

**Performance Optimization: How Wearable Technology Will
Revolutionize Police Officer Performance and Enhance Resiliency**

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**Mike Goldstein
Peter Lecy
Steve Mase**

Even with the suppressors there was a great deal of noise, as there was a near continuous spit of bullets flying and the metallic clank of slides blowing back and slamming forward. When things were tense like this, he could block out the fear and extraneous information, focus on what was important, and slow things down. Panic-induced decisions had a nasty way of leading to bad, or in this case, fatal outcomes.¹

The advances in law enforcement technology have transformed how police officers perform the various functions of their job. Call boxes have been replaced with robust digital communications systems; conducted electrical weapons assist with the apprehension of the non-compliant; once paper files are now accessed from anywhere in the field via mobile devices; and body-worn cameras, along with drones, provide real-time imagery of police activity.

These devices, and a myriad of others, provide law enforcement personnel the requisite tools to do their work in a more effective and efficient manner.

More so, futurists and technologists continue to develop other advanced tools that will assist police officers to better serve their communities; whereby, their safety, and the safety of those they are charged to protect, will be enhanced. Further, through the ever-evolving social contract, the public will continue to demand certain changes in how the police operate, which again, technology will eventually accommodate.

While a number of helpful, and in some cases, costly, lessons have been learned through a complex mix of planned operations, trial and error, and simple happenstance, one critical aspect is perfectly clear: no matter what tool is developed, nothing can replace the human decision-making process that police officers must effectively employ in their service.

Thankfully, this crucial fact has assisted with the advancement of scenario-based training activities, better hiring practices, stronger supervisory actions and prudent policy development. Moreover, conscientious police agencies have adopted time-tested best practices and have collaborated with professional organizations, peer departments, and others to share their talents, experiences and successes, all in the name of bettering the profession.

In addition to this proactive approach, some departments looked beyond their protocols and policies and have deliberately included another, often overlooked, element of effective policing in their advancement—the health and wellness of their personnel.

This notion is gaining momentum as police leaders better understand the imperative need to help keep their personnel healthy if they want to deliver the professional services their communities deserve.

To help support this concept, it was no accident that officer wellness and safety initiatives were included in the President's Task Force on 21st Century Policing Report.² In fact, this idea was prominently listed as one of the report's major pillars—Pillar Six.

Within the 21st Century Policing Report's Pillar Six framework, the authors clearly identify the imperative need to transform the law enforcement culture to fully accept and adopt this wellness notion and for good reason: "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 the hazards of their job."²

There is no disputing the need for this paradigm shift, as the research and endorsements by healthcare providers, scientists, trainers and others to create and sustain systemic wellness opportunities for law enforcement personnel has been validated time and time again. In reviewing the literature, one such paper that was prepared and published by Christina L. Cusic, M.D. titled: *Development and Implementation of a Physical Fitness Program for a Local Police Department*³ offered a wealth of information justifying this type of programing, which was supported by irrefutable data.

In her report, Dr. Cusic noted, "Physical fitness programs in law enforcement are important for both the strenuous activities and cardiorespiratory fitness required for the job, as well as for maintenance of officers' overall health."³ Further, Dr. Cusic cited that "law enforcement is considered one of the most dangerous, stressful, and health-threatening occupations."⁴ In order to perform their job safely and effectively, law enforcement officers need to be physically fit. Policing is unique in that it is primarily sedentary in nature; however, it requires occasional bursts of maximum exertion.³

Some departments maintain fitness programs, however, few offer programs sufficient to maintain a level of fitness appropriate for the job. Physical fitness generally declines throughout an officer's career and, although the data is scarce, it is the general consensus that law enforcement officers are at or below average fitness levels.⁵⁻⁷ Similarly, from 1983 to 1993, the Cooper Institute for Aerobics Research conducted a comprehensive assessment of 1,700 law enforcement officers across the U.S. and found them to have lower than average fitness levels when compared with the general population, based on aerobic fitness, strength, and body fat.⁸

