

Heart Rates, Performance, and High-Fidelity Training

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By Von Kliem, JD, LL.M. September 28, 2023



Heart rates are frequently used to measure stress levels in actual and simulated police operations.¹ Understanding that increased heart rates can result from elevated stress, the question has long been whether elevated heart rates mean that decision-making and performance will suffer.

By now, regular readers of Force Science News know the answer to this question. Will decision-making and performance suffer? Not necessarily. It depends. And, under the right circumstances—it can actually improve!

Better or Worse

In 2019, Inspector (Retired) [Chris Butler](#), Advanced Specialist and partnering instructor for Force Science, reviewed the latest [research](#) into whether physiological arousal (heart rates) affected officers' verbal communication, nonverbal communication, and tactical skills.²

Published in [Frontiers in Psychology](#), the research provided evidence that greater physiological arousal (including increased heart rate) was associated with lower communication skills. However, the greater physiological arousal did not significantly affect nonverbal communication or tactical skills.

Writing for [Force Science News](#), Chris Butler noted that “well-rehearsed skills survive increased heart rates.”

Chris continued, “...while high stress can negatively impact verbal communication, there is promising evidence that training tactical skills until they become automatic, increases confidence, relieves the attentional system, and results in reduced arousal states during critical incidents.”³

Evidence continues to support the idea that increased arousal and heart rates will not necessarily result in diminished performance during police operations.

But what of the findings from [Dr. Simon Baldwin's 2022 study](#) into the relationship between stress, training, and performance? In Baldwin's study, researchers assessed the performance of active-duty police officers during a complex, dynamic, and stress-inducing

scenario. The officers' stress responses included elevated heart rates and perceptual and cognitive adaptations, including tunnel vision. More importantly, researchers calculated that the elevated stress reactivity predicted poorer performance (13% decrease) and increased lethal force errors (6 times higher) during the study.

Experts continue to recognize that increased arousal can negatively impact decision-making and performance. But they are equally convinced that the adverse effects of arousal can be mitigated, and that performance can be optimized—even under extreme stress and with elevated heart rates. So, what makes the difference?

Experts Weigh-In

[Dr. Bill Lewinski](#), Executive Director and Senior Researcher at Force Science, has long been critical of any suggestion that elevated heart rates necessarily predict poor performance.

“Motocross racers perform at elite levels with heart rates over 180 beats per minute (bpm). Downhill skiers can reach speeds between 75 and 90 mph and perform with heart rates nearing 200 bpm. Formula 1 drivers with resting heart rates in the 40s consistently perform at heart rates in the 190s. Even firefighters in full gear, after carrying a 40-pound hose up 4 flights of stairs, may reach a pulse over 180 bpm and still successfully execute their drills. It is true that elevated heart rates and arousal states are seen with both poor performance and high-level expert performance. Our challenge now is to understand how police can mitigate the negative effects, while maximizing the benefits.”

[Dr. Nick Murray](#), Professor of Kinesiology and author of over 40 publications in human performance, reinforced Dr. Lewinski's observations and echoed that increased heart rate and elevated arousal responses do not necessarily result in decreased performance:

“When done well, use-of-force scenarios can elevate arousal levels and elicit physiological responses. These can include visual changes, activation of parts of the brain associated with memory, emotion, hormone production, decision-making, and modified heart rate. *These increases in physiological responses can either facilitate or impede goal-directed actions* (emphasis added).”

Dr. Murray continued,

“Heart rate reactivity is a good indicator of arousal response; however, a high heart rate alone does not determine performance outcomes. During critical incidents, where arousal may be elevated, performance can be driven by focusing on your goals—which uses our goal-directed attentional system—or by focusing on stimulus, using the stimulus-driven attentional system.”

“If driven by a goal, then physiological factors such as high heart rates have little affect on performance. However, when people focus on stimulus – especially during critical incidents where multiple stimulus can be pulling attention—available cognitive resources can be exceeded and decision-making and performance can suffer.”

After identifying the challenges posed by stimulus-directed attention, Dr. Murray supported the earlier observations of Chris Butler and provided a promising solution to maintaining optimal performance.

Domain-Specific Practice and High-Fidelity

Dr. Murray suggested that well-done use-of-force scenarios can elevate arousal levels and elicit physiological responses. If one of the keys to great training is realistic, domain-specific practice, the question then is how can trainers create those conditions?

Whether training with live or video simulations, the consensus is that the training benefit is directly tied to the realism of the simulation. Fidelity in training means that the training corresponds with the quality and condition of the real-world operating environment and tasks.

[Lon Bartel](#), the Director of Training for [VirTra](#), a high-performance training simulator company and longtime Simunitions trainer, has extensive experience developing live and video training for law enforcement. Lon explains how training fidelity can be achieved.

