



ARMY WEST POINT

SKEET & TRAP



RESEARCH PROJECT REPORT: BIOMETRIC INDICATORS OF SHOOTING

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Biometric Indicators of Shooting

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In the fall of 2024, the West Point Skeet and Trap team was funded by a research grant to issue Oura rings to 20 cadets as part of a pilot program to study the impact of measurable biometrics on shooting performance. The study was conducted by cadets majoring in engineering, with support from faculty/coaches experienced in human performance research. This unique blend of shooting and science highlights the innovative opportunities created by West Point's Skeet and Trap team to modernize the way analytics can be utilized to enhance individual performance, as well as benefit the broader discipline of shooting.

BACKGROUND: The rise of sports analytics has led to improvements in safety and performance across a wide range of sports. While much of this work is sport-specific, some broader studies have found that improved sleep and lower stress are strongly correlated with higher performance.[1] Clay target shooting, where competitors engage moving targets, have been largely excluded from this analytical revolution; however, notable research has shown that stress degrades performance in other shooting disciplines, such as tactical[2] and stationary shooting.[3]

The idea that improved sleep and stress management would benefit skeet and trap shooters may not sound like a groundbreaking concept, but there are many competing hypotheses that the research team has anecdotally heard that provide unfounded reasons for shooting success. Comments like, "I didn't sleep last night and shot my best scores today," are common along with statements by athletes being tired or stressed helps them not "overthink" things on the range. This study aims to test these hypotheses to get beyond the typical "common wisdom" of amateur athletes.

STUDY DESIGN: The study was conducted over four practices with 20 enrolled athletes. We captured biometric data using Oura rings and scored rounds with traditional paper scoring methods. From these sources, we constructed a dataset of each shooter's performance in a given practice (out of 100 targets) and their sleep, stress, and activity profiles from the three days leading up to the practice. Sleep and activity are measured from 0 to 100 and are provided by complex proprietary algorithms from the Oura rings. Stress is measured with a proxy from surveyed academic load, scored from 0 to 10. Due to issues with sensor data and practice constraints (some shooters were not able to score full 100-target rounds due to other training needs), we were left with 26 complete data points.

RESULTS: Traditional linear regression is not designed to operate on small datasets; therefore, we leverage Bayesian regression, which is specifically designed to address this weakness.

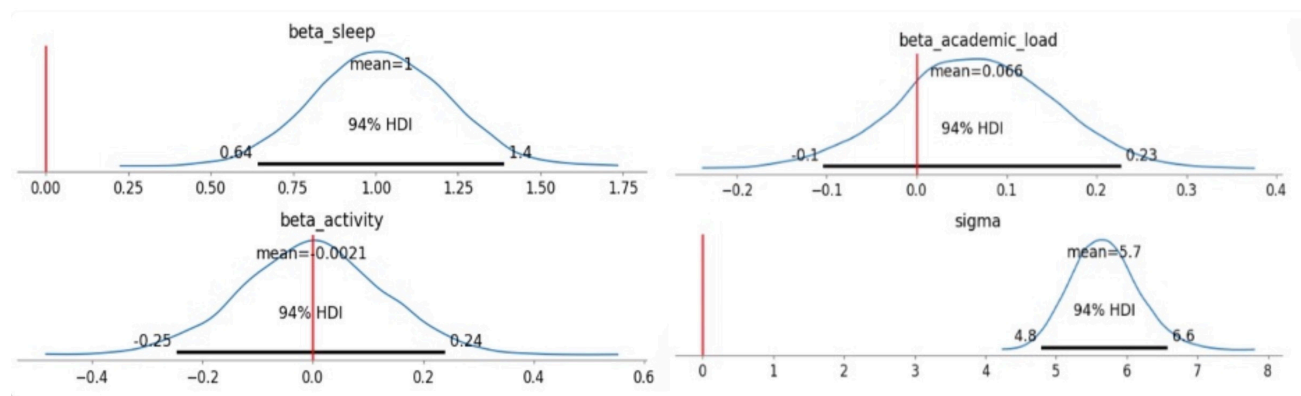


Figure 1: Posterior beta distributions on the impact of sleep, academic load (stress), and activity on skeet and trapshooting performance.

The distributions in Figure 1 show the likely values (the posterior distributions) for each of the coefficients. For example, a one-unit increase in sleep quality is associated with a score improvement between 0.64 and 1.4 targets. The activity and academic load distributions both span zero, indicating that there are no statistically significant associations between these variables and shooting scores. The bottom right distribution shows the average error in the model, suggesting that performance varied by roughly 5.7 targets after controlling for the other factors.

FINDINGS: The key finding in this small study is that sleep quality is statistically significantly associated with shooting performance. Given the small sample size, we cannot meaningfully exclude the hypothesis that activity and stress are also related to shooting performance; however, it is notable that the sleep association is strong enough to be visible even in such a small study. It is essential to note that these findings are specific to our small study population and apply only over a short period of time.

Another finding not shown here comes from further analysis of the survey data. In addition to academic load, we also asked athletes to report their subjective sleep quality on each survey. We found no correlation between perceived sleep quality and sleep quality as reported by the Oura rings. One might think this suggests the Oura rings are inadequate – but these sleep scores have been verified in sleep labs by USSOCOM. This suggests self-reported biometrics are not adequate replacements for sensor measurements.

NEXT STEPS: The next step is to validate this research with more data from an extended study, aimed for completion by the end of the next academic year. We will shift focus from macro to micro biometric indicators, specifically exploring the link between second-level stress indicators and target achievement probability.



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- [2] Liu, Y., Mao, L., Zhao, Y., & Huang, Y. (2018). Impact of a simulated stress training program on the tactical shooting performance of SWAT trainees. *Research quarterly for exercise and sport*, 89(4), 482-489.
- [3] Mosley, E., Laborde, S., & Kavanagh, E. (2018). The contribution of coping-related variables and cardiac vagal activity on prone rifle shooting performance under pressure. *Journal of Psychophysiology*.