Assessment of Discomfort and Characterization of Officer Activity in Police Fleet Vehicles

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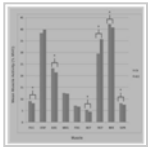
Mobile Police Characteristics



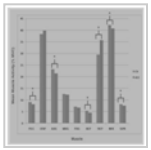
- Occupational Driving
  - Risk 2X prolonged sitting alone [Kelsey & Hardy, 1975]
    - Fixed posture
    - Whole body vibration
    - Loss of lumbar lordosis
  - LBP - 66% of occupational drivers [Porter, Porter & Lee, 1992]

- Peripheral Tasks
  - Postural changes occur via limb posture
  - Prolonged upper limb loading

Police Cruiser Physical Constraints







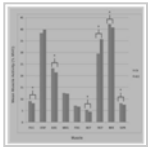

- Mobile Data Terminal (MDT) Systems
  - Better communication
  - Increased time efficiency
  - Job satisfaction and performance
- Added risk factors



Moving to Improved Designs





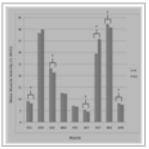



- Limited modern research describing postural and load exposures
- Justification for intervention difficult

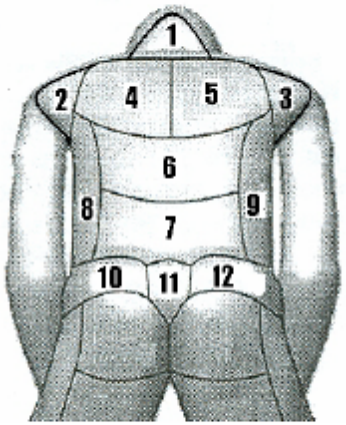
- *Moving to improved designs*
  - Maintain officer proficiency
  - Improve workplace safety
  - Reduce financial burden

- *Project Aims:*
  - Characterize essential driver activities
  - Quantify cumulative exposures to whole body postures

Phase 1 – Discomfort Survey



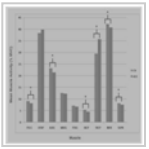
- Posture and Load Exposure Assessment
  - Adapted from Mergl *et al.* (2005) and Smith *et al.* (2006)

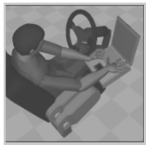


The number displayed in the regions in the diagram above correspond with the numbers in the survey to the right of the diagram.

	No Discomfort	Extreme Discomfort
1. Neck		
2. (L) Shoulder		
3. (R) Shoulder		
4. (L) Upper Back		
5. (R) Upper Back		
6. Middle Back		
7. Lower Back		
8. (L) Side of Body		
9. (R) Side of Body		
10. (L) Upper Pelvis		
11. Sacrum/tail bone		
12. (R) Upper Pelvis		

Phase 1 – Participants

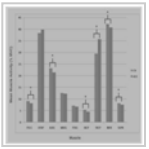


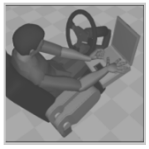


- Current duty Patrol Officers (*n* = *88*)
  - Ford Crown Victoria Police Interceptor

  - Gender (74 male, 14 female)
  - District (1D-23, 2D-15, 4D-29, 5D-21)
  - Shift (57 day, 31 night)

