Cognitive Errors with Catastrophic Consequences: Why Do Parents Accidently Leave Children in Hot Cars?

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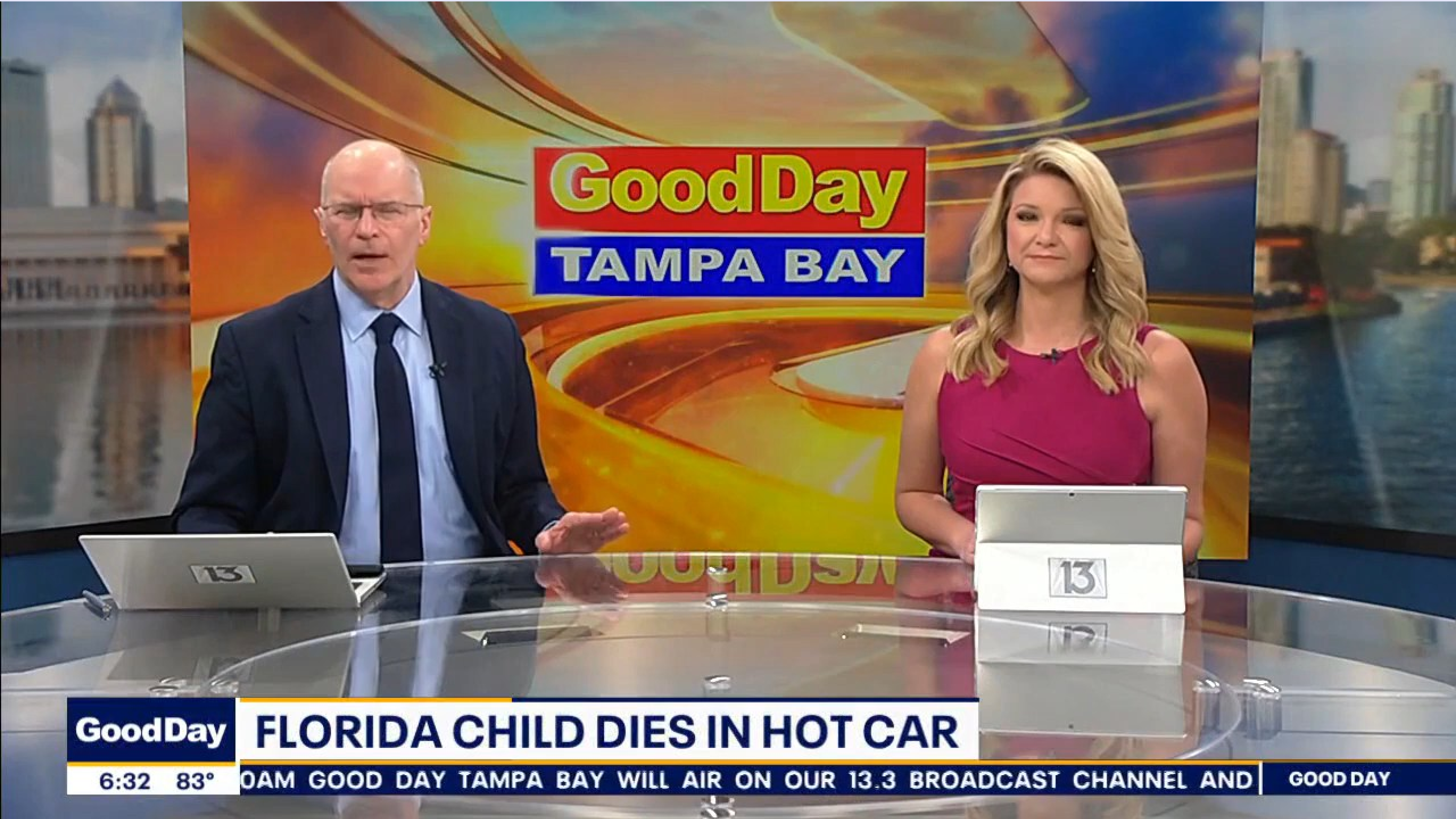