Consequently, there are associated legal implications, and a police department may be found negligent on the grounds of negligent retention or failure to train.⁷ For example, in the case of *Parker vs. District of Columbia*, the arresting officer was accused of using excessive force in an arrest of a combative suspect.⁸ Due to the officer's lack of physical fitness, he was unable to use less-harmful defense tactics and resorted to using his firearm, causing the suspect to become paraplegic. In the verdict, the D.C. Metropolitan Police Department was found to be deliberately indifferent to the physical training needs of its officers and the plaintiff was awarded a substantial sum of money.⁸ Perhaps fitness standards would have prevented this incident.³

Beyond the legal repercussions of how wellness initiatives will help transform law enforcement organizations for the better, there are other injurious consequences and distressing social costs that cannot be ignored. Whether one points to the suicide, divorce, substance abuse, disability tolls or life expectancy rates, all of which exceed the norms found in other professions, the facts are disturbing. For example, according to the Minnesota League of Cities, police work compensation claims rose from 1,040 claims (2008-2011) to 1,150 claims (2012-2015); whereby, millions of dollars and work productivity were lost.¹² Further, according to the Minnesota Public

Employee Retirement Association (PERA), the number of disability retirements for both physical and psychological injuries for police officers rose from 128 (2009-2012) to 231 (2013-2016) in the last six years.¹³ Most striking is the increase of disability retirements for psychological injuries, which rose from 33 retirements (2009-2012) to 70 retirements (2013-2016).¹³

Physical inactivity and other unhealthy behaviors in law enforcement contribute to excess morbidity and mortality from lifestyle related conditions such as cardiovascular disease, cancer, diabetes, obesity, and chronic back pain.^{5,14,15} A study of Connecticut law enforcement officers found the mortality ratio for cardiovascular disease to be 32 percent higher when compared to the general population.¹⁶ In recognition of this increased cardiovascular disease risk, Congress enacted the “Hometown Heroes Act,” which provides death benefits to family members of officers who die from a heart attack or stroke in the line of duty.¹⁷ It is estimated that each in-service myocardial infarction costs \$400,000 to \$750,000.¹⁸

Benefits of law enforcement physical fitness programs are numerous and include improved physical and mental health, decreased injuries, and increased employee morale and job satisfaction. Additionally, they can serve as a recruitment and retention tool. A four-month circuit weight-training program for Florida law enforcement officers led to significant increases in strength and cardiovascular fitness, as well as psychological benefits of decreased somatization, anxiety, depression, and hostility and improvements in job satisfaction.¹⁹

Knowing this information, would it not make sense to use available technologies to assist law enforcement organizations to optimize their personnel's health and performance? As previously noted, technologists have developed a number of useful tools for police officers to utilize in the field, yet the most important element regarding the use of available and newly developing technology to best aid law enforcement is being missed.

One simple, yet disquieting comparison is that between elite athletes and those who are sworn to protect and serve. Top athletes and their trainers have taken advantage of the emerging wearable monitor (advanced sensors) market to track various biometrics to assist in the optimization of their performance. Due to the expanding wearable market, these measurements have been able to exit the lab environment and enter into the actual training field. Through this exercise, athletes both in the amateur and professional realm have benefited significantly.

Beyond top athletes, the wearable market has extended into the general consumer marketplace, as these devices are now commonplace in measuring an individual's steps, heart rate, glucose levels, etc., in the name of better fitness and health.

Why would we reserve that benefit for the field of sports and not consider the enormous advantages this technology could offer law enforcement? Shouldn't that same consideration also be afforded to police officers, who provide critical services to society, in that these devices would provide helpful, real-time feedback on specific biometrics measuring physical fitness and mental acuity, both of which are critical performance metrics?

From both a pre-service and in-service perspective, wearable technology would provide law enforcement the opportunity to capture useful physiological metrics to establish baselines to better study how stress-induced events affect an officer's performance during both routine and critical incidents. With that knowledge, more specific advanced conditioning techniques, analogous to personalized medicine, both in the academy and in-service training settings, could be applied to assist in optimizing one's performance and over time, help increase an officer's resiliency to stress. Through this optimization, performance levels would congruently increase resulting in less liability for all.

It is incumbent for police organizations to ensure that its workforce is properly trained and prepared for the circumstances its personnel will face. As the research vividly exposes, unfit police officers will offer less-than-fit services. The research further illustrates that officers who are caught in either a hypo-vigilant or a hyper-vigilant state, will be incapable of making prudent decisions or taking the appropriate actions. Many times, officers who are caught in either of those situations, only survive due to the threat's inability or unwillingness to harm them.