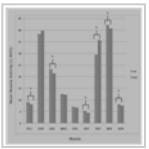
Phase 2 – Activity Characterization

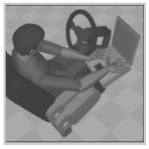


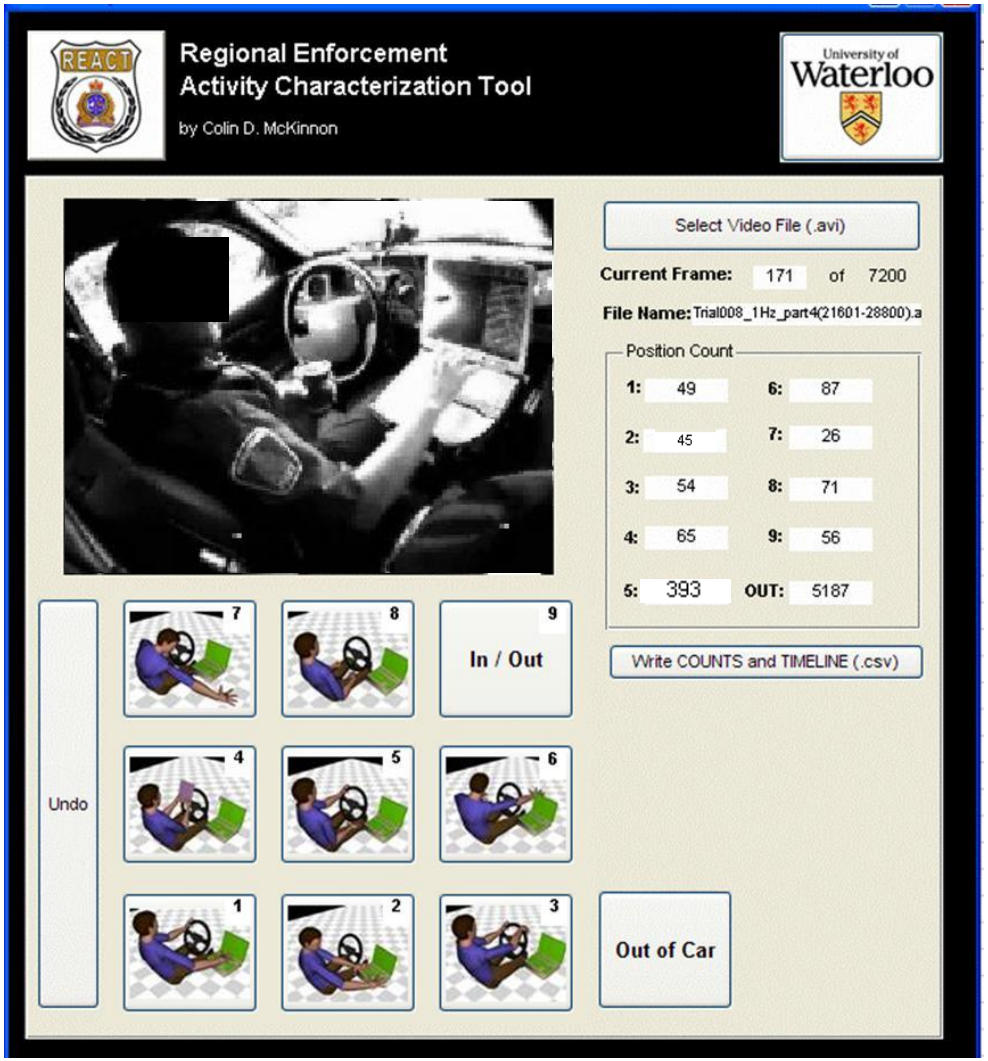


- In-car digital video capture
  - 3.6mm, 0.1 LUX Bullet Camera (Defender Security, Centerville, OH)
  - SunPlus SPCA506A (Bronzepoint Security Products, Belleville, IL)