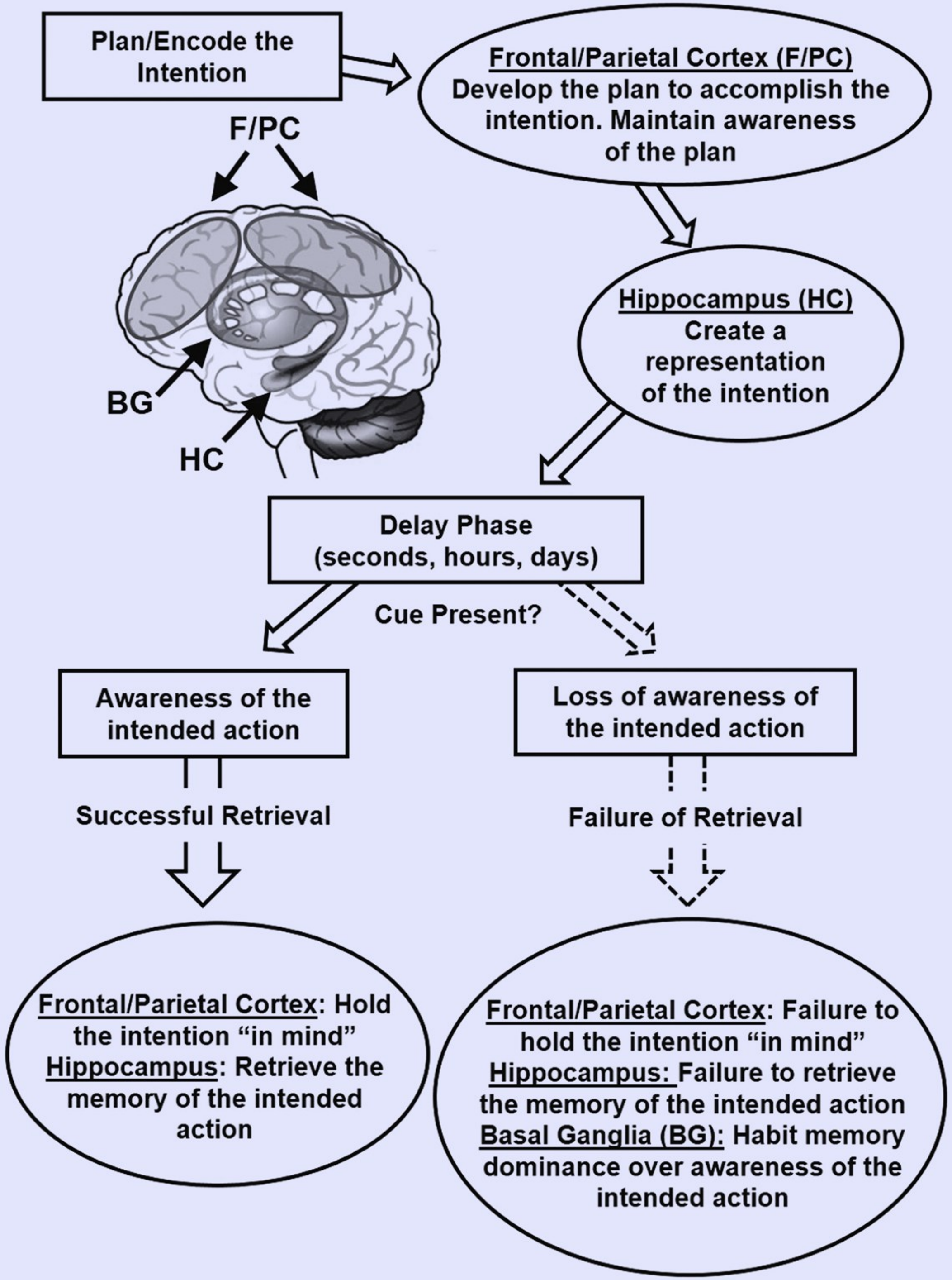
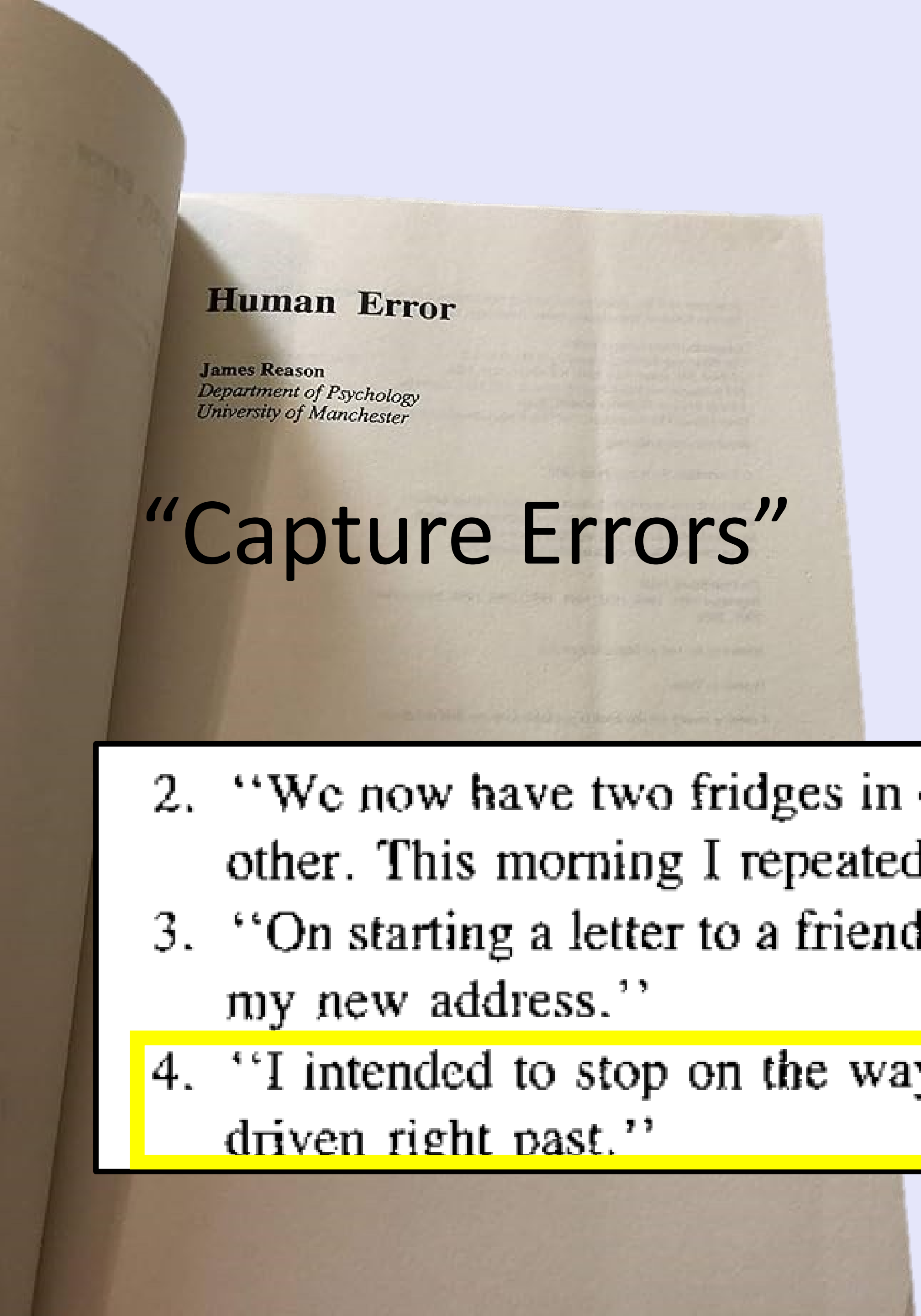

