

**PREDICTIVE INJURY TESTING, BIOMECHANICS
AND CORRECTIVE EXERCISE:
ONE COMPONENT OF OFFICER WELLNESS**

by

**Mike Hamel
Irvine Police Department**

April, 2013

COMMAND COLLEGE CLASS 52

The Command College Futures Study Project is a FUTURES study of a particular emerging issue of relevance to law enforcement. Its purpose is NOT to predict the future; rather, to project a variety of possible scenarios useful for strategic planning in anticipation of the emerging landscape facing policing organizations.

This journal article was created using the futures forecasting process of Command College and its outcomes. Defining the future differs from analyzing the past, because it has not yet happened. In this article, methodologies have been used to discern useful alternatives to enhance the success of planners and leaders in their response to a range of possible future environments.

Managing the future means influencing it—creating, constraining and adapting to emerging trends and events in a way that optimizes the opportunities and minimizes the threats of relevance to the profession.

The views and conclusions expressed in the Command College Futures Project and journal article are those of the author, and are not necessarily those of the CA Commission on Peace Officer Standards and Training (POST).

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January 18, 2013: I'm meeting Captain Mike Contreras at 8:30 a.m. at the front doors of the Irvine Police Department. He's dressed in workout gear, carrying a gym bag and a couple of interesting props. I see a PVC pipe and an object resembling a 2" x 6" with large measurement markings on its face – like a giant ruler. I had spoken to him on the phone after learning he was the Orange County Fire Authority's fitness expert, but today we're meeting for the first time. Mike has agreed to assist me in my quest to enhance the level of overall wellness and job satisfaction for our 205 sworn officers at the Irvine Police Department. Interestingly, his specific expertise is how to approach wellness scientifically.

As I escort him upstairs, he tells me more about the Functional Movement Screen™ (FMS). “The FMS™ is a predictive injury tool, and we are using it to identify our recruits who are most at risk to injure themselves in the line of duty or during training” he says. “The real value” he continues “is someone trained to administer FMS can use the results to prescribe corrective exercises designed to repair functional movement”. Mike concludes his introduction to FMS screening by noting some studies suggest individuals who overcome their deficiencies may decrease their propensity for musculoskeletal injury under a variety of conditions (Contreras 2012; Lisman, O'Connor, Duester & Knapick, 2012; O'Connor, Duester, Davis, Pappas & Knapick, 2011; Peate, Bates, Lunda, Francis & Bellamy, 2007).

As we reach the City's Wellness Center, Mike sets up all of his contraptions. “I'm going to put you through a series of seven tests, designed to evaluate your functional movement. I'll assign a score between one and three for each test. The sum of the scores for these tests will be your overall score.”

As I align my feet with my shoulders, I squat, while bracing a PVC pipe across the top of my shoulders, behind my neck. During the next 15 minutes Mike watches my form while I bend, balance, reach and lunge. He takes measurements and makes notes. When I have completed all seven movements that comprise the screen, he announces in a range from 0 to 21, I have scored an overall 9. “Is that good or bad?” I inquire. “It’s not good” he responds. A lower FMS™ score is correlated with a greater number of biomechanical deficits. According to Contrearas, if I were an Orange County Fire Authority recruit, I wouldn’t be permitted to “workout” in the traditional sense of the word. Instead, a cadre of corrective exercises designed to restore my functional movement would be prescribed. Since a part of my goal for the day is to assess how we might use FMS for working cops, I wondered to myself what score we would use. First, though, I had to get a better understanding of what the FMS is, and how predictive injury testing actually works.