Through the appropriate monitoring, law enforcement would have the ability to ensure, to the best of its capabilities, that officers stay within acceptable margins of vigilance; whereby, they will be poised to manage what they encounter in a prudent and appropriate manner. If the margins should slip in one direction or another, the wearable device could offer a corrective reminder or alert to the officer. In the case of hypo-vigilance, the device could offer a stimulus to wake the officer's attention e.g. an electrical pulse to wake an officer getting drowsy behind the wheel; or in the case of hyper-vigilance, a stimulus reminding the officer to take a deep breath, as the art of breathing directly impacts the human decision-making process when under stress.

Another potential outcome of this wearable technology is for law enforcement to actively monitor an officer's biometrics while in the field eyeing for extreme biometric variances. In this example, dispatchers, supervisors and/or others who are alerted to an unusual variance could directly intervene by checking on an officer's welfare or status. A spike in certain biometrics could indicate a health emergency or that an officer is physically struggling with an adversary. In either circumstance, support resources could be started to the officer's location especially if voice communications have been compromised.

With the rationale firmly established, this simple and prudent action will help prevent complex problems for law enforcement personnel and for any other professional where vigilant situational awareness is required.

This notion can be easily implemented on the individual or local level for which those involved will benefit. However, think of the possibilities this technology could achieve if implemented on a larger scale. Think of the numerous benefits, liability reductions, and enhanced service delivery that would result if this idea were systematized at all levels within the law enforcement field.

Defined inputs when properly analyzed could deliver innumerable outputs that would transform and optimize a police officer's performance. As such, the shared data sets could assist police leaders, physicians, sleep therapists, nutritionists and others in providing guidance to keep officers healthy and in the proper mindset. Again, both advanced mental and physical conditioning will help avert costly mishaps, allowing officers to serve their communities more effectively and as importantly, allowing officers to increase their overall health and resiliency to both acute and chronic stress.

The Biometric Advantage:

Heart rate (HR) and heart rate variability (HRV) have been shown to correlate with performance under stress. HR seems to be more useful for real-time monitoring while HRV may help establish a baseline for an officer and predict when that officer is fit to return to duty.

The research is clear that even with measured biometrics, decision-making is not 100% predictable. Just because one's biometric parameters are "in-line" does not mean one will not make a mistake. However, the research does suggest if some biometric parameters are out of line, one is more likely to make a mistake. Although it's origins are a mystery, "The first pulse you check is your own" has long been taught to medical trainees dealing with stressful or "code" situations.

Specifically, HR has long been known to correlate with adrenaline-induced stress.⁹ There is wide variability among individuals, but the consensus from experts indicates as the HR rises, performance rises but only to a point and then performance suffers. This is often compared to a bell curve with peak performance being at the top of the curve. Situational awareness, which is largely a product of vigilance, follows a similar curve. Hypo-vigilance is dangerous in the short term, but so is hyper-vigilance in the long term. As Dussault, et. al. point out, "HR has been established as a valid and sensitive measure of vigilance and a fundamental metric for any operational task and for high cognitive output."¹⁰

Which begs the question, what is the HR of police officers when they are on patrol, on a SWAT call out, or in a use-of-force encounter? Besides data from relatively small studies, this data has not been collected in large populations of officers on the job. Assumptions can be made about an officer's HR on a routine traffic stop and speculation can be offered that the 20-year veteran will have a lower HR than the rookie, but suppositions do not equate to fact. Maybe the 20-year veteran has chronic PTSD from a traffic stop that resulted in an officer involved shooting (OIS) early in their career and ever since, traffic stops have caused the officer stress. Alternatively, maybe the rookie officer served time in Iraq or Afghanistan and although IEDs are a worry, the officer remains vigilant back in the U.S., but traffic stops are not particularly stressful.

Speculative gaming by changing the officers, the suspects, the conditions, the time of day, the crime being committed, etc. is how scenario-based training is currently designed. But what if the system is training the wrong officer for the wrong scenario? Putting it another way, the training is not necessarily *wrong* but simply not the *best* training for that officer.