GoodDay
TAMPA BAY
GoodDay
FLORIDA CHILD DIES IN HOT CAR
6:32 83°
0AM GOOD DAY TAMPA BAY WILL AIR ON OUR 13.3 BROADCAST CHANNEL AND
GOOD DAY

What is Going Wrong?

- Diamond gives a neurocognitive explanation.
- Based on competition between fronto-parietal-hippocampal declarative memory and basal ganglia habit memory systems.
- The cognitive-level explanation is that an intention is formed, but sometimes our habit ‘autopilot’ takes over and the intention is forgotten.
- The mistake is a failure of prospective memory.



Diamond, D. M. (2019). When a child dies of heatstroke after a parent or caretaker unknowingly leaves the child in a car: How does it happen and is it a crime?. Medicine, Science and the Law, 59(2), 115-126.



"Capture Errors"

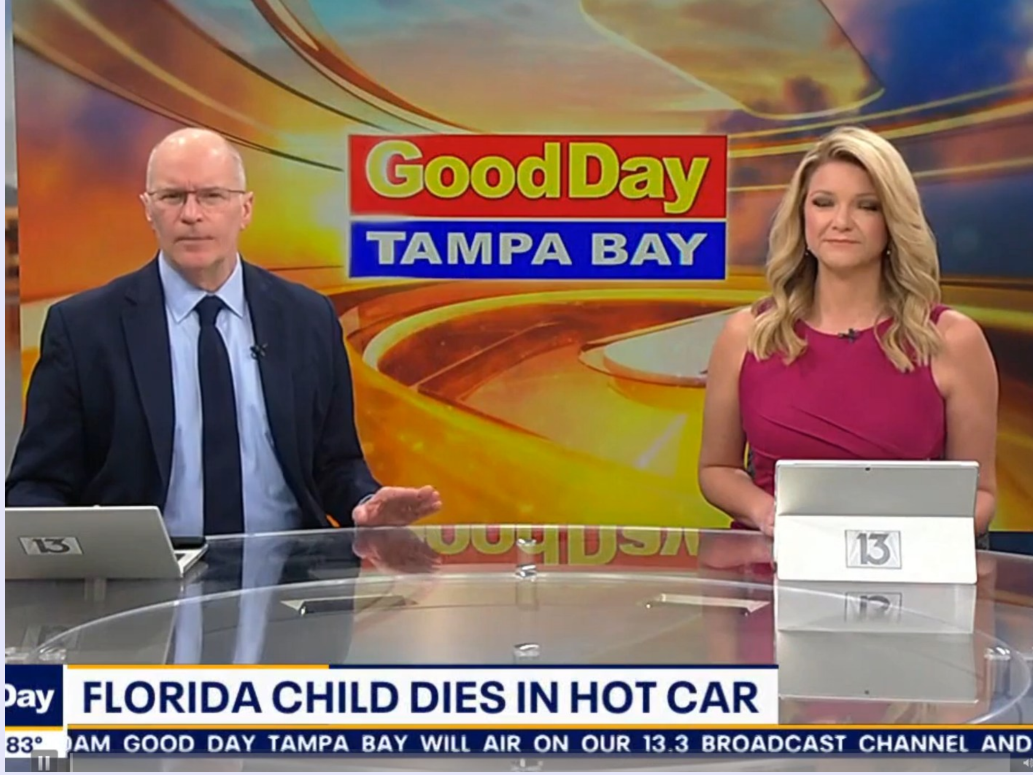
- The psychologist James Reason conducted diary studies in the 1970's and 1980's.
- He collected and classified errors that people make in everyday life.

2. "We now have two fridges in our kitchen and yesterday we moved our food from one to the other. This morning I repeatedly opened the fridge that we used to have our food in."
3. "On starting a letter to a friend I headed the paper with my previous home address instead of my new address."
4. "I intended to stop on the way to work to buy some shoes, but woke up to find that I had driven right past."

Reason J; Lapses of attention in everyday life, in R Parasuraman, DR Davies (Eds.). Varieties of Attention. 1984. Academic Press.

Summary:

- Babysitter left the baby in a car.
- Inside the garage of the family home.
- For 5 hours.



- It is a failure of prospective memory.
- But can this be a capture error?
- It sounds like the journey was planned.

Post-completion errors:

- Byrne and Bovair (1997) showed that in multi-step plans, the subgoal is sometimes omitted, if it occurs **after** the main goal is achieved.
- High-cognitive load increases the risk of these errors occurring.

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A Working Memory Model of a Common Procedural Error