Predictive Injury Testing

The Functional Movement Screen™ was developed by Gray Cook, a board-certified orthopedic clinical specialist, and Lee Burton, who holds a PhD in Health Promotion and Wellness. Originally introduced in 1998 to rate and rank the movement patterns of high school athletes, the FMS™ today has been applied in many other settings (Cook, Burton & Fields, n.d.). According to the creators, the validity of the tool in predicting injuries stems from the test’s ability to identify “...weaknesses, imbalances, asymmetries and limitations...” that cause compensatory movement patterns which lead to poor biomechanics and possible future musculoskeletal injury (Cook et al., p. 1). The FMS™ reflects an appreciation of the human body as a kinetic chain, consisting of interdependent joints and muscles working together to create functional movement (Schneiders, Davidsson, Horman, & Sullivan, 2011). FMS™

technology has already been adopted by a growing number of governmental organizations, such as the Orange County Fire Authority, the United States Secret Service and various branches of the United States Military. More than a dozen college and professional sports organizations have also successfully used the FMS™ to assess athletes and their propensity for injury (Functional Movement Systems, n.d.; Kiesel, Plisky, & Voigt, 2007).

While perhaps the most prominent, the FMS™ is not the only predictive injury test. Among many others, the Star Excursion Balance Test (SEBT) and general joint laxity tests have been accepted as screening tools to identify athletes who are at greater risk for lower extremity injury (Filipa, Burnes, Paterno, Myer & Hewett, 2010; Dallinga, Benjaminse, & Lemmink, 2012; McGuine, Greene, Best, & Levenson, 2000). Other companies, such as U.K. based Intelligent Training Systems™ (ITS), also promote predictive injury testing through an assessment of *intrinsic* biomechanics to identify biomechanical flaws, asymmetries and imbalances, which gives rise to prescriptive corrective exercises. (personal communication with D. Langston, ITS™, February 15, 2013).

ITS™ has worked with many police and fire departments in the past, including the South Yorkshire Police Department in the U.K. According to Langston, while official research data is not yet available, initial assessments indicate the ITS™ system effective in reducing injuries among South Yorkshire police officers. Recently, ITS™ has established an office on in North Carolina, and has partnered with the American College of Sports Medicine and the University of Wisconsin. As ITS™ establishes itself in the United States, it will be interesting to track any published research related to the efficacy of the ITS system in predicting and mitigating injury to law enforcement personnel. The FMS™, though, has already begun delivering data to strongly indicate its use will result in fewer injuries and decreased time lost due to those injuries.

Functional Movement Screening in the Fire Service

The Orange County Fire Authority has been using the FMS™ in its fire academy since 2007 to identify recruits most at risk for musculoskeletal injury. In a preliminary study of recruits in two academy classes, those who scored 14 or less on the FMS™ were twice as likely to be injured during the academy. And, in further study, 113 recruits from four consecutive fire academies were screened using the FMS™. Although only 47% of the recruits scored 14 or less, this group accounted for 72% of the total musculoskeletal injuries reported during the academy and 85% of the total cost to treat these injuries (Contrearras, 2012). Contrearras is currently processing ten years of data related to work injuries and the impact of using FMS™ as a means to identify and correct sub-optimal biomechanical movement patterns. His time-series, longitudinal study will determine if reported injuries and workers' compensation costs for musculoskeletal injuries have decreased since the screen's implementation.

One study in the Tucson AZ Fire Department has already demonstrated appropriate post-FMS™ intervention strategies can be beneficial. In this study of 433 firefighters, the prescribed corrective exercise routines and accompanying training to promote optimal body mechanics reduced lost time by 62%, and the overall number of injuries by 42% over a year's period, compared to a historical control group (Peate et al., 2007).

Predictive Injury Testing in Law Enforcement?

While the job duties of a firefighter and police officer differ, the movements required to perform specific job tasks are similar. Because of these similarities, the prospect of similar success in law enforcement is promising. Contrearras reports the top three musculoskeletal injuries within the Orange County Fire Authority are back, knee and shoulder injuries – all

relatively equal in distribution (personal communication, January 18, 2012). A recent analysis of workers' compensation claims from 2008 through 2012 for the Irvine Police Department revealed musculoskeletal injury data that mirrored the Fire Authority's data. Since many back, knee and shoulder injuries are due to repetitive use, it further supports a similarity between the movement patterns of police officers and firefighters.

Exercise physiologist Kari Mefferd (personal communication, January 28, 2013), who directs Anaheim Police Department's wellness program, and Hayley Stevens (personal communication, February 14, 2013), Glendale Police Department's wellness coordinator, have incorporated the FMS™ into their agencies' respective comprehensive wellness programs. Both agree the FMS™ is one useful tool in identifying police officers who may be at risk for injury. Mefferd, who is certified to administer the FMS™, advocates follow-up with a physical therapist for any FMS™ participant who reports pain during the screening.

