Health, Stress, & Wellness in Policing: Current Issues and Emergent Solutions

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This project was supported, in whole or in part, by Cooperative Agreement Number 2017CKWXX09 awarded by the U.S. Department of Justice, Office of Community Oriented Policing Services. The opinions contained herein are those of the author(s) or contributor(s) and do not necessarily represent the official position or policies of the U.S. Department of Justice. References to specific individuals, agencies, companies, products, or services should not be considered an endorsement by the author(s) or the U.S. Department of Justice. Rather, the references are illustrations to supplement discussion of the issues.
Today’s Presenters

Brian Aagaard, a member of RTI’s Policing Research Program, has worked with law enforcement at the local, county, state, and federal levels for more than a decade. His areas of expertise include the collection, management, and analysis of law enforcement data.

Dr. Robert Furberg is a senior clinical informaticist in RTI’s Digital Health and Clinical Informatics program, where he conducts future-oriented research on technology-enabled behavior change interventions. His work explores how sensor-based biometric data can be used to better support individualized prevention and disease management strategies.

Dr. Jenn Rineer is a research psychologist in RTI’s Policing Research Program. With a background in workplace psychology and occupational health, her work focuses on aspects of the work environment that affect individuals’ stress, health, and performance. She designs, implements and evaluates initiatives designed to improve the wellbeing and effectiveness of individuals and organizations.
Overview

01. The effects of health on police and policing
02. The state of existing research
03. How to measure stress
04. How RTI is contributing to this research
Understanding the Problem

Policing has significant negative effects on the mental health, physical health, and wellness of officers.

For individuals in law enforcement, there are far too many stories with tragic endings.
Implications for Officers

**Physical health**
- Sleep problems
- Risky behaviors
- Cardiovascular disease
- Injuries

**Mental health**
- Anxiety
- Depression
- PTSD
- Suicidal thoughts

**Work/Life**
- Work/family conflict
- Relationship problems
- Increased divorce rates
Implications for Agencies

**Absenteeism**
- Operational disruption
- Overtime
- Morale

**Turnover**
- Staffing disruption
- Time
- Training costs
- Search costs

**Performance**
- Professionalism
- Situational response
Some interventions to reduce stress have shown positive effects

**Self-regulation skills**
- Improved sleep
- Reduced negative emotions
- Increased use of coping strategies

**Relaxation Training**
- Improved sleep
- Reduced overall stress

**Resilience Training**
- Reduced impact of operational stressors
Existing Research

- Fails to consider complex nature of policing
- Doesn’t describe how agency-level policies effect an individual’s health
- Uses a one-size-fits-all approach
- Implementation and outcome evaluations are limited
Studying H&W in Policing

- Calls-for-service data
- Incident data
- Officer location data
- Advanced biometrics & biomarker data
- Self-report data
Biometrics: Collecting Data in the Field
Advances in wearable sensors make it possible to study stress in a real-world setting

Heart rate variability (HRV)
- Calculated on the variation of time between two heartbeats
- Indicates the heart’s ability to respond to normal regulatory impulses and can reflect changes in stress

Electrodermal activity (EDA)
- Involuntary changes in the electrical properties of the skin
- EDA is considered the most useful index of changes in sympathetic arousal
Variation in the time interval between heartbeats

Optimal HRV reflects healthy function and an inherent self-regulatory capacity, adaptability, or resilience.

Greater HRV is better

Low variation can indicate age-related system depletion, chronic stress, pathology, or inadequate functioning in self-regulatory control systems.
Biometrics: Data Collection Devices: CorSense

Meaningful, Accurate Data

Unlike most alternatives, designed from ground-up for accurate (comparable to 5-lead ECG/EKG) heart rate variability and heart rate at rest, including the full cardiac pulse waveform.
Heart Rate Variability (HRV)

