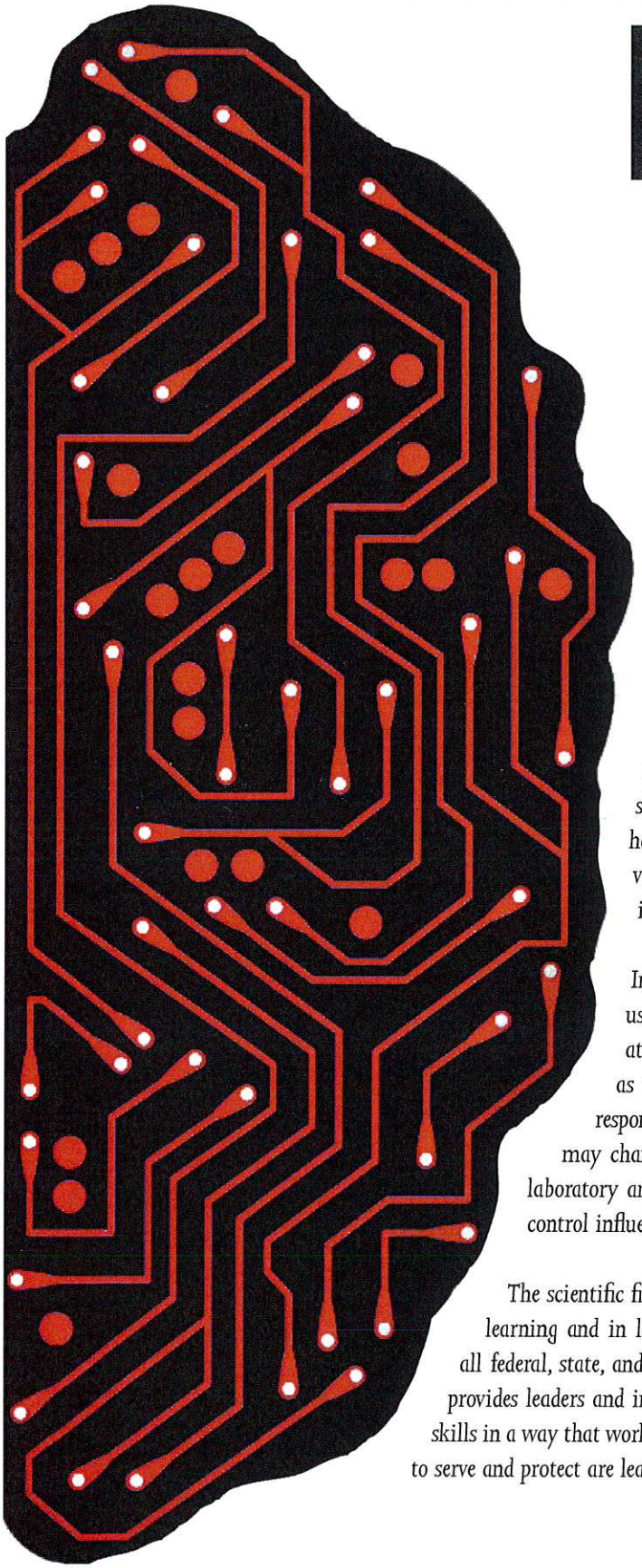


NEURO COP

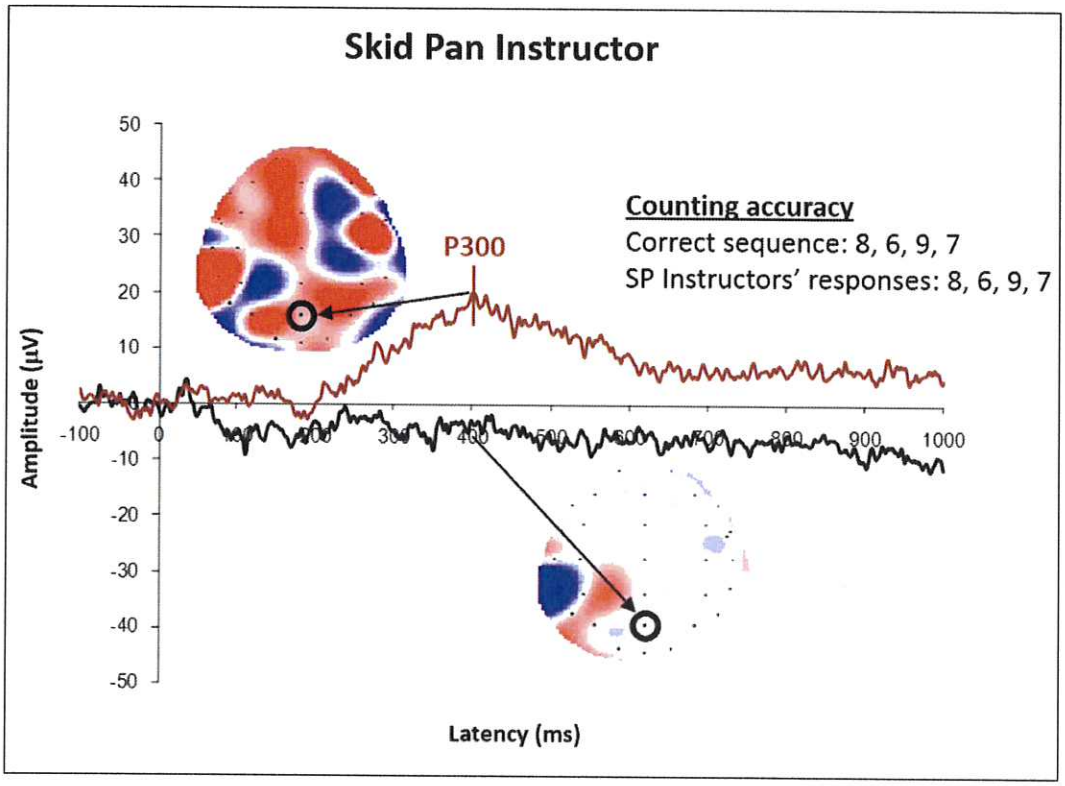
Using Science to Understand Policing Under Stress

By Jonathan W. Page & Kasee F. Page

Editor's Note: For many years there have been numerous research studies documenting the negative effects of stress as they relate to officer judgment, decision making, and performance when faced with deadly force and self-defense situations. At the same time, for approximately 16 of the past 18 years there have been more law enforcement officers and agents killed in the line of duty by vehicle related incidents than by any other cause. Thus, there is a great need to investigate the effects of stress as they relate to law enforcement driving.

In coordination with the Metropolitan Police Department in England, Dr. Page used law enforcement driving as the foundation for his research study, which attempts to link specific brain functioning to higher order cognitive tasks such as visual discrimination, multitasking, and imagination while driving emergency response. Of particular interest to his team and him is finding out how these processes may change under stressful situations. Much of Dr. Page's research endeavors have been laboratory and field experiments that help to better understand how maintaining cognitive control influences driving and tactical decisions in law enforcement.

The scientific findings of Dr. Page's study regarding the effects of stress and performance during learning and in law enforcement operations are critical information for FLETC as well as for all federal, state, and local law enforcement departments and training academies. Such information provides leaders and instructors with knowledge and tools needed to ensure they are teaching specific skills in a way that works with the brain—not against it in order to help ensure those they are preparing to serve and protect are learning the critical skills needed to safely and effectively perform their jobs.



The dispatcher's call crackles over the radio in the squad car, "terminate the pursuit, terminate the pursuit." The officer ignores the directive and continues to pursue the fleeing vehicle. In a short time, the pursuit indeed ends; but it ends in a non-fatal crash that tarnishes the officer's reputation and leaves the police agency exposed to liability issues.

