Provicta's mission is simple – to provide a community of support for the physical and mental wellbeing of first responders.

Title: *Testing the Impact of Sympathetic Response on Police Performance During Critical Job Tasks*

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Introduction

"The bulletproof cop does not exist. The officers who protect us must also be protected – against incapacitating physical, mental, and emotional health problems as well as against hazards of their job." (21st Century Policing Report's Pillar Six framework)

Policing is an inherently stressful profession. Police officers are required to respond to ambiguous, fast-paced, and rapidly changing encounters that have the potential to turn deadly. A police officer's response, or lack of response, to a volatile situation can result in a deadly outcome. This outcome can be influenced by how the officer responds to stress. Finding effective ways of teaching officers to manage stress and control their physiology is critical for protecting their wellbeing and enhancing the outcomes of police-citizen encounters.

However, helping officers condition themselves to deal with stressful situations has traditionally been dealt with by offering additional training without measuring how each officer is actually performing. Consequently, the effectiveness of training designed to help officers overcome stress is largely unknown. All the while, officer rates of PTSD, suicidal ideation, and suicide are rising (Violanti et al., 2013). In addition, the cost of "broken" officers is putting enormous financial strains on local communities.

To add to the existing body of knowledge on the relationship between stress and job performance in policing, we conducted a feasibility test of the Provicta Platform – a method of measuring stress using physiological data collected from Hexoskin monitors. Using a multi-phase approach, we sought to determine:

- Whether the Provicta Stress Index can be readily established in police participants
- Whether control over physiology can improve police performance
- Whether a simple intervention can improve vigilance and performance in police officers when responding to stress-inducing scenarios

Methods

We employed a mixed repeated-measures (baseline, intervention, post-intervention), between groups (treatment vs. control group) design. Participants (40 police officers) came to the training facility for testing on three separate occasions, each roughly one month apart, for an

approximate two-hour testing session.

The first test session was baseline testing, exposing the participants to stress-inducing scenarios while monitoring their physiology to get a "Provicta Stress Index." The second test session was for the intervention, during which half of the participants were randomly assigned to receive the intervention (designed to help participants stay "in the zone" during stress scenarios). Finally, the third session was the post-intervention test, where participants were again tested on a selection of high-stress scenarios.

For each session, participants were fitted with a Hexoskin vest for monitoring their physiology, including heart rate (HR) and heart rate variability (HRV). From these, an SNS Index (measure of sympathetic response) and a PNS Index (measure of parasympathetic response) were calculated.

The primary aim was to determine whether participant physiology could be mapped, and whether it could predict optimal performance during scenario testing. The secondary aim was to pilot test a simple intervention to see if participants could be taught to "stay in the zone" in real time while responding to scenarios.

Findings

Performance Scores

Overall, there was little difference in performance scores between groups – with treatment group subjects receiving an "A" grade 35% of the time, and control group subjects receiving an "A" grade 37% of the time.

Vigilance

When comparing PNS Index, SNS Index, mean HR, and HRV across sessions and between groups several interesting patterns emerged.

PNS Index was lower overall for treatment participants than for control participants, whereas SNS Index was higher, indicating that treatment participants had stronger sympathetic responses than control participants. This appears to be corroborated by HR, which was higher for treatment participants than for control participants and HRV, which was lower for treatment participants than for control participants.

We also examined PNS Index, SNS Index, mean HR, and HRV across sessions and found that PNS Index decreased from pre- during- to post-intervention, SNS Index increased, mean HR increased, while HRV decreased, indicating that sympathetic response increased over test sessions.

Impact of sympathetic response on performance score

Correlations were run to investigate the impact of stress response on performance scores. As anticipated, performance grade was directly and significantly associated with PNS Index ($r=.12$; $p<.05$) and HRV ($r=.21$; $p<.001$) and indirectly associated with SNS Index ($r=-.16$; $p<.01$) and mean HR ($r=-.12$; $p<.05$). This indicates that PNS Index and HRV are associated with better

performance scores while SNS Index and HR are associated with poorer scores.

Discussion

The data collected throughout this experiment revealed several key findings. First, it was feasible to establish a stress index for participants based on data collected throughout the study. Thus, our first research question was answered successfully.

Second, participant vigilance levels did predict performance on scenarios. Although every vigilance variable was correlated with performance, this was most evident for HRV. Participants who had higher HRV (indicative of greater parasympathetic response) had better performance scores than participants with lower HRV. This indicates that greater physiological control and the ability to prevent sympathetic "flooding" resulted in better performance during highly stressful scenarios. Thus, our second research question was answered successfully.

Although our intervention to try and keep participants "in the zone" was not successful, several key lessons can be taken from our attempt that could inform future efforts in this area. The real-time nature of the intervention potentially backfired—participants in many cases were significantly more stressed by the feedback than calmed by it. It is possible this is related to an "experimenter effect" of participants feeling like they are being monitored and evaluated, which can induce some stress in and of itself.

One way to avoid this is to conduct the intervention ahead of time, for example via mindfulness training, so that participants can feel supported during stressful scenarios without the feeling of having an instructor over their shoulder critiquing them. That the intervention was unsuccessful at the vigilance level (rather than just at the performance level) is encouraging for future interventions aiming to optimize police officer vigilance and performance. In other words, our intervention did not work because it did not promote officer ability to control their sympathetic response. Given the connection we established between control over physiology and better performance on scenarios, we are hopeful that interventions that can successfully promote physiological control will also promote officer performance on stressful scenarios.

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