The LCT - a valid measure to assess driver distraction?

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Driver Distraction

Driver attending to cell phone hits police car

A man was apparently texting on his cell phone Tuesday when he ran into the back of a stopped St. Joseph police patrol car, knocked it into another squad car and sent two police officers to the hospital, police said. The accident occurred after police stopped southbound traffic on Interstate 29 to work a one-car accident. The man sped around stopped semi-trucks and ran into the patrol car, police said. He was arrested on an unrelated warrant. The officers suffered minor injuries.

(Kansas City Star, May 19th, 2009)

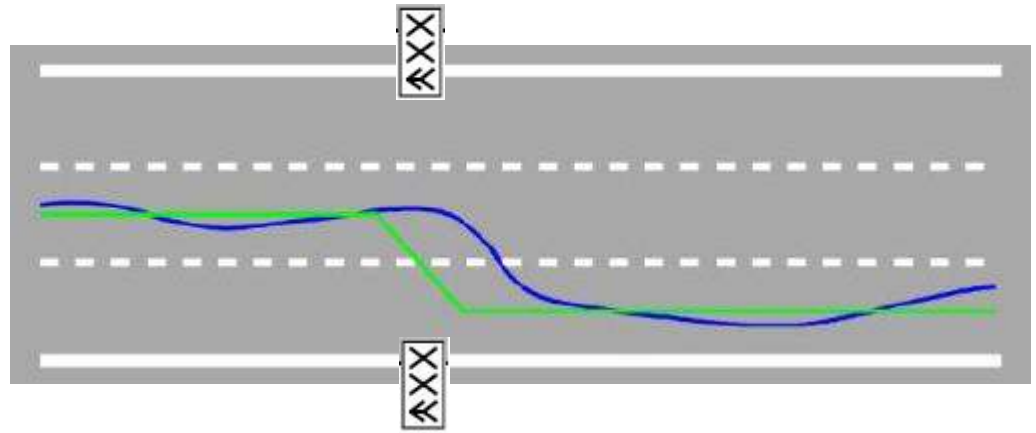
Simple Measures of Distraction

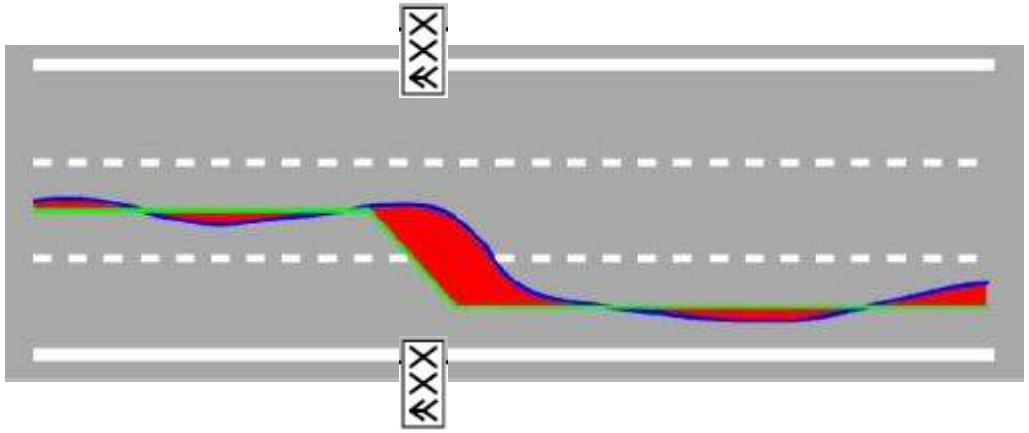
- 15-second rule (e.g. Tijerina et al., 2000)
- Occlusion Method (e.g. Baumann, Keinath, Krems, & Bengler, 2004)
- Peripheral Detection Task (PDT; e.g. Jahn, Oehme, Krems, & Gelau, 2005)
- …
- Lane Change Test/Task (LCT; Mattes, 2003)

Lane Change Task/Test (LCT)

- speed 60 kph
- no other vehicles present
- change to indicated lane quickly

LCT - Analysis





- reaction time
- accuracy of manouevre
- lane keeping performance

→ MDEV

LCT – ISO TC 22/SC 13/WG 8 (2008)