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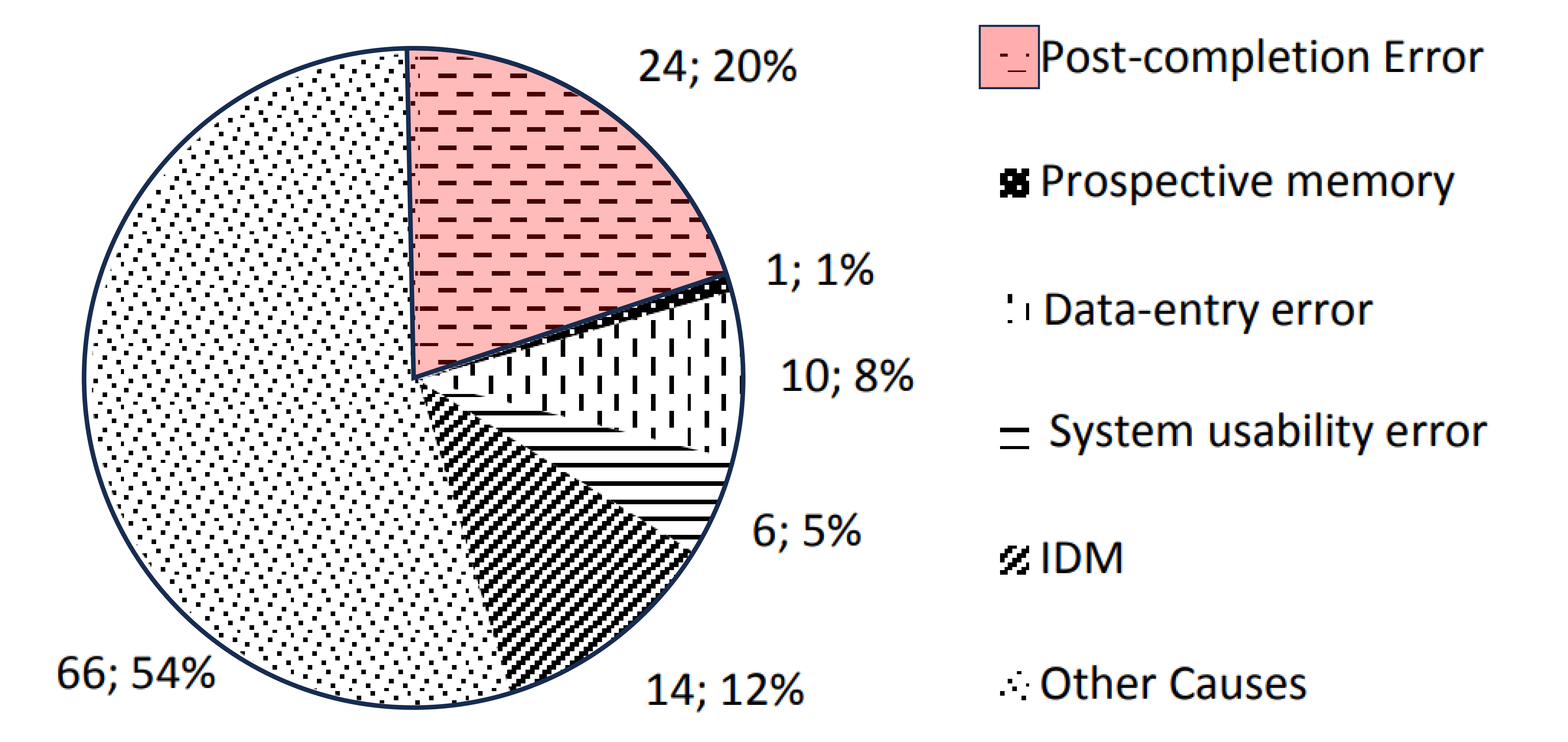
Systematic errors in performance are an important aspect of human behavior that have not received adequate explanation. One such systematic error is termed postcompletion error; a typical example is leaving one's card in the automatic teller after withdrawing cash. This type of error seems to occur when people have an extra step to perform in a procedure *after* the main goal has been satisfied. The fact that people frequently make this type of error, but do not make this error every time, may best be explained by considering the working memory load at the time the step is to be performed: The error is made when the load on working memory is high, but will not be made when the load is low. A model of performance in the task was constructed using Just and Carpenter's (1992) CAPS that predicted that high working memory load should be associated with postcompletion errors. Two experiments confirmed that such errors can be produced in a laboratory as well as a naturalistic setting, and that the conditions under which the CAPS model makes the error are consistent with the conditions under which the errors occur in the laboratory.

Post-completion errors:

- One possibility is that children are left in cars because of post-completion errors.

- Classic real-life example of post-completion error is using a bank ATM.
- The main goal = obtain $$$$.
- The subgoal of retrieving your card occurs after the main goal is achieved.
- Consequently, people sometimes grab the $$$$ and walk away without their bank card.

Post-completion errors are one of the most common single cause of maintenance incidents in aviation.



Ng, M., & Li, S. Y. W. (2016). An analysis of aircraft maintenance incidents using psychological and cognitive engineering knowledge. Proceedings of the Human Factors and Ergonomics Society Annual Meeting, 60(1), 1676-1680.