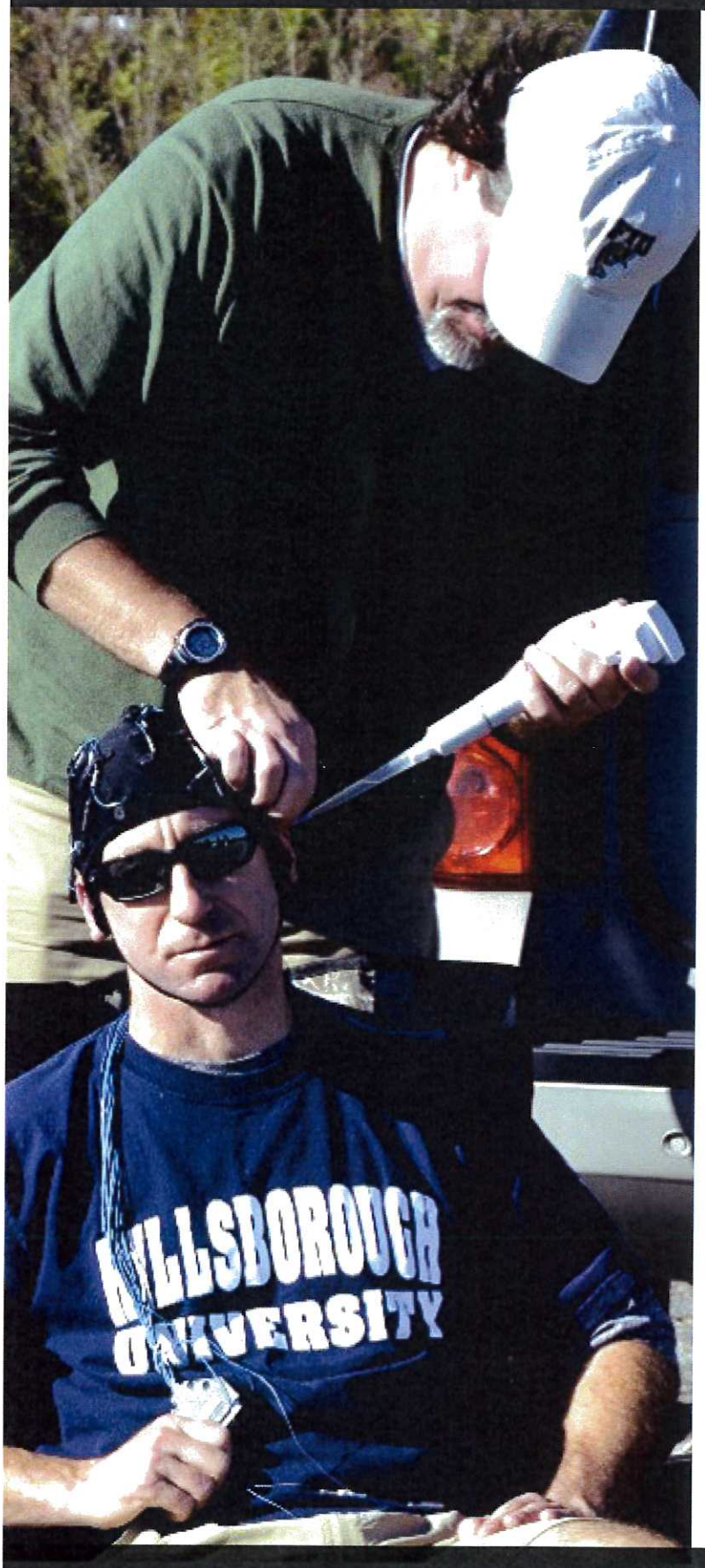
A few years ago, a deputy commissioner of a large police organization asked us why the officer in the above example did not disengage the pursuit as instructed by the dispatcher. There had been three similar cases in his organization in the year and a half leading up to our discussion, so he was interested in finding the answer. In his words, "I spoke to all three officers and they all claimed not to have heard the termination order. But is that possible? From a scientific standpoint, is it possible to be engaged in a radio conversation with dispatch, but somehow miss this vital information?"

To answer the deputy commissioner's question, we conducted a series of experiments designed to explore multitasking under stress and to find training techniques to improve cognitive functioning and control during such instances. We believe sharing our findings here will be beneficial to the field of law enforcement, but our research should also be taken as a demonstration of how law enforcement can use science to find such answers.

Multitasking on the Skid Pan

We spent two summers in London researching at the London Metropolitan Police's driver training school in Hendon. At the training facility is a skid pan: a large, circular asphalt area that slopes gently to a drain in the center. Cones and tires are placed at key locations to create "courses" the instructors can use during training. Each morning an instructor covers the skid pan with a fresh coat of oil and then turns on water that trickles out of spigots embedded in the curbing. The water trickles over the surface throughout the day, mixing with the oil, to create a slick surface that allows the instructors to teach traction control.

We recruited a few officers attending a driving course, along with a handful of instructors, and connected a portable electroencephalograph (EEG) to their heads to measure brain activity while driving. Additionally, we asked them to discriminate between two tones (low- and high-pitched beeps) while navigating a course of half circles on the pan. Our original plan was to see if



one of the two groups was better at multitasking than the other. We hypothesized that the instructors would be better, and that the difference could be attributed to expertise (i.e., amount of training).