- ISO TC 22/SC 13 WG 8, 2008 – “Road vehicles – Ergonomic aspects of transport information and control systems – Simulated lane change test to assess in-vehicle secondary task demand”

- Problem: varying results despite uniform (?) setup

  (Arkevall, 2007; Bengler & Rakic, 2007; Rognin et al., 2007; Schwalm, 2006; Weir, Kwok & Peak, 2007)

- Investigation of moderating factors necessary

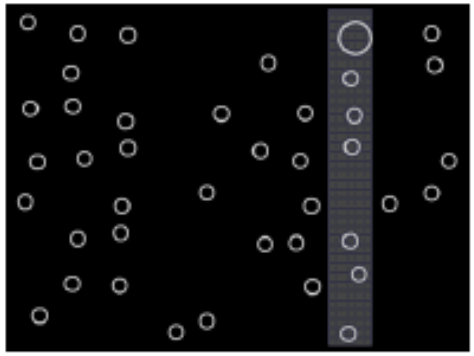
  → ***Could previous experience with the LCT probably result in better performance in subsequent LCT encounters?***

General setup

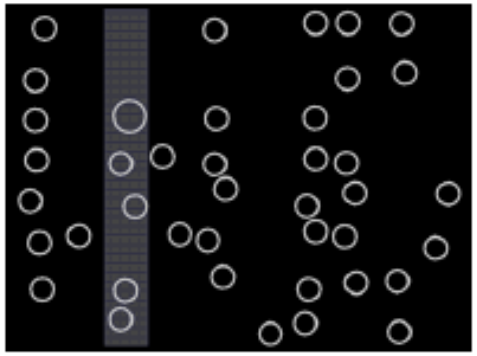
- LCT simulation on 17“ flatscreen
- secondary task display 8,37“
- LogiTech force feedback steering wheel
- control of secondary task with cursor keys
- all measures / dimensions in compliance with ISO draft

Surrogate Reference Task (SuRT)

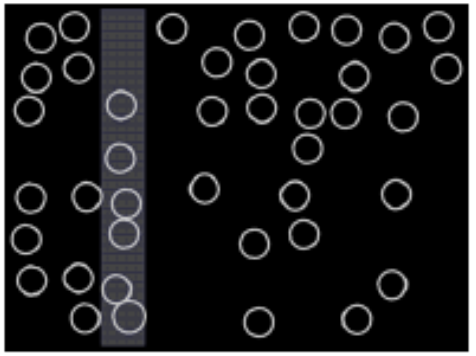
- visual search task: target size constant
  number & size of distractors varies



