not solely a problem affecting the United Kingdom. The United States has a higher homicide rate “due to knives or cutting instruments” per every million of population; in 2016, this was at 4.96 for every million of population compared to the United Kingdom’s 3.26 per million.<sup>2</sup>

Damage to clothing regularly occurs during a sharp-force fatality. Karlsson reported that 79% of 145 victims had damage to clothing after being subjected to a sharp-force event.<sup>3</sup> Examination of the resultant size and appearance of the severance in the fabric post-impact can provide information about the characteristics of the weapon used, the dynamics of the assault, and the post-impact conditions to which the fabric was exposed.<sup>4</sup> The tension applied to a fabric is affected by clothing fit (i.e., ranges from ill-fitting clothing that is oversized or to purposely undersized such as athletic sportswear). Tension applied to a fabric reportedly influences the severance profile; however, there is very little experimental data available to provide confidence in the analysis of what the severity of the influence might be. Cowper et al. provides one of the few studies in this area.<sup>5</sup>

The goal of this research was to investigate whether fabric tension affects the resulting severance due to stab and slash events. A range of commonly worn fabrics were pre-tensioned over silicone skin-simulant resin. The pre-tensioning ranged from loose fit to tight. Several sharp implements, including kitchen knives and sharpened screwdrivers, were used to perform stabbing events that were recorded using high-speed imaging. The forces generated during the stab events were recorded using an instrumented knife and a dynamometer. The fabric was examined post-test to determine the effect of tension on the severance. The results are presented in a way that provides insights that can be used to inform future analysis of fabric damage

### Reference(s):

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3. Thore Karlsson. Homicidal and suicidal sharp force fatalities in Stockholm, Sweden: Orientation of entrance wounds in stabs gives information in the classification. *Forensic Science International* 93.1 (1998): 21-32.
4. S.E. Kemp. Forensic analysis of sharp weapon damage to textile products. *Forensic Textile Science*. Woodhead Publishing, 2017. 71-97.
5. E.J. Cowper, D.J. Carr, I. Horsfall, and S.M. Fergusson. The effect of fabric and stabbing variables on severance appearance. *Forensic Science International* 249 (2015): 214-224.

### Knife Crime, Fabric, Tension