Our findings may not surprise you, but they surprised us at the time: the trainees were under a great deal of stress during the driving test. We had not considered that stress may play a role; why should we? The task was simple: drive in slow circles while counting beeps. It became clear, however, that most of the trainees were experiencing a tremendous amount of stress. When we asked why, one trainee said, "Because the instructor is in the car." Our response was, "The instructor told you that he was not evaluating you today, he was simply riding along to follow protocol." The trainee responded, "Maybe he didn't evaluate me today, but had I screwed up on the course, he would have remembered my bad performance the next time I am on the skid pan for training."

Looking at our brain data, a bump (known as the P300) at a specific point in the brainwaves indicates participants were paying attention and discriminating the beeps. They were multitasking. No bump means that they were not multitasking. A bump is obvious in the instructors' EEG, which matches their nearly perfect performances of counting the high-tones; but we didn't see much of a bump in the trainees' brainwaves. The difference is more obvious when comparing performances at the extremes: We saw textbook-perfect multitasking by an instructor, and absolute tunnel vision by a trainee. The colors in the brain model of our graph represent neural activity attributed to the task. Again, the instructor was multitasking (bright colors); the trainee was not (dull colors).

The following summer, we directly measured stress as it relates to multitasking. Again, we found that those trainees with the highest levels of stress (determined by self-reports and measures of the stress hormone cortisol) performed the poorest, and those with the least amount of stress performed the best. We included three skid pan instructors in the study and found their performances to be perfect.

Left: University students volunteer to be hooked up to sensors as part of a study on attention responses.

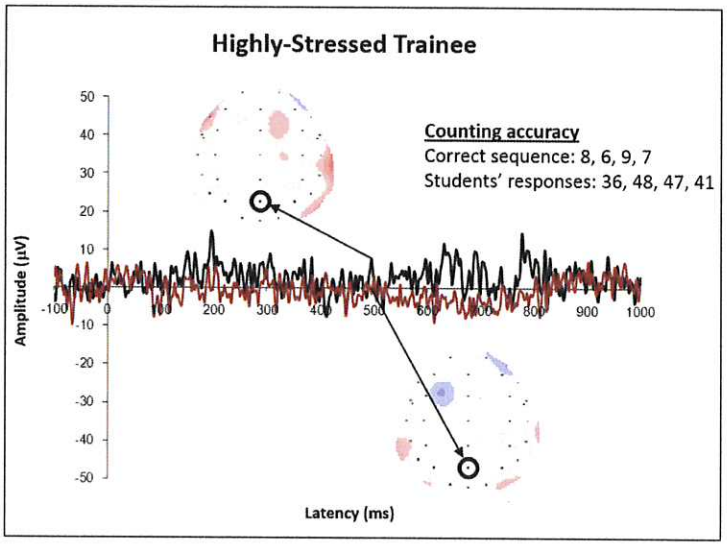
In discussions with the few trainees that performed fairly well, we asked why they were so close to accurately counting the tones, but were still slightly off (usually by only a few counts). Their responses were all similar and went something like this..."I was driving along counting the beeps when all of a sudden I sensed that I was losing control of the vehicle. All of my attention went towards getting the vehicle back under control. Once I felt that I was back in control, I heard another beep. That reminded me to start counting again. I didn't hear the beeps while I was trying to gain control of the vehicle, so I had to guess how many beeps sounded during the time that I wasn't paying attention."

Our research showed that an officer could be in control and multitasking until something threatens her/his control of the vehicle. At that point, multitasking was compromised. It would be like pursuing another vehicle and talking on the police radio. An officer may be doing both, but if a threat suddenly appears–like another vehicle approaching from a side street or a child running through a yard along the pursuit path–the officer turns all of his or her focus towards controlling the threat and maintaining safety. During this time, the officer may miss auditory information from the police radio. Once the threat is no longer present, multitasking resumes.

Laboratory Study of Multitasking and Memory

In a laboratory study in London, we had officers with different amounts of training watch one-minute videos of pursuits while counting beeps (multitasking). After each video, we recorded officers' detailed memories of the pursuit. We found large memory differences between groups, with the highly trained pursuit drivers scoring the highest on the memory tests, followed by the lesser trained response drivers, followed by officers who had not received police driver training. There were no differences between these groups using standard tests of memory, nor when looking at brain activity related to multitasking. The differences were for police-related information only, and were due to training.