simple



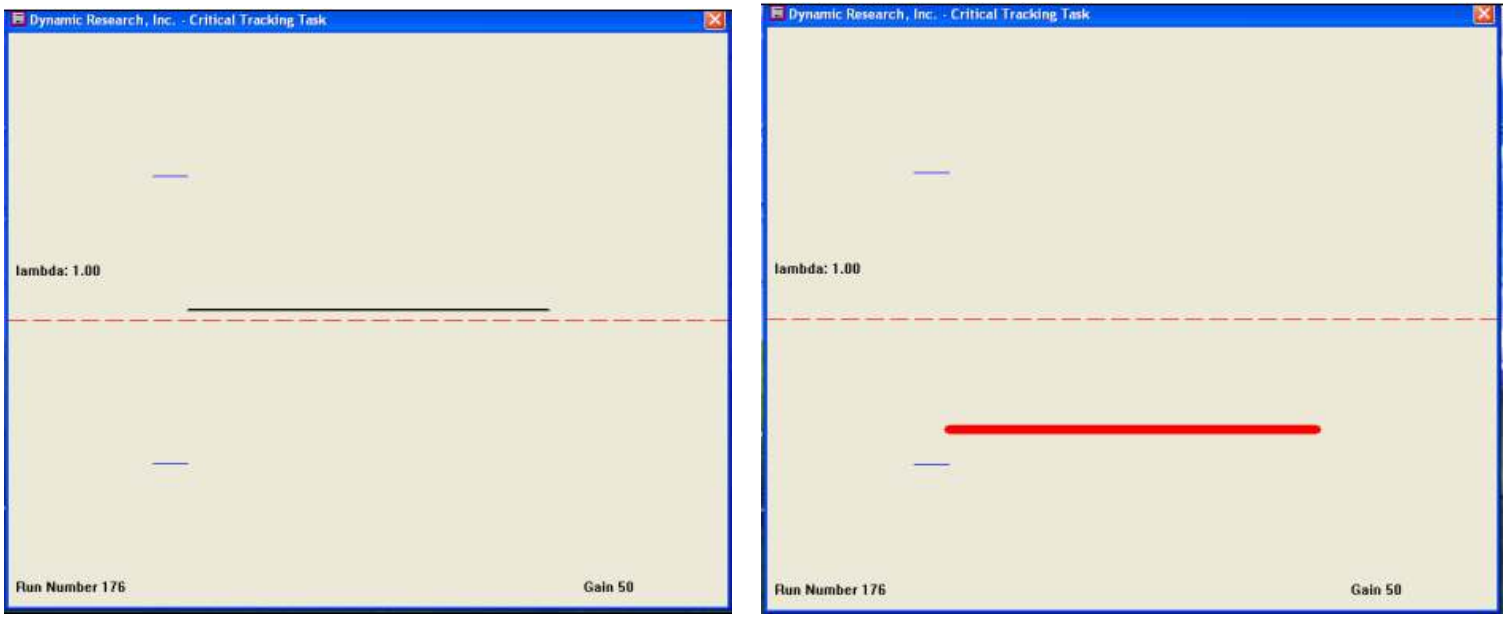
moderate



hard

Critical Tracking Task (CTT)

- tracking task with customisable level of difficulty (3 different levels for the reported experiments)

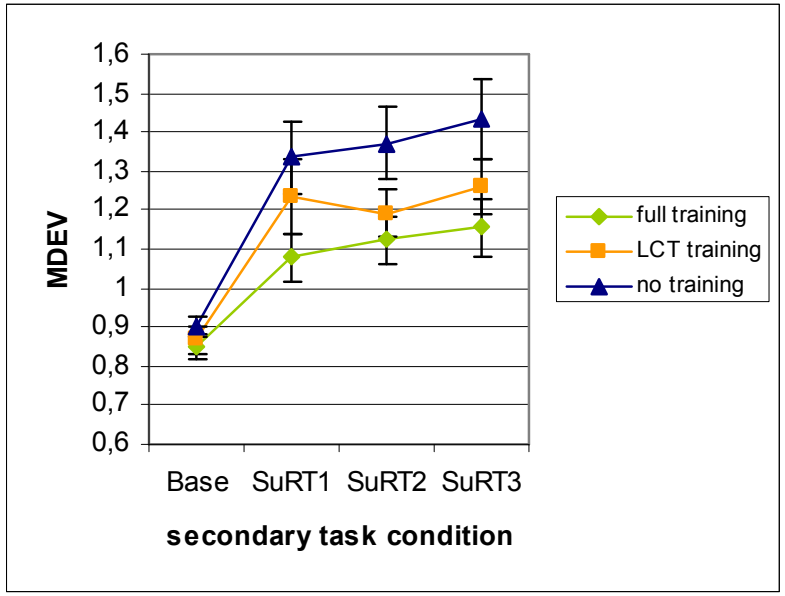


Experiment I

	Full training	LCT training	No training
Training session	= testing session	20 min LCT driving, no secondary task	-
Test session	ca. 1 week after training session Baseline drives + secondary tasks (blocked for task type, balanced for levels of difficulty)		

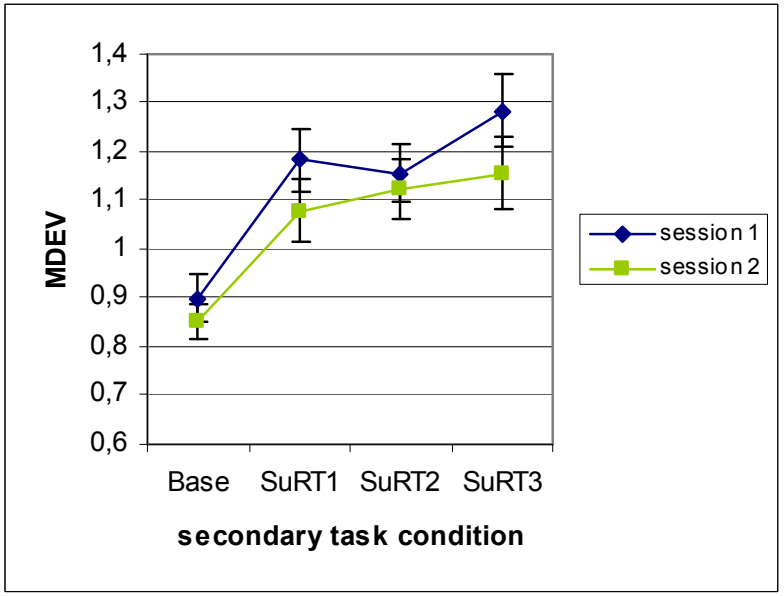
Results – LCT (+ SuRT)