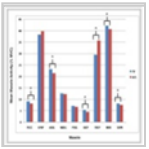
Phase 2 – Activity Characterization

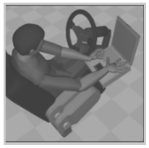


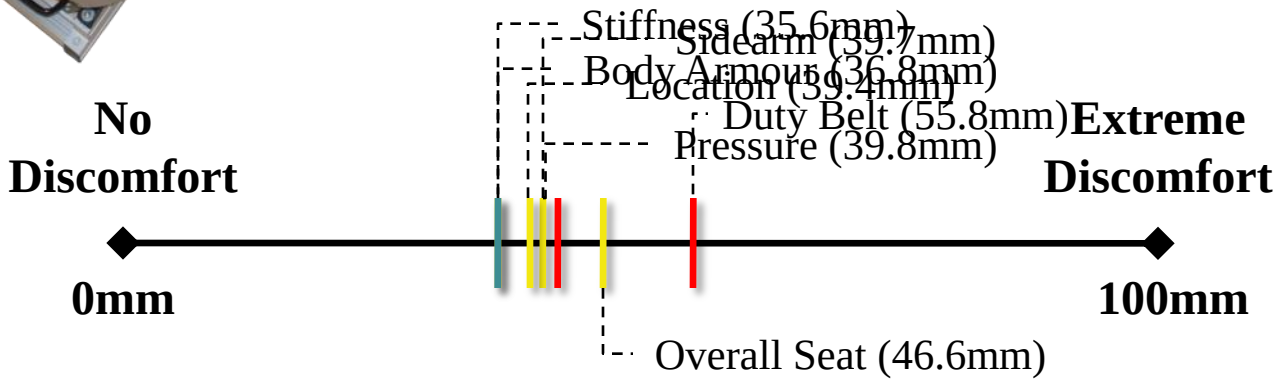




Phase 1 – Results







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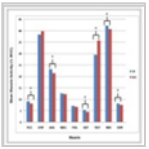
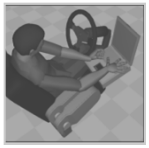
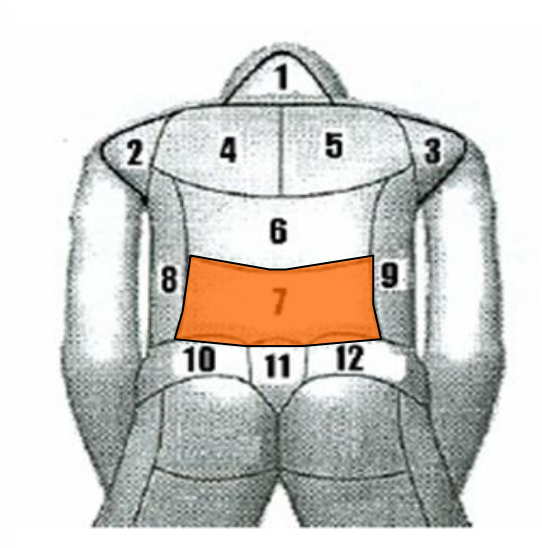
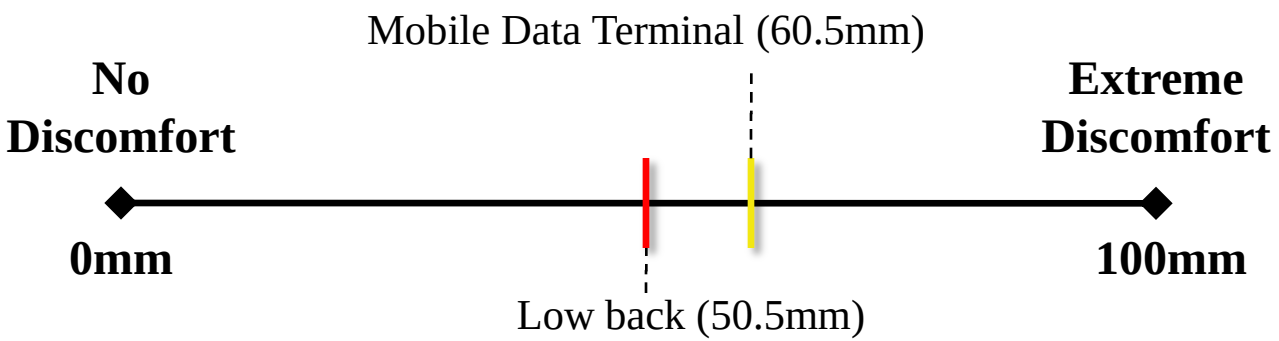




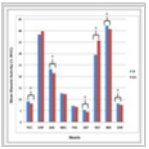
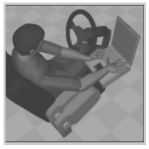