“Fidelity in simulation can come in two predominant forms: psychological and physical. Psychological fidelity (emotional fidelity) is the level at which a simulated task or event can evoke a feeling of realism in the student. That realism should be experienced in how the students perceive the stimulus during the event. It also needs to be experienced through the cognitive demands—including the need to solve problems and choose among competing priorities.⁴ Physical fidelity is the degree to which the simulated event duplicates the appearance and requires performance and actions consistent with real-world task constraints.⁵ Fidelity allows us to suspend disbelief and evoke the emotional response that can trigger higher arousal states. It allows us to engage in the same or similar movement patterns as the real-world task or skills. Fidelity matters.”

Lon added an important insight and caution,

“It can be important that training evokes the emotional response that might be expected during real-world operations. If elevated arousal and increased heart rates are training goals, it is important to recognize what is causing those reactions. Of course, increased heart rates and elevated arousal can, and should, result from high-fidelity training. But we have also seen these responses from unintended influences. Think about the protective mask. When officers put on protective masks in training scenarios, the mask can cause the user to inhale more CO₂. The mask can also limit the participant's vision. Although seemingly unrelated, both conditions can increase stress and influence the heart rate, leading to the false perception of scenario-

induced arousal. If your students might wear gas masks in their anticipated operating environment, these may be responses you want to evoke to encourage acclimation. However, if the masks are training equipment only used for participant safety, you may be introducing stimulus and physiological responses into training that are unrelated to the operating environment. That is a move away from the goal of fidelity in training.”

Managing or Excelling with Stress

Dr. Lewinski has watched the police profession grow in its understanding of stress for nearly 50 years.

“Over the years, we have started to recognize and distinguish the difference between distress, or bad stress, and eustress, sometimes thought of as good stress. We have learned the value of seeing difficult situations as challenges rather than threats and to facilitate more effective performance with those mental shifts.”

Dr. Lewinski shared his observations of how police have evolved in their approach to stress and performance.

“In the 70s, the police community started to focus on the implications of fight, flight, and freeze on officer performance. In the 80s, we started identifying the factors connected to police performance and stress, such as elevated heart rate, tunnel vision, shaking and trembling reactions, and diminished judgment. The focus was on the negative elements of stress arousal. That led some researchers to focus on how to get officers’ pulses down during critical incidents to perform better.”

Dr. Lewinski continued,

In the 90s, we saw the exercise community move away from the negative aspects of stress and focus on how arousal could benefit performance. The police community focused on positive self-talk, breath regulation, mental rehearsals, and “when / then thinking to avoid emotional recoiling in the face of unexpected challenges. From the 2000s through today, we’ve highlighted the benefits of arousal on focus and performance.”

“As Dr. Murray has explained in his research and training, officers need skills to mitigate physiological responses that can interfere with focus and performance. But equal to that, officers need to develop their skills to the point of automaticity, interpret their environments as challenges rather than threats, and learn to be goal-directed rather than stimulus-directed. We no longer want to leave officers believing that elevated arousal states and heart rates mean they have done something wrong, or that something is wrong with them.

Dr. Lewinski emphasized in his conclusion,

“We have to continue learning lessons from science, and from the experience of elite athletes and other professions that elevated arousal and high heart rates do not necessarily equate to poor performance. But training and experience matter.”

“In a recent Force Science study, participants responded to a simulated lethal force encounter with an average heart rate of 165 bpm. It was not the heart rate that predicted who successfully navigated the scenario. Instead, we noted that tactical training and experience was more predictably associated with success.”

“It may not be enough to regulate heart rates with breathing techniques, and in critical incidents, there may simply not be time. In these cases, goal-directed focus, and confidence built on training and experience can lead officers to view operational problems as challenges rather than threats. Just as we’ve seen with high-performing athletes, with the right training, elevated arousal may in fact be necessary to drive excellent decision-making and performance.”

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2. Arble E, Daugherty AM and Arnetz B (2019) Differential Effects of Physiological Arousal Following Acute Stress on Police Officer Performance in a Simulated Critical Incident. *Front. Psychol.* 10:759. doi: 10.3389/fpsyg.2019.00759 [🔗]
3. C. Butler, *Is Heart Rate a Predictor of Police Officer Performance?* Force Science News, May 2019, at <https://www.forcescience.com/2019/05/is-heart-rate-a-predictor-of-police-officer-performance/> [🔗]
4. See, Gray, R. (2019). Virtual environments and their role in developing perceptual-cognitive skills in sports. In M. Williams & R. C. Jackson, (Eds.) *Anticipation and Decision Making in Sport* (1st ed., pp. 342-358). Routledge; and Munshi, F., Lababidi, H., & Alyousef, S. (2015). Low- versus high-fidelity simulations in teaching and assessing clinical skills. *Journal of Taibah University Medical Sciences*, 10(1), 12-15. 10.1016/j.jtumed.2015.01.008 [🔗]
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