between-groups comparison - LCT



$F_{condition(3, 132)} = 46.616$, **$p < .001$**
$F_{training(2, 44)} = 3.089$, **$p = .056$**

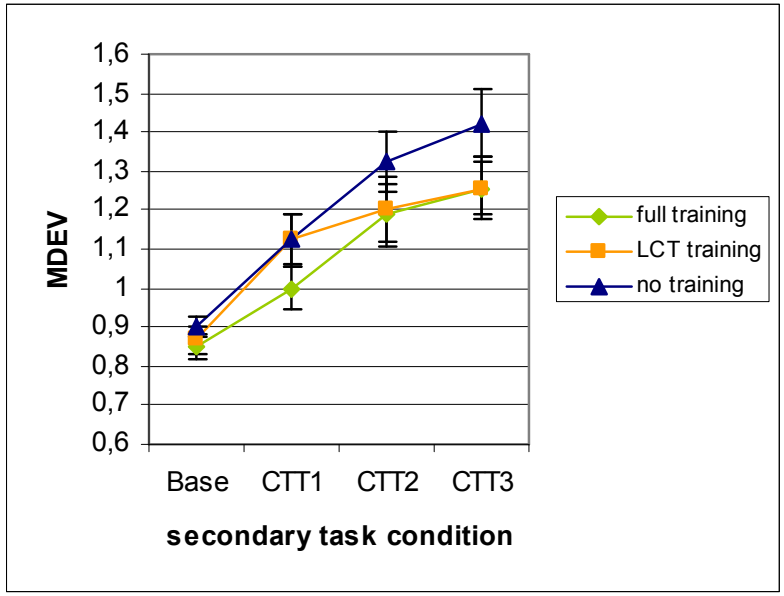
between-sessions comparison - LCT



$F_{condition(3, 45)} = 23.458$, **$p < .001$**
$F_{training(1, 15)} = 5.425$, **$p = .034$**

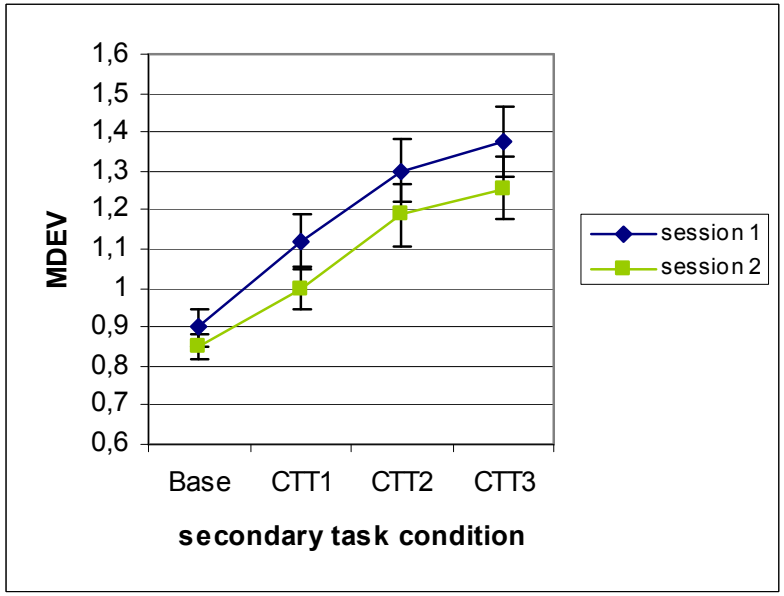
Results – LCT (+ CTT)