Both Mefferd and Stevens have worked in partnership with exercise physiologist Terri Wann, who is the coordinator for Santa Ana College's wellness program. Wann's college has been offering comprehensive fitness evaluations to public safety personnel for the past 30 years, and the FMS™ is one component of their overall program. Wann explains the FMS™ is an effective screening tool since public safety personnel are often athletic and fit, but some possess poor body mechanics (personal communication, February 4, 2013). Santa Ana College's clients include 22 fire departments, and four police departments, including Glendale and Anaheim. Wann has collected FMS™ data on thousands of public safety personnel, but this data has not been analyzed.

Incorporating Predictive Injury Testing into Wellness Programming

Law enforcement leaders have good cause to take action designed to mitigate their personnel's potential for job-related injuries. In Tucson, between 2002 and 2008, injuries to public safety personnel cost the city 20 million dollars, and the injury rate for these personnel was more than two times the state average (Brosseau, 2008). And in one Orange County City, 83% of the open workers' compensation claims were linked to police officers or firefighters (Cassidy, 2011). The research, as reviewed here, clearly supports predictive injury testing for police officers as a viable solution for agencies wishing to mitigate future injury to their personnel, while enhancing their health and job performance.

Injury Prevention Training Should Augment Predictive Injury Testing

It is also important to distinguish between predictive injury screening and injury prevention programs. A corrective exercise program flowing from a predictive injury screen can reduce the likelihood of injury *when* movement occurs, whereas an injury prevention program teaches *how* to move to mitigate injury potential. From this perspective, predictive injury testing and injury prevention programming work in synergy to reduce the likelihood of line-of-duty and training injuries.

As suggested in the Tucson Firefighter study, the value of injury prevention programming for recruits and in-service officers should not be overlooked. The Tucson firefighters participating in the study not only received prescriptions for corrective exercise to strengthen and stabilize their core, they also received comprehensive training related to proper posture and biomechanical form when engaging in physical activities involving pushing, pulling, twisting or lifting (Peate et al., 2007).

Understand Predictive Injury Testing and Corrective Exercise is Just One Aspect of Comprehensive Wellness

Mefferd, Stevens and Wann stress to law enforcement administrators to remember predictive injury testing and corrective exercise is only one component of a comprehensive wellness program. Comprehensive wellness encompasses *any program administered through a city or a police department for sworn personnel, whether mandatory or voluntary in nature, and irrespective of compensation or incentives, that aims to enhance or preserve the employee's mental or physical health.* With this definition in mind, cardiovascular fitness, nutrition and weight management, measured health indicators, such as blood lipid levels, mental health and stress management, and chemical dependency treatment can all be considered under the umbrella of comprehensive wellness. Following from the same definition, ergonomics, injury prevention programs and even educational campaigns to promote driving safety and seatbelt usage can (and should) be viewed as important aspects of wellness.

Much like predictive injury testing, strategies to enhance health and fitness within other wellness dimensions should target *modifiable risk factors.* For instance, “heart” programs incorporate blood lipid level screening, and medical professionals recommend various interventions when certain measurements fall outside normal health parameters. Incidentally, one study estimates the cost of an in-service heart-attack for a police officer to be between \$400,000 and \$750,000 (Bullock, n.d.). *Every* dimension of any wellness program should be approached scientifically with an understanding that mitigating as many risk factors as possible related to an officer's health and wellness has an additive effect which reduces the overall risk of injury, illness, or even death.

Proving the efficacy of wellness programming shouldn't be difficult. There are countless studies supporting the proposition wellness programs pay for themselves in the long run. For example, Portland Fire Department's ten-year wellness program, designed to teach firefighters better eating and exercise habits, has reduced work-related health expenses by \$1500 per firefighter annually (Ceniceros, 2011). And, a study of 734 police officers linked sedentary police officers to statistically significant elevated rates of absenteeism and workers' compensation costs, compared to their active counterparts (Steinhardt, Greehhow & Stewart, 1991).

