Driver Distraction is Greater with Cell Phone Conversation than with Passenger Conversation -- A Social Cybernetic Interpretation

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Introduction

Background

Social Cybernetic Interpretation

Social Tracking Differences

Discussion and Conclusion

Mitigating Driver Distraction Affected by Cell Phone Use
INTRODUCTION

Definition

Driver Distraction

Take The Driver’s Attention away from The Road

Driving

Engaged in Other Activities

Cell Phone Conversation

Video Watching

Heat/Radio Adjustment

Passenger Conversation

Children Attention

Eating

Reading

Make Up

, etc.

Type

Visual distraction

Manual distraction

Cognitive distraction
INTRODUCTION

Driver Distraction

Having Conversations While Driving

Remote Condition

Cell Phone Conversation

versus

In-Vehicle Condition

Passenger Conversation
**BACKGROUND**

**Former Studies**

<table>
<thead>
<tr>
<th>Study</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strayer et al., 2006</td>
<td></td>
</tr>
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<td>Regan et al., 2013</td>
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... the impairments associated with using a cell phone while driving can be as profound as those associated with driving while drunk.”
Using a mobile phone while driving not only “is associated with a four-fold increase in crash risk”, but also “can distract drivers visually, physically and cognitively”.

Former Studies

- Strayer et al., 2006
- Brace et al., 2007
- McEvoy et al., 2007
- Collet et al., 2010a, 2010b
- Asbridge et al., 2013
- Regan et al., 2013

“When drivers use a mobile phone there is an increased likelihood of a crash resulting in injury. Using a hands-free phone is not any safer.”
“83% of drivers rated distracted drivers and drivers using cell phones both as serious (interpreting responses of 4 as serious) or extremely serious problems.”
“... driving is impacted by holding a mobile-phone conversation.”
Crash culpability was found to be significantly associated with cell phone use by drivers, increasing the odds of a culpable crash by 70% compared with drivers who did not use a cell phone. This increased risk was particularly high for middle-aged drivers.
“... attentional demand is higher in the case of a mobile phone conversation than in the case of a conversation with a passenger.”
Remote conversation with a cell phone partner is MORE distracting than in vehicle conversation with a passenger.

WHY?
Cognitive Psychological Interpretation

Cognitive Effort

Inattention - Blindness

Situation Awareness

Competition for Brain Resources

Attentional Demand
“...in-vehicle conversations do not interfere with driving as much as cell-phone conversations do, because drivers are better able to synchronize the processing demands of driving with in-vehicle conversations than with cell-phone conversations. Together, these data support an inattention-blindness interpretation wherein the disruptive effects of cell-phone conversations on driving are due in large part to the diversion of attention from driving to the phone conversation.”
“The results indicate that passenger conversations differ from cell-phone conversations because the surrounding traffic not only becomes a topic of the conversation, helping driver and passenger to share situation awareness, but the driving condition also has a direct influence on the complexity of the conversation, thereby mitigating the potential negative effects of a conversation on driving.”
Using a cellphone causes impairment to our peripheral vision, similar to horse blinkers, rendering us blind to objects we would normally have no trouble seeing (for example, a child in a crosswalk.).

- Strayer and Drews (2007, p. 128)
- Drews et al. (2008, p. 392)
- Pussell (2009, p. 58)
- Bruyas (2013, p. 301)
…a conversation with a passenger is regulated by the driver and can be interrupted if the attentional demand of driving increases. On the other hand, the pace of a mobile phone conversation is directed by an expectation of continuity.