between-groups comparison - LCT



$F_{condition(3, 132)} = 76.569$, **$p < .001$**
$F_{training(2, 44)} = 1.130$, $p = .332$

between-sessions comparison - LCT



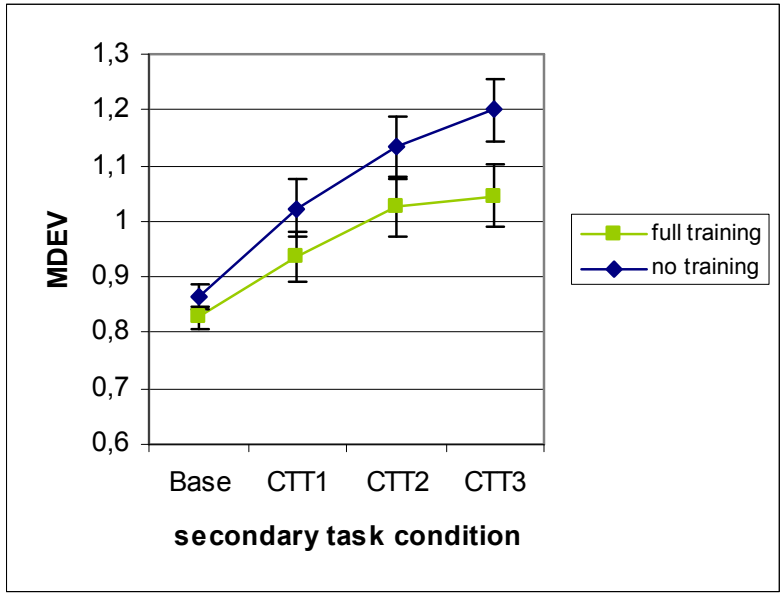
$F_{condition(3, 45)} = 32.813$, **$p < .001$**
$F_{training(1, 15)} = 6.700$, **$p = .021$**

Experiment II

	Full training	No training
Training session	= testing session	-
Test session	ca. 6 months after training session Baseline drives + secondary tasks (balanced for levels of difficulty)	

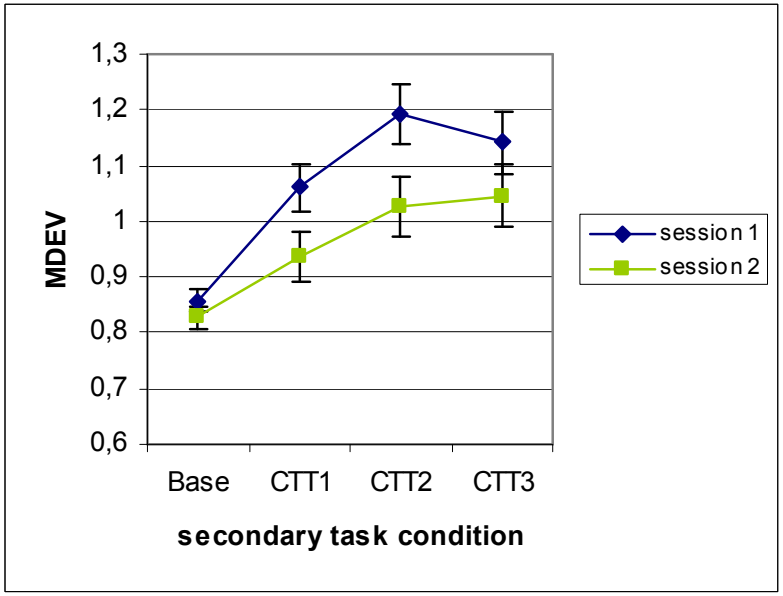
Results – LCT (+ CTT)

between-groups comparison - LCT



$F_{condition(3, 129)} = 41.693$, **$p < .001$**
$F_{training(1, 43)} = 3.708$, **$p = .061$**

