

Poster Communication 75

## The dynamics of 3D printed projectiles: a systematic review

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### Abstract

**Background:** The relative ease with which it is now possible to produce ballistic components through additive manufacturing (3D-printing) brings the need to study them to understand the impact they may have in a forensic context [1]. **Objectives:** The main goal of this review is to summarize the state of the art on dynamical studies of 3D-printed projectiles for light weapons. **Methods:** To produce this review, a search was conducted using the keywords “3D printed projectiles” and “low caliber projectiles” on the ResearchGate, Google Scholar, and Wiley Online Library databases. The Boolean operators “!” and “AND” were used with those keywords. The initial search was conducted without any date restrictions. Subsequently, the number of relevant articles was narrowed down, limiting publications to dates between 2023 and 2025. **Results:** To obtain information about comparative tests between 3D printed projectiles and conventional projectiles, three articles with similar themes were analyzed. Bisić et al. 2025 [2] and Vandenburg 2025 [3] show that projectiles produced by additive manufacturing can be fired with firearms and maintain structural integrity. The muzzle velocity and the corresponding kinetic energy are smaller for printed projectiles than for conventional ones [2], typically characteristic of aged or poorly stored ammunition. Integrity during flight was also ascertained, mainly through observation of impact marks on [2, 3]. It was demonstrated that some types of “homemade” 3D-printed projectiles can effectively penetrate materials (that simulate human skin) and even be lethal (theoretically) depending on the energy density at the moment of impact [1]. It is also described that variations in projectile printing quality may affect flight stability, leading to a relatively high velocity dispersion and impact angles [2]. However, the results described are not sufficient to provide a thorough understanding of the external/terminal ballistics of 3D-printed projectiles. **Conclusions:** In conclusion, the external/terminal ballistics of 3D-printed projectiles should be studied further and in greater depth, especially aspects that are poorly explored in the articles mentioned, such as flight stability, velocity, and kinetic energy at muzzle and throughout the trajectory, to optimize forensic protocols.

**Keywords:** 3D printed low caliber projectiles; forensic protocols; energy density; kinetic energy

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