What about their training led to these differences? Our research showed that the pursuit drivers had a much more detailed pattern-recognition system, probably due to



training using verbal commentary–a technique used by the driving school to train with correction. Using this method, trainees are required to talk about what they are doing as they do it so that the instructor can assess intent along with behavior. As a side benefit, describing the environment and giving details about the maneuvers they were performing seemed to train up the pattern-recognition system.

Our Additional Research Findings

Since our original findings in London, we have conducted several studies aimed at finding ways to enhance training by building strong pattern-recognition systems in the brain. In one study, we partnered with a driver training program called "Slower is Faster" delivered by the Hillsborough, North Carolina, Police Department. They allowed us to conduct research during their driving course. Brain activity was measured using a portable EEG while officers drove a closed course on an abandoned airport runway. We assessed multitasking, using beeps again, and driving, by timing each drive and counting errors based on how many cones were struck.

Initial measures were taken from two groups (baseline), followed by an hour and a half break, and then a second round of measures were taken (test). One group rested during the break; the other group received 75 minutes of training on how to stay in cognitive command, which we refer to as C2. Results showed that the improvement between drives, comparing the test to the baseline, was greatest for the cognitive command group. Its multitasking

improved six fold compared to the control group and its driving improvement was tenfold.

Additional research has shown that these improvements are not specific to driving. We found similar results during a scenario-based test at a deputy sheriffs' academy. An academy class of deputies were trained in cognitive command and put through a scenario-based test of tactically clearing a building. A variety of responses were evaluated and recorded and compared to another academy class of deputies that had not been trained in cognitive command. The cognitive command deputies showed an increase in perceptual awareness, memory, pattern-recognition, and confidence compared to the control group.

Conclusions

Officers and trainers that we have talked to generally agree that there are two basic reasons why the driver in the above example failed to follow the directive to terminate the pursuit: (1) the officer heard the command but was so jacked up on adrenaline, and had such a bad case of red mist, that he simply didn't want to stop the pursuit; or (2) stress from the pursuit led to a form of auditory exclusion that prevented him from hearing the directive.

While our research cannot determine why an officer behaves in a certain way in a given situation–i.e., there is no machine to date that can literally read minds–our research does show how such mental lapses can occur. Stress wreaks havoc on our cognitive and perceptual systems. When under "threat-of-harm" or "threat-of-life" stress, our system behaves much differently from what is typical.

We were also able to show that training can mitigate some of the effects of stress. Cognitive command training has a positive effect on stress-related performance. Having a strong pattern-recognition system allows an officer to automatically understand a situation and take quick and decisive action. It increases awareness and frees up neural resources so that additional information can be attended to and processed. Our current research into this exciting area is providing first-of-its-kind information about how a pattern-recognition system can be trained in law enforcement; and we are expanding our brain research into new areas and testing training concepts that should have a positive impact on academy and in-service based training in the near future. Being able to answer questions about stress and officer behavior from a scientific point of view is essential. Having an understanding of how the brain operates under stress can inform opinions on policing behaviors and improve police training.

JONATHAN PAGE *is a professor, cognitive neuroscientist, and co-founder of the World is Round, LLC, a research, training, and consulting company. He has conducted more than a decade of research studying human perception and action. His extensive research on physiological responses to stress and how stress influences behavior led him to pursue new and more effective ways to deal with stress and stressful situations. Collaborating in field research with law enforcement agencies in the U.S. and U.K. provided Jon with the knowledge he needed to develop cognitive command, a mental mindset training technique for public safety. Along with his wife Kasee, Jon co-authored a training curriculum that is currently being used in law enforcement academies in the US. He also authored the book NeuroCop: The Science of Using Automatic Thinking to Guide Tactical Behaviors (www.see-too.com) and has published his research in several professional journals.*

KASEE PAGE *is an educator. A love for learning and growing knowledge led her professional experiences in the fields of education and research. She has taught in multiple U.S. regions to numerous student populations from public grade schools to institutions of higher education, and participated in field research in the U.S. and abroad. Kasee received a Master's in Educational Leadership from the University of Nevada. She has trained district administrators and teachers in professional development to implement new curriculum and instruction methods in public education and worked as a leadership team member for school improvement plans, including an extended administrative internship role. She has worked as a consultant for a large western school district and volunteered for the May Foundation to provide enriched learning events for Northern Nevada's children. Kasee is co-founder of The World is Round and is currently conducting research with her husband Jonathan to develop curriculum and instruction training methods for law enforcement. Kasee's most important teamwork assignment with her husband Jonathan is being mom to their three young adult kids.*