Goal neglect

- People (especially people with low fluid intelligence or frontal lobe damage) will often miss out parts of a plan.
- They do this despite being able to describe what is required.
- Experiments show that this appears to be due to failure to form a plan that includes all subgoals.
- Occurs in complex tasks or procedures.
- Insensitive to cognitive load.

Journal of Experimental Psychology: General
2008, Vol. 137, No. 1, 131–148

0096-3445/08/$12.00 DOI: 10.1037/0096-3445.137.1.131

Goal Neglect and Spearman's *g*: Competing Parts of a Complex Task

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In goal neglect, a person ignores some task requirement though being able to describe it. Goal neglect is closely related to general intelligence or C. Spearman's (1904) *g* (J. Duncan, H. Emslie, P. Williams, R. Johnson, & C. Freer, 1996). The authors tested the role of task complexity in neglect and the hypothesis that different task components in some sense compete for attention. In contrast to many kinds of attentional limits, increasing the real-time demands of one task component does not promote neglect of another. Neither does neglect depend on preparation for different possible events in a block of trials. Instead, the key factor is complexity in the whole body of knowledge specified in task instructions. The authors suggest that as novel activity is constructed, relevant facts, rules, and requirements must be organized into a "task model." As this model increases in complexity, different task components compete for representation, and vulnerable components may be lost. Construction of effective task models is closely linked to *g*.

Keywords: goal neglect, intelligence, attention, working memory, frontal lobe

Supplemental materials: http://dx.doi.org/10.1037/0096-3445,137,1,131

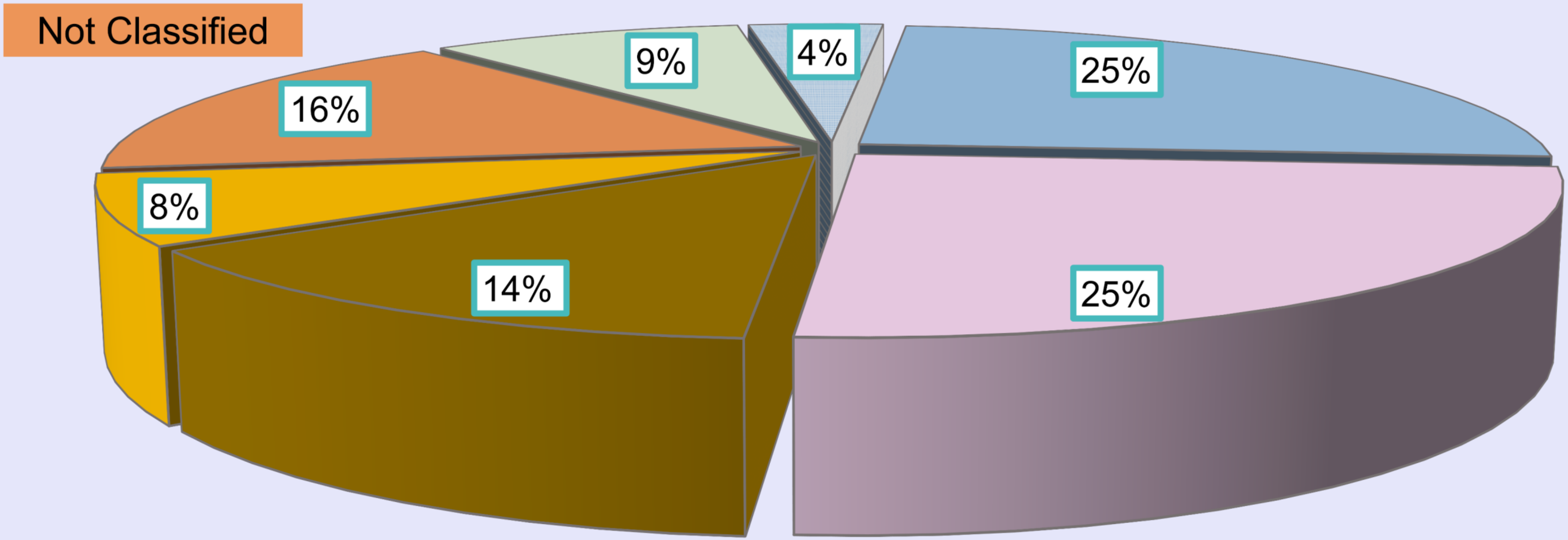
Some predictions about circumstances of children left in hot cars:

- **Routine captures** should only occur when a habitual route is taken instead of the planned (non-routine route).
- **Post-completion errors** should occur when the main goal is achieved as planned, and the child is not central to that plan.
- **Goal-neglect** should occur on complex, multi-step, non-routine journeys.