Strayer and Drews (2007, p. 128)
Drews et al. (2008, p. 392)
Pussell (2009, p. 58)

Bruyas (2013, p. 301)
Cognitive Psychological Interpretation

- Cognitive Effort
  - Inattention - Blindness
  - Situation Awareness
    - Competition for Brain Resources
      - Attentional Demand

Speculative or Empirically Challenging to Validate

- Non-Falsifiable
  - Need In-Depth Neurosensory Analysis
Introduction
Background

Social Cybernetic Interpretation

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Social Cybernetic Interpretation

Motivation
Control Theory Model of Driver Distraction (Sheridan, 2004)
Social Cybernetic Interpretation

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Control Theory Model of Driver Distraction (Sheridan, 2004)

Foundation
Social Cybernetic Theory: A Behavioral Cybernetic Interpretation of Social Interaction
Social Cybernetic Interpretation

**Motivation**
Control Theory Model of Driver Distraction (Sheridan, 2004)

**Assumption**
Less Able to Control Social Interaction with The Conversing Partner

**Foundation**
Social Cybernetic Theory:
A Behavioral Cybernetic Interpretation of Social Interaction
Social Cybernetic Interpretation

**Focus**
Social Tracking Differences (Smith et al., 1995; Smith, 1972)

**Assumption**
Less Able to Control Social Interaction with The Conversing Partner

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Social Cybernetic Interpretation

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Social Cybernetic Interpretation
SOCIAL TRACKING DIFFERENCES

Social Cybernetic Interpretation

The Movements of One Individual

The Movements of The Social Partner
SOCIAL TRACKING DIFFERENCES

The Movements of One Individual

Generate Stimuli

The Movements of The Social Partner
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The Movements of One Individual

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The Movements of The Social Partner

Tracks This Sensory Feedback by further movement

Generate Compliant Sensory Stimuli Back

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Social Cybernetic Interpretation
SOCIAL TRACKING DIFFERENCES

Social Cybernetic Interpretation

An Integrated System
Control Multiple Motor, Sensory and Cognitive Modalities and Transformations (Displacements, Delays, etc.) of Sensory Feedback
# Social Tracking Differences

## Social Cybernetic Interpretation

<table>
<thead>
<tr>
<th>Compare</th>
<th>The Exchange of Feedback During Conversation between The Driver and An In-Vehicle Passenger versus The Driver and A Remote Cell-Phone Partner</th>
</tr>
</thead>
</table>

## An Integrated System

Control Multiple Motor, Sensory and Cognitive Modalities and Transformations (Displacements, Delays, etc.) of Sensory Feedback
<table>
<thead>
<tr>
<th>SOCIAL TRACKING DIFFERENCES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Visual Social Tracking</td>
</tr>
<tr>
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</tr>
<tr>
<td>Haptic Social Tracking</td>
</tr>
<tr>
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</tr>
</tbody>
</table>

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</tr>
</thead>
<tbody>
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</tr>
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</tr>
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</tr>
<tr>
<td>The Driver and An In-Vehicle</td>
</tr>
<tr>
<td>Passenger</td>
</tr>
<tr>
<td><strong>versus</strong></td>
</tr>
<tr>
<td>The Driver and A Remote Cell-Phone</td>
</tr>
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</tr>
</tbody>
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<table>
<thead>
<tr>
<th>Visual Social Tracking</th>
<th>Visual Environment of Vehicle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Driver Vision</td>
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</tr>
<tr>
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<td></td>
</tr>
</tbody>
</table>

- Auditory Social Tracking
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<table>
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<td></td>
</tr>
</tbody>
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Visual Social Tracking

Visual Environment of Vehicle

Driver Vision ↔ Passenger Vision ↔ Driver Vision

Cell Phone Partner Vision

Auditory Social Tracking

Auditory Environment of Vehicle

Driver Speech ↔ Passenger Speech ↔ Driver Speech

Weak

Cell Phone Partner Speech

Haptic Social Tracking

Vestibular Social Tracking
SOCI AL TRACKING DIFFERENCES

Visual Social Tracking

Visual Environment of Vehicle

Driver Vision ↔ Passenger Vision

Auditory Social Tracking

Auditory Environment of Vehicle

Driver Speech ↔ Passenger Speech

Haptic Social Tracking

Touch/Vibration from Vehicle

Driver Touch Perception ↔ Passenger Touch Perception

Vestibular Social Tracking

Weak

Driver Speech

Passenger Speech

Driver Speech

Cell Phone Partner Speech

Driver Touch Perception

Cell Phone Partner Touch Perception
SOCIAL TRACKING DIFFERENCES

**Visual Social Tracking**
- Visual Environment of Vehicle
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  - Driver Vision
  - Cell Phone Partner Vision