Kubios HRV - Results Overview

Results compared to Normal (resting) values

- Parasympathetic tone (recovery)
- Sympathetic tone (stress)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Units</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean RR</td>
<td>(ms)</td>
<td>1001</td>
</tr>
<tr>
<td>Mean HR</td>
<td>(bpm)</td>
<td>60</td>
</tr>
<tr>
<td>Min HR</td>
<td>(bpm)</td>
<td>28</td>
</tr>
<tr>
<td>Max HR</td>
<td>(bpm)</td>
<td>91</td>
</tr>
<tr>
<td>SDNN</td>
<td>(ms)</td>
<td>496.2</td>
</tr>
<tr>
<td>RMSSD</td>
<td>(ms)</td>
<td>623.2</td>
</tr>
<tr>
<td>NN50</td>
<td>(beats)</td>
<td>175</td>
</tr>
<tr>
<td>pNN50</td>
<td>(%)</td>
<td>58.33</td>
</tr>
<tr>
<td>RR triangular index</td>
<td></td>
<td>30.10</td>
</tr>
<tr>
<td>TINN</td>
<td>(ms)</td>
<td>4815.0</td>
</tr>
<tr>
<td>Stress Index (SI)</td>
<td></td>
<td>1.0</td>
</tr>
</tbody>
</table>

Frequency-Domain Results (FFT spectrum)

- Frequency band (Hz) 0.00-0.04, 0.04-0.15, 0.15-0.40
- Peak frequency (Hz) 0.040, 0.137, 0.180
- Power (ms²) 4684, 72295, 65565
- Power (log) 8.452, 11.189, 11.091
- Power (%) 3.28, 50.69, 45.97
- Power (n.u.) 52.41, 47.53

- Total power (ms²) 142629
- Total Power (log) 11.868
- LF/HF ratio 1.103

Parasympathetic Nervous System (PNS)

<table>
<thead>
<tr>
<th>Mean RR</th>
<th>RMSSD</th>
<th>HF power n.u.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1001 ms</td>
<td>623.2 ms</td>
<td>47.5 %</td>
</tr>
</tbody>
</table>

PNS Index = 15.98

Sympathetic Nervous System (SNS)

<table>
<thead>
<tr>
<th>Mean HR</th>
<th>Stress index</th>
<th>LF power n.u.</th>
</tr>
</thead>
<tbody>
<tr>
<td>60 bpm</td>
<td>1.0</td>
<td>52.4 %</td>
</tr>
</tbody>
</table>

SNS Index = -1.64
Skin resistance varies with the state of sweat glands controlled by the sympathetic nervous system.

AKA Skin conductance, galvanic skin response (GSR), electrodermal response (EDR), psychogalvanic reflex (PGR), skin conductance response (SCR).
Biometrics: Data Collection Devices: E4

E4 Sensors

PPG Sensor
Photoplethysmography Sensor - Measures Blood Volume Pulse (BVP), from which heart rate, heart rate variability (HRV), and other cardiovascular features may be derived.

3-axis Accelerometer
Captures motion-based activity.

EDA Sensor (GSR Sensor)
Electrodermal Activity Sensor - Used to measure sympathetic nervous system arousal and to derive features related to stress, engagement, and excitement.

Infrared Thermopile
Reads peripheral skin temperature.

Event Mark Button
Tags events and correlate them with physiological signals.

Internal Real-Time Clock
Temporal resolution up to 0.2 seconds in streaming mode.
Biometrics: Data Output
Effects of call stage for domestic violence on EDA
## Call Types and EDA

<table>
<thead>
<tr>
<th>Description</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>... with calls involving violence</td>
<td>EDA is greater when an event may involve violence...</td>
</tr>
<tr>
<td></td>
<td>...but decreases the longer the officer is involved with a violent call;</td>
</tr>
<tr>
<td>... when the officer was called to respond to an alarm</td>
<td>EDA is slightly greater when responding to an alarm...</td>
</tr>
<tr>
<td></td>
<td>...but is considerably greater when the alarm occurs at night;</td>
</tr>
<tr>
<td>... call priority</td>
<td>EDA is lower for higher priority calls</td>
</tr>
<tr>
<td></td>
<td>... and decreases over time slightly more for higher priority calls.</td>
</tr>
</tbody>
</table>
Biomarkers: Cortisol

Cortisol is a hormone associated with acute stress. It is typically measured in saliva using the “passive drool method.”