No one would argue that scenario-based training has contributed to making officers safer. But, with the correct data, law enforcement trainers can do better. What if that 20-year veteran needs to work through that OIS with a counselor? And rookies need to be reminded that all traffic stops, although appearing relatively safe, are unknown and deserve respect, even if they are not expecting an IED. Individualized training through the use and analysis of data will optimize an officer's performance and will enhance the officer's resiliency to the stressful factors that impact said officer.

Moreover, maybe that elevation in HR is not as much a product of the traffic stop, but indicative of an underlying health problem. The elevated HR may go hand in hand with increased sympathetic tone, which also correlates with decreased HRV. Which in turn might be a sign of burnout and chronic fatigue. The wrong training will not fix that concern. There are layers to the onion that need to be peeled back to look at what else is happening. Whether it is a difficult marriage, a wayward child, excessive debt, or a substance abuse problem, other issues need to be addressed for the sake of the officer and the people the officer serves.

As Fogt, et. al. point out in a study of military-aged recruits, "Chronic fatigue/physical exhaustion (FPE) impacts combat readiness but is difficult to identify."¹¹ Using HRV, the authors make correlations to aerobic capacity and hydration status and highlight the potential for further applications of this technology. They conclude by saying, "Identification of altered autonomic nervous system (ANS) activity using field-based HRV will likely prove effective in preventing and diagnosing FPE during accelerated training or missions involving sleep deprivation, inadequate food and fluid intake, and physical or mental challenges."¹¹

Although the authors were referring to military personnel, it is not inappropriate to compare those individuals to police officers who are also sleep deprived, often eating fast food, hydrating with caffeine and sugared beverages, and obviously faced with a myriad of physical and mental challenges. It is one thing to advise officers that some of their long-held habits may be negatively impacting their health, yet it is something else to show them the objective data that predicts their health and performance is suffering.

A comparison of an officer's baseline HRV to an officer's HRV after a stressful event could be made to predict whether they are fit to return to duty. Dussault, et. al. looked at HRV in a population of fighter pilots before and after combat missions. Their data suggested that a rise in HRV after a combat mission might be a sign of fatigue. Furthermore, Fogt, et al. explains that "the absolute ranges of individual values were considerable."¹¹ So what constitutes an out of range HRV measurement for one individual may not be out of range for another; thus begging the need for individualized training and performance measurements.

Although an officer might feel ready and want to get back to duty, an abrupt change in HRV may indicate that is not a prudent notion. It is an objective piece of data to be used in connection with the whole picture. Certainly, an abnormal measurement may not be an indicator to keep an officer off the street in and of itself, but when taken as part of the whole picture, it will add value to the overall assessment.

Related, it is imperative to understand that the goal of measuring biometrics is not punitive. A HR that elevates more than predicted and HRV out of the norm is not, and should never be, cause for disciplinary action. Law enforcement agencies spend considerable resources hiring and training officers with the hopeful goal of those officers retiring from that agency in a healthy state many years in the future. Measureable biometrics are not a surreptitious method to find fault and force early retirements. The absolute antithesis of that notion is the true goal. Through the use of wearable technology and the proper analysis of the data, law enforcement organizations will have the capacity to build both optimized performance and resiliency with its most important assets—its personnel.

Preparedness, performance, and prediction are the goals. By establishing baseline biometrics like HR and HRV for a given officer, proper preparations can be tailored for police personnel to meet and exceed the challenges of the job. In real time, biometrics can provide feedback to correct and influence performance. And as importantly, these measurements can help predict future behavior and prescribe corrective courses of action resulting in optimized performance and resiliency.

A Call to Action:

The digital world comprised of its evolving technology, databases and artificial intelligence is changing the face of policing. For example, through the emergence of CompStat, hot spot policing and other analytical methodologies, artificial intelligence has demonstrated its superior capabilities in spotting and anticipating crime. The time has arrived to turn devices, data and analytics into solving the critical problems we want solved: optimized performance and resiliency.

With assistance from technologists and academicians, law enforcement has the opportunity to lead the way on this innovation. Working together, from within our collective ranks, police leadership can develop solutions that will advance officer performance in the field resulting in higher productivity, enlightened decision-making and safer, more sensible tactics.

With the common desire to optimize performance, law enforcement might be tempted to procure different wearable devices from emerging and well-established companies so officers can monitor certain biometrics to help improve their health. But, that simple action is not the ultimate solution. Our profession lacks the proper platform to: produce the best practices for these wearables—what biometrics will be consistently measured and why; where the data will be safely stored; how resultant data will be analyzed; and most importantly, how will the discovered data and information be shared across jurisdictions to improve officer performance?