**Auditory Social Tracking**
- Auditory Environment of Vehicle
  - Driver Speech <-> Passenger Speech
  - Driver Speech -> Cell Phone Partner Speech
  - Weak

**Haptic Social Tracking**
- Touch/Vibration from Vehicle
  - Driver Touch Perception <-> Passenger Touch Perception

**Vestibular Social Tracking**
- Acceleration/Deceleration (Accel/Decel) of Vehicle
  - Driver Accel/Decel Perception
  - Passenger Accel/Decel Perception
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  - Cell Phone Partner Accel/Decel Perception
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  - Driver Accel/Decel Perception ↔ Passenger Accel/Decel Perception
  - Cell Phone Partner Accel/Decel Perception
DISCUSSION AND CONCLUSION

Driver Distraction

Cell Phone Conversation

Less Social Feedback
Synchronism &
Less Effective Mutual Control

-versus-

Passenger Conversation

Social Cybernetic Interpretation

The Movements of One Individual

Controls This Sensory Feedback by further movement

Generate Compliant Sensory Stimuli Back

The Movements of The Social Partner

Generate Stimuli
DISCUSSION AND CONCLUSION

**Driver Distraction**

- Cell Phone Conversation
- Less Social Feedback
  - Synchronism
  - &
  - Less Effective Mutual Control
- Open Loop -- Social Tracking
  - Environment is Deficient

versus

**Passenger Conversation**

**Social Cybernetic Interpretation**

- The Movements of One Individual
- Controls This Sensory Feedback by further movement
- Generate Stimuli

- The Movements of The Social Partner
- Generate Compliant Sensory Stimuli Back
DISCUSSION AND CONCLUSION

Driver Distraction

Cell Phone Conversation

Less Social Feedback Synchronism & Less Effective Mutual Control

Open Loop -- Social Tracking Environment is Deficient

Distracts Relatively Greater

versus

Passenger Conversation

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Open Loop -- Social Tracking Environment is Deficient

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Social Feedback Synchronism & Effective Mutual Control

Closed Loop -- Social Tracking Environment is much richer

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**Driver Distraction**

- Cell Phone Conversation
- Less Social Feedback Synchronism & Less Effective Mutual Control
- Open Loop -- Social Tracking Environment is Deficient
- Distracts Relatively Greater

versus

**Passenger Conversation**

**Social Feedback Synchronism & Effective Mutual Control**

**Closed Loop -- Social Tracking Environment is much richer**

**Less Relative Distraction**

**Social Cybernetic Interpretation**

- The Movements of One Individual
- Controls This Sensory Feedback by further movement
- Generate Compliant Sensory Stimuli Back

- The Movements of The Social Partner

Less Relative Distraction

Cell Phone Conversation versus Passenger Conversation

- Generate Stimuli
- Controls This Sensory Feedback by further movement
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The Movements of One Individual

Social Feedback Synchronism & Effective Mutual Control

Closed Loop -- Social Tracking Environment is much richer
DISCUSSION AND CONCLUSION

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Distracts Relatively Greater

Concomitant Demands
Both Driving and Conversation Demands Need The Driver’s Mediation
DISCUSSION AND CONCLUSION

Cell Phone Conversation

Less Social Feedback Synchronism & Less Effective Mutual Control

Open Loop -- Social Tracking Environment is Deficient

Distracts Relatively Greater

Concomitant Demands
Both Driving and Conversation Demands Need The Driver’s Mediation

A Social Cybernetic Interpretation of Remote conversation with a cell phone partner is MORE distracting than in vehicle conversation with a passenger.

WHY?
Mitigating Driver Distraction Affected by Cell Phone Use
Mitigating Driver Distraction Affected by Cell Phone Use

How Driver Distraction Due to Cell Phone Use Could Be Mitigated?

Legal Restrictions on Cell Phone Use During Driving

Marginal Effect
## Mitigating Driver Distraction Affected by Cell Phone Use

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<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
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<table>
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<td><strong>Driverless Cars</strong></td>
<td>The Best Bet?</td>
</tr>
</tbody>
</table>
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