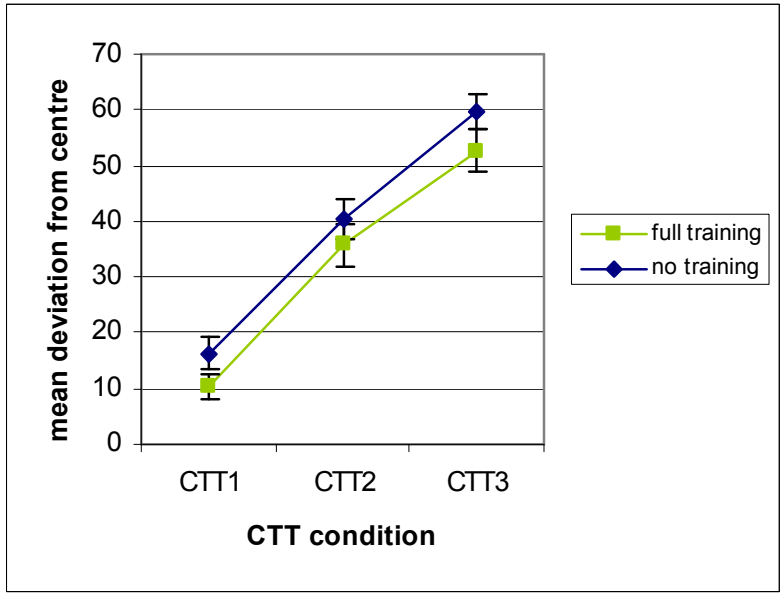
between-sessions comparison - LCT



$F_{condition(3, 63)} = 25.596$, **$p < .001$**
$F_{training(1, 21)} = 14.837$, **$p = .001$**

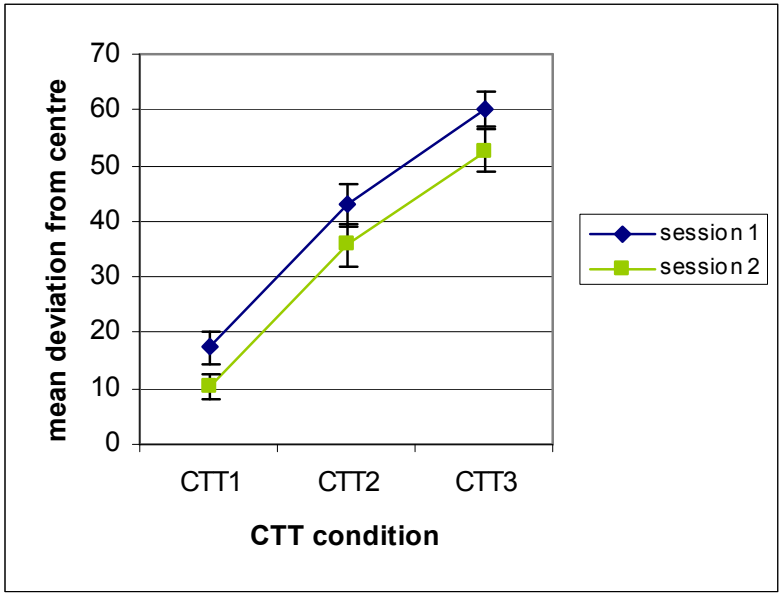
Results – CTT

between-groups comparison - CTT



$F_{condition(2, 86)} = 198.586$, **$p < .001$**
$F_{training(1, 43)} = 2.255$, $p = .140$

between-sessions comparison - CTT



$F_{condition(2, 42)} = 182.722$, **$p < .001$**
$F_{training(1, 21)} = 20.339$, **$p < .001$**

Conclusions

- training effects do occur
- training effects are stable

→ amount of training has to be standardised, or at least to be controlled and reported

- „ideal“ state of training (inexperienced or experienced) is unclear
  - inexperienced = maximum level of distraction elicited by a system (e.g. rental car szenario – unknown vehicle, unknown system)
  - experienced = average level of distraction elicited by a system (e.g. everyday user in own vehicle with own system)

Driver Distraction…

Man charged for watching porn while driving

A Mississauga man faces a charge of operating a motor vehicle with a TV visible to the driver, as well as speeding, after Northumberland OPP stopped his vehicle on Hwy. 401, in Port Hope, after a traffic complaint, at 12:40 a.m., on July 18.

OPP found the driver was watching a pornographic movie on a TV placed on the front seat of the vehicle. Police also noticed evidence of alcohol impairment, but the 32-year-old driver registered a low reading on a breath test, and was charged with speeding and watching TV when driving.

(Northumberland News, July 20th, 2009)