- Has been used for decades in human studies
- Multiple samples characterize features of physiological response

**HOWEVER**

- Field data collection can be challenging because of timing and storage requirements

**Step #3 - Allow Saliva to Gently Flow Through the SCA and Into the Cryovial**

**Tip:** Let saliva pool in your mouth before drooling.
Hair Cortisol Concentration (HCC)

- Direction of hair growth
- medulla
cortex
cuticle
- scalp
- 3-5mm beneath scalp; lag time of 1-2 weeks
- 7cm distal to scalp
- 6cm distal to scalp
- 5cm distal to scalp
- 4cm distal to scalp
- 3cm distal to scalp
- 2cm distal to scalp
- 1cm distal to scalp
- Universally agreed to be reliable up to at least 5cm from scalp
- 3 months' exposure
- 1 month's exposure
- ○ = cortisol
Hair can be used to measure cortisol levels

Hair cortisol concentrations are a novel measure of chronic stress

Benefits of hair tests
- Sample collection is considerably easier
- Lower costs
In 2017, the DOJ Community Oriented Policing Services (COPS) Office awarded funding to RTI to support a project to address the aforementioned gaps in policing H&W: *Developing and Validating Self-Guided Wellness and Stress Management Tools for Law Enforcement Agencies*

Key elements of the project include:

- Advisory board input into all aspects of design
- Stress reduction strategies based on knowledge of previous research
- Best practices in measurement & analysis and triangulation of different data sources
- Regular opportunities for agency input & feedback and resulting process improvement
Utilization of Subject Matter Experts

Advisory board input into all aspects of design

- Input on types and prevalence of stressors experienced
- Survey measures and items utilized
- Training design considerations & components
- Implementation & evaluation considerations

Example Benefit/Outcome

Questions added to Work Experiences & Stressors Assessment:

<table>
<thead>
<tr>
<th>Current Issues in Policing</th>
<th>No stress at all</th>
<th>Moderate stress</th>
<th>A lot of stress</th>
</tr>
</thead>
<tbody>
<tr>
<td>New items developed based on advisory board suggestions</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Instructions: Below is a list of items that describe different aspects of being a police officer. For each item, please indicate how much stress it has caused you over the past 6 months, using a 7-point scale that ranges from “No Stress at All” to “A Lot of Stress”:

- Fast pace of change in the profession
- Lack of training/preparation you are given for the work you’re expected to do
- Dealing with social issues in the community, such as homelessness and mental health issues
- Problems or limitations resulting from job-related injuries
- Life-threatening job situations
- Interpersonal conflicts at home or outside or work
- Content posted on social media (Facebook, Twitter, etc.)
Providing Evidence-Based Solutions

Stress reduction strategies based on knowledge of previous research

- Stress management options for agencies informed by research evidence
- Importance of behavior change at various organizational levels
- Understanding of principles of motivation & barriers/facilitators to implementation effectiveness

Example Benefit/Outcome

Principle incorporated in training materials:

**Habit Change**

Habit change is most likely when we...

- Understand what motivates us
- Focus on a few attainable habits rather than one big goal
- Set easy goals and build on them over time
- Understand the habit loop:
Collecting High-Quality Data

Best practices in measurement & analysis and triangulation of different data sources

- Use of validated self-report items & scales
- Tailoring of survey items to ensure relevance & validity in law enforcement context
- Utilization of existing administrative data
- Biometrics & biomarker data

Example Benefit/Outcome

1. Ensure validity
2. Triangulation
3. Improve accuracy of judgement
4. Reduce bias
5. Inspire confidence in results
Tailoring to Meet Agency Needs

Regular opportunities for agency input & feedback and resulting process improvement

- Agency review and input on all project-related communications and materials
- Agencies to choose their own stress management tools (with guidance from project team)
- Utilization of iterative design process to ensure stress reduction program meets agency needs

Example Benefit/Outcome

Increases in...

- Employee buy-in & commitment
- Likelihood of training transfer
- Sustainability of behavior change
Next Steps/Overarching Project Goals

- Utilize pilot agency feedback to refine & improve processes for assessing and reducing stress.
- Share lessons learned, key findings, and remaining knowledge gaps with law enforcement and occupational health researchers.
- Disseminate stress-reduction tools to other law enforcement agencies to enhance impact.
Q&A/Open Discussion