

Walking and chewing gum with language

Linguistic complexity and cognitive workload: measurement and management, day 1, ESLLI 2014

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A classic. . .

Dave Bowman: Hello, HAL. Do you read me, HAL?

HAL: Affirmative, Dave. I read you.

Dave Bowman: Open the pod bay doors, HAL.

HAL: I'm sorry, Dave. I'm afraid I can't do that.

Dave Bowman: What's the problem?

HAL: I think you know what the problem is just as well as I do.

Dave Bowman: What are you talking about, HAL?

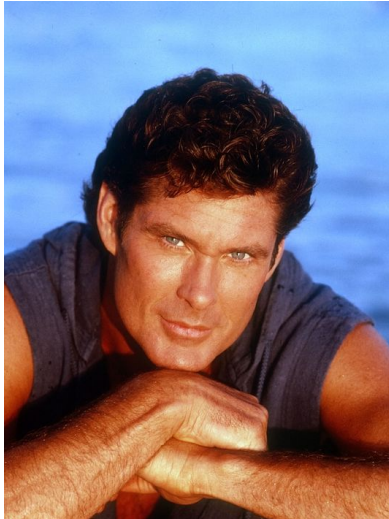
HAL: This mission is too important for me to allow you to jeopardize it.

— from 2001: A Space Odyssey

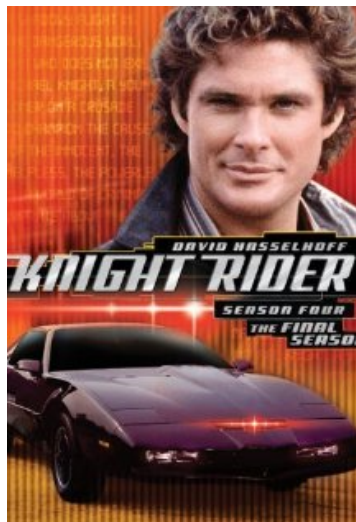
But we're still not at the point of building insane AIs in space.



Instead, let's talk about David Hasselhoff.



We're a LOT closer to building cars
we can talk to.



Or at least talking to automated systems, while driving cars.



But driver distraction kills.

- Rash of laws against driving with a cell phone.
- From “distraction.gov”, the US government’s anti-distracted driving web site:
 - 3328 deaths, 421K injured due to distracted driving.
 - Visual-manual tasks like texting by far the worst.
 - Comparable to drunk driving.

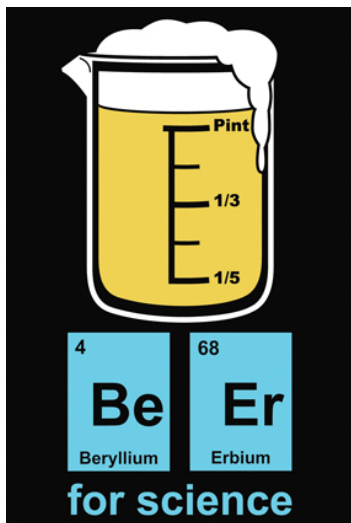
As bad as drunk driving?

Worse! Strayer et al (2006) in *Human Factors*.

- Subjects were tested in a driving simulator (following a “pace” car).
- Three conditions: Alcohol-influenced (0.08% wt/vol) vs. cell phone vs. baseline driving.
- Cell phone conditions included handheld and hands-free.
- **Found:** Cell phone drivers had a total of 3 accidents, drunk and baseline, none.

(Which doesn't mean that drunk driving is safe, obviously.)

(As an aside, they paid subjects to drink.)



So how do people behave?

What they do when the pace car decelerates:

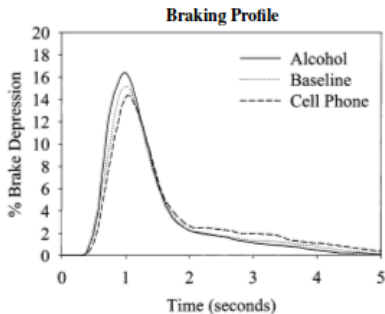


Figure 3. The braking profile.

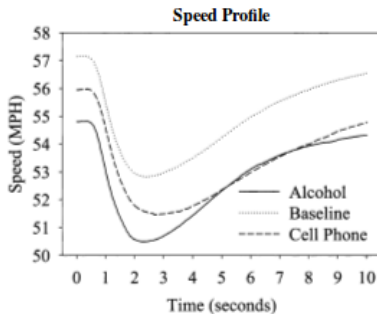


Figure 4. The speed profile.

Not all comparisons significant, but alcohol never significant vs. baseline.