We analysed all media reports of fatal paediatric vehicular heatstroke:

- Reported in the media.
- Occurred in the USA.
- Years 2019-2023
- 164 fatal accidents analysed
- 78 found to involve cognitive errors (48%)

The 78 incidents caused by cognitive errors were classified as:

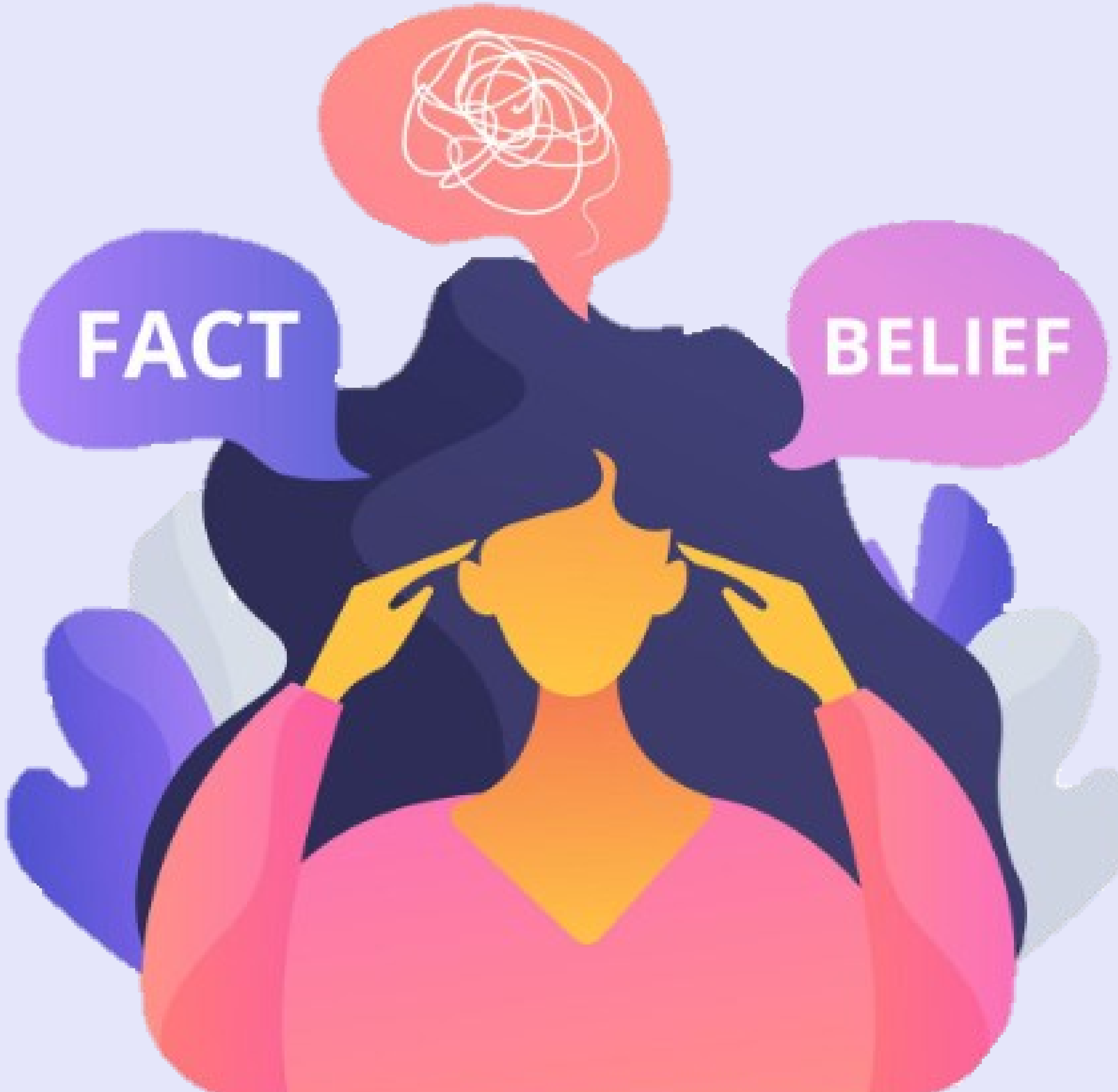