Every law enforcement agency across the nation should be a data collector and an analyzer of that data. Only then will policing truly develop mechanisms to lean how to keep its officers physically healthy, mentally fit and capable of prudently managing the acute and chronic stress of the job over the course of their careers. “An officer whose capabilities, judgment, and behavior are adversely affected by poor physical or psychological health not only may be of little use to the community he or she serves, but also may be a danger to the community and to other officers.”³

References:

1. Flynn, V., (2012). *Kill Shot*. pp. 26
2. President's Task Force on 21st Century Policing, *Final Report of the President's Task Force on 21st Century Policing* (Washington, D.C.: Office of Community Oriented Policing Services, 2015), pp. 61-68, http://www.cops.usdoj.gov/pdf/taskforce/taskforce_finalreport.pdf (accessed January 5, 2015).
3. Cusic, C., (2014). *Development and Implementation of a Physical Fitness Program for a Local Police Department*. pp. 1-15.
4. Hem, E., Berg, A., & Ekeberg, O. (2001). Suicide in police—a critical review. *Suicide & Life-Threatening Behavior*, 31(2), 224-33.
5. Pollock, M., Gettman, L., & Meyer, B. (1978). Analysis of physical fitness and coronary heart disease risk of Dallas area police officers. *Journal of Occupational Medicine*, 20(6), 393–398.
6. Stamford, B., Weltman, A., Moffatt, R., & Fulco, C. (1978). Status of police officers with regard to selected cardio-respiratory and body compositional fitness variables. *Medicine and Science in Sports*, 10(4), 294–297.
7. Lee, J. C., & Mallory, S. (2004). A guide for implementing a physical fitness maintenance training program in a criminal justice agency. *Smart Online Journal*, 1(1), 15–19.
8. Quigley, A. (2008). Fit for duty? The Need for Physical Fitness Programs for Law Enforcement Officers. *The Police Chief*, 75(6).
9. Grossman, D., (2004). *On Combat*.
10. Dussault, C., Lely, L., Langrume, C., Sauvet, F., & Jouanin, J. C. (2009). Heart rate and autonomic balance during stand tests before and after fighter combat missions. *Aviation, Space, and Environment Medicine*. September; 80(9), 796-802.
11. Fogt, D. L., Cooper, P.J., Freeman, C.N., Kalns, J.E., & Cooke, W. H. (2009). Heart rate variability to assess combat readiness. *Military Medicine*, May; 174(5), 491-495.
12. League of Minnesota Cities Law Enforcement Work Compensation Data, (2016). Extrapolated by Risvold, M., Wayzata Police Department.

13. Minnesota Public Employee Retirement Association Disability Retirement Data, (2016). Extrapolated by Risvold, M., Wayzata Police Department.
14. Thayyil, J., Jayakrishnan, T. T., Raja, M., & Cherumanalil, J. M. (2012). Metabolic syndrome and other cardiovascular risk factors among police officers. *North American Journal of Medical Sciences*, 4(12), 630–5. doi:10.4103/1947-2714.104313
15. Richmond, R. L., Wodak, A., Kehoe, L., & Heather, N. (1998). How healthy are the police? A survey of lifestyle factors. *Addiction*, 93(11), 1729–37.
16. Sardinas, A., Miller, J. W., & Hansen, H. (1986). Ischemic Heart Disease Mortality of Firemen and Policemen. *American Journal of Public Health*, 76(9), 1140–1141.
17. Janke, H. (2011). U.S. Department of Justice: Hometown Heroes Survivors Benefits Act of 2003. *Bureau of Justice Assistance (BJA)*, (April), 1-2. Retrieved from <http://www.justice.gov/oig/reports/OJP/e0805/final.pdf>
18. Smith, J., & Tooker, G. (2005). Health and fitness in law enforcement: A voluntary model program response to a critical issue. *The Commission for Accreditation for Law Enforcement Agencies (CALEA)*. 87.
19. Norvell, N., & Belles, D. (1993). Psychological and physical benefits of circuit weight training in law enforcement personnel. *Journal of Consulting and Clinical Psychology*, 61(3), 520–7.