So how do people behave?

How they follow when the pace car brakes:

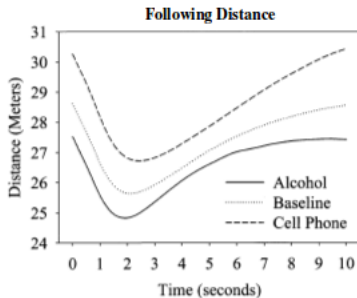


Figure 5. The following distance profile.

Mean following distance comparisons not significant.

St. dev. following distance for alcohol vs. cell phone *** very significant.

Meaning that people are bad at following consistently when they talk on their cell phones.

So the world reacts.

- Many jurisdictions now ban cell phone use – but allow handsfree.
- Ban might stop texting (really bad).
- But Strayer et al. (2006) find *no* significant difference between handsfree and handheld cell phone conversations.

Why might that be?

Multiple possibilities:

- Strayer and Drews (2007; *Cur. Dir. Psych. Sci.*) look at “inattention blindness” .
 - Are drivers able to recall objects shown while driving?
 - Hands-free cell vs. single task driving.
 - Greater failure in dual-task driving condition to recall objects after the driving is over – significant.
- Event-related potentials (ERP), P300 (claimed for memory encoding) much reduced during dual task condition.

(A slight digression.)

Why do we care so much about driving?

- Lots of different kinds of multitasking environments: medical, emergency, industrial, etc.
- But (simulated) driving offers easily controlled conditions for which experimental subjects are easily available.
- Affects almost all of the developed-world public!

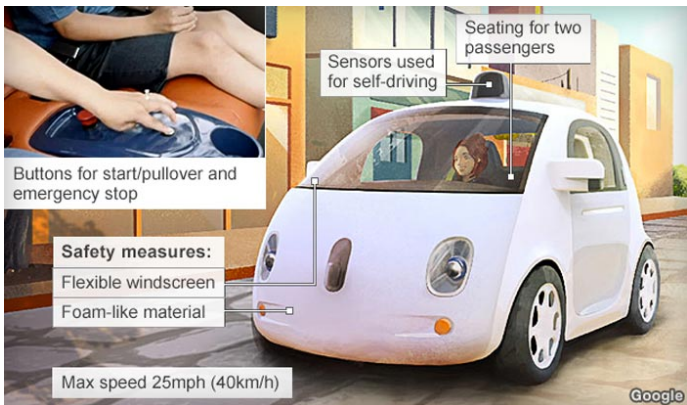
(A slight digression.)

What does driving as a test environment actually get us scientifically?

- A task from which *you should not (cannot?) take your attention*.
 - Otherwise, confounded by occasional possibility of “rescheduling” attention.
- A task that can be varied in difficulty over time.
- A very large subject pool.
 - Much easier to find drivers than to find native English speakers in Germany ;)

(OK, fine, a not-so-slight digression.)

But will it even matter in real life?



(OK, fine, a not-so-slight digression.)

Actually, yeah. Even if self-driving cars worked today. . .

- Many many obstacles to adoption – may take years.
- Cost, consumer acceptance, just for starters.
- Still there are safety issues: how MUCH attention will the passenger still need, until when?
- AN ENORMOUS ARMY OF REGULATORY HURDLES!



Anyway, back to business.

So what is it about phoning that makes concentration hard?



Turns out, not all language is equally distracting.

Talking with a passenger in the car isn't anywhere near as bad.

- Drews et al. (2004; *Proc. Hum. Fac. and Erg. Soc.*): tested cell phone vs. passenger vs. control/neither.
- Tasks: driving simulator of highway with exits, subjects must exit at the correct points while conversing about close call accidents.
- Cell phone drivers missed many more exits.
- References to traffic slightly larger in passenger condition.
- Turns of speech: far more often in passenger condition.

But is it just references to traffic?

Probably not. Villing et al. (2008; *Adv. Nat. Lang. Proc.*), Villing (2009; *SIMPE*).

- Transcribed driver-passenger conversations in car (Swedish).
- Annotated switches in conversation topic domain.
- Found: Driver and passenger seem to co-operate in scheduling topic shifts based on driver workload.

How far can we go?

Our mission, this week and beyond:

- We want to figure out how deeply this behaviour goes:
 - Does it apply to phonology? Syntax? Semantics?
 - Or is it just discourse-level information scheduling?
- How do we measure this?
- What can we *do* about it?

But HAL knows what we should do.

Look Dave, I can see you're really upset about this. I honestly think you ought to sit down calmly, take a stress pill, and think things over.

— HAL in *2001: A Space Odyssey*