Phase 2 – Results





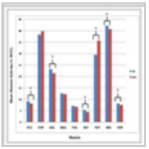
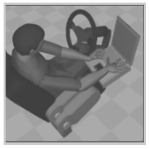
- Percentage time in each activity
  - Full shift

Activity Posture	Mean Time (%)	Standard Deviation (%)	Time (h:m:s)	Rank
Officer out of vehicle	**44.2**	19.8	4:47:4	1
Left-handed driving (right-hand relaxed)	17.8	7.1	1:55:36	2
Relaxed/traffic watch	11.7	7.1	1:16:10	3
On-paper documentation	7.44	4.0	0:48:17	4
Right-handed MDT use	7.35	4.1	0:47:44	5
Two-handed MDT use	6.07	5.8	0:39:26	6
Omitted video frames	2.78	4.6	0:19:03	7
Two-handed driving	1.28	1.9	0:08:18	8
Vehicle entry/exit	0.75	0.3	0:04:53	9
In-vehicle reach tasks	0.57	0.7	0:03:43	10

Phase 2 – Results



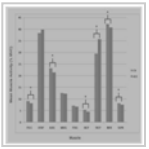


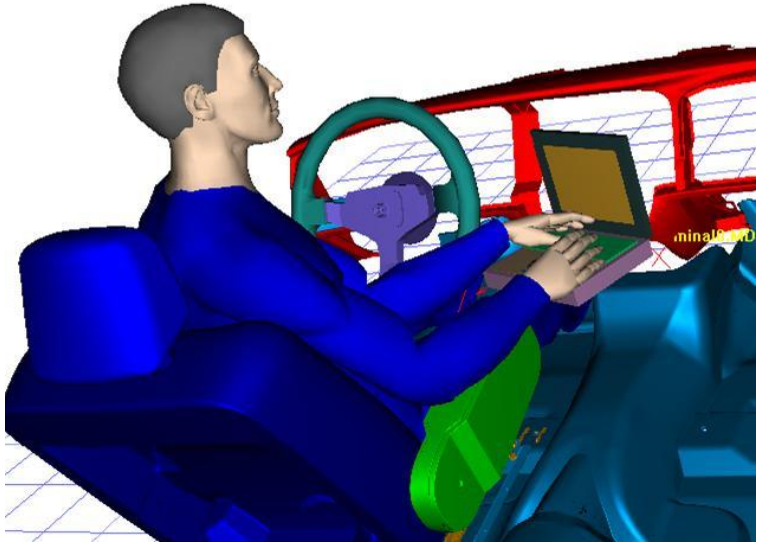



- Percentage time in each activity
  - Time in vehicle (out of vehicle omitted)

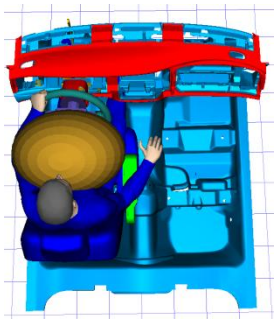
Activity Posture	Mean Time (%)	Standard Deviation (%)	Rank
Left-handed driving (right-hand relaxed)	**32.9**	7.7	1
Relaxed/traffic watch	20.5	9.7	2
On-paper documentation	13.3	4.9	3
Right-handed MDT use	12.7	4.8	4
Two-handed MDT use	10.2	7.8	5
Omitted video frames	5.16	9.8	6
Two-handed driving	2.48	3.1	7
Vehicle entry/exit	1.58	1.0	8
In-vehicle reach tasks	1.18	1.3	9

Discussion

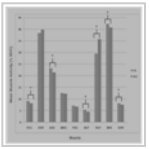




- Awkward postures
- Common to many users
- No applicable solutions
- Safety Restrictions

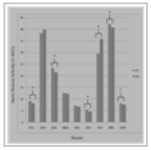


Recommendations



- Reduction in MDT use
- Technology changes
- Structural changes

Acknowledgements



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Questions?

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