The scientific approach should not be limited to identifying and targeting modifiable risk factors. Science and research can be helpful during the implementation phase as well, especially within the context of motivation and human behavior. Self-determination theory (SDT) distinguishes between behavior motivated by an inherent desire in the behavior itself, divorced of any external pressure to perform (*autonomous motivation*), versus behavior motivated by the presence of deadlines, incentives or punishment (*controlling motivation*). Researchers have found individuals are more likely to sustain behaviors associated with autonomous motivation, and experience a greater degree of satisfaction and enjoyment (Hagger & Nikos, 2012).

Branding, Technology and Program Organization Are Important Too

Branding may also be useful to create sustainable programs. Brands can create identity, transcend cultures and elicit emotion. Wellness and fitness programs should be branded too, for all of same reasons. The Chicago Police Department, for example, calls their program POWER (Peace Officer Wellness Evaluation Report) (Peggy, 2003).

Technology should also be leveraged to promote and support wellness programming and initiatives. There are several companies who host online communities related to various aspects

of wellness, enabling clients to create profiles or memberships, design customized fitness programs, and track progress.

It is also recommended every dimension of wellness be managed under one umbrella. Mefferd, who has headed Anaheim's wellness program for over a decade, stresses the importance of central control to enable effective branding and to enhance execution of the program. She is assigned to the Training Division (personal communication, January 28, 2013).

Next Steps

Agencies wishing to move toward the future of health science should consider the following action steps to integrate predictive injury testing into comprehensive wellness initiatives:

- Analyze your department's workers' compensation data, with a focus on musculoskeletal injuries. Study, tabulate and organize the injuries, by body part, type and cause. Calculate the cost of these injuries.
- Utilize this data to demonstrate to other stakeholders the need to mitigate work-related injuries. Share studies related to the success of predictive injury testing to mitigate employee injuries. Provide evidence that wellness programs have been proven to be effective in reducing workers' compensation costs.
- Enlist kinesiologists or exercise physiologists who specialize in predictive injury testing to screen your officers. Academy directors should consider the same approach for police recruits.
- Understand predictive injury screening will identify personnel with flawed biomechanics who are most at risk for musculoskeletal injury. Understand the role prescriptive corrective exercise will have in restoring proper biomechanics, while *reducing the*

likelihood of future injury. Provide opportunity, incentives and motivation for your personnel to adopt prescriptive exercise regimens.

- Be sure your predictive injury testing component complements a *comprehensive* wellness initiative. Be sure other dimensions of your wellness program are also approached scientifically, with an emphasis on identifying and targeting modifiable risk factors.
- Share facts, stories and information with your personnel to demonstrate how a commitment to wellness will enhance their health, fitness and job satisfaction. Brand the program to promote identity, excitement and sustainability. Market it using time-tested strategies from private industry. Leverage technology to assist in this area.
- Establish performance goals. Collect comprehensive data related to injuries, predictive injury testing, and other wellness interventions designed to target *modifiable risk factors*. Track progress. Demonstrate your success - *scientifically*.
- Be sure your managers and supervisors set the example and lead the way, through a demonstration of their own commitment to health and wellness.

As law enforcement leaders, we have a responsibility for the health and welfare of our workforce. Predictive injury testing offers a proven strategy to promote fitness and increase job satisfaction, while reducing workers' compensation costs and mitigating our officers' risk of future injury.

Conclusion

While predictive injury testing and corrective exercise is not new, it is a relatively unexplored area for law enforcement. Empirical research concerning the efficacy of both public domain screening tests and proprietary screening systems continues to be conducted. What is currently known supports law enforcement administrators exploring how predictive injury testing

can be incorporated into broader wellness initiatives designed to target modifiable risk factors that can mitigate injury, reduce health care costs and enhance job satisfaction. To this end, decision makers should borrow from research and theory related to motivation to develop optimal implementation strategies that promote scientifically based, sustainable wellness initiatives. It's been over a month now since I first participated in the FMS™. I have been performing corrective exercises daily, and I recently improved my FMS™ score from 9 to 11. It's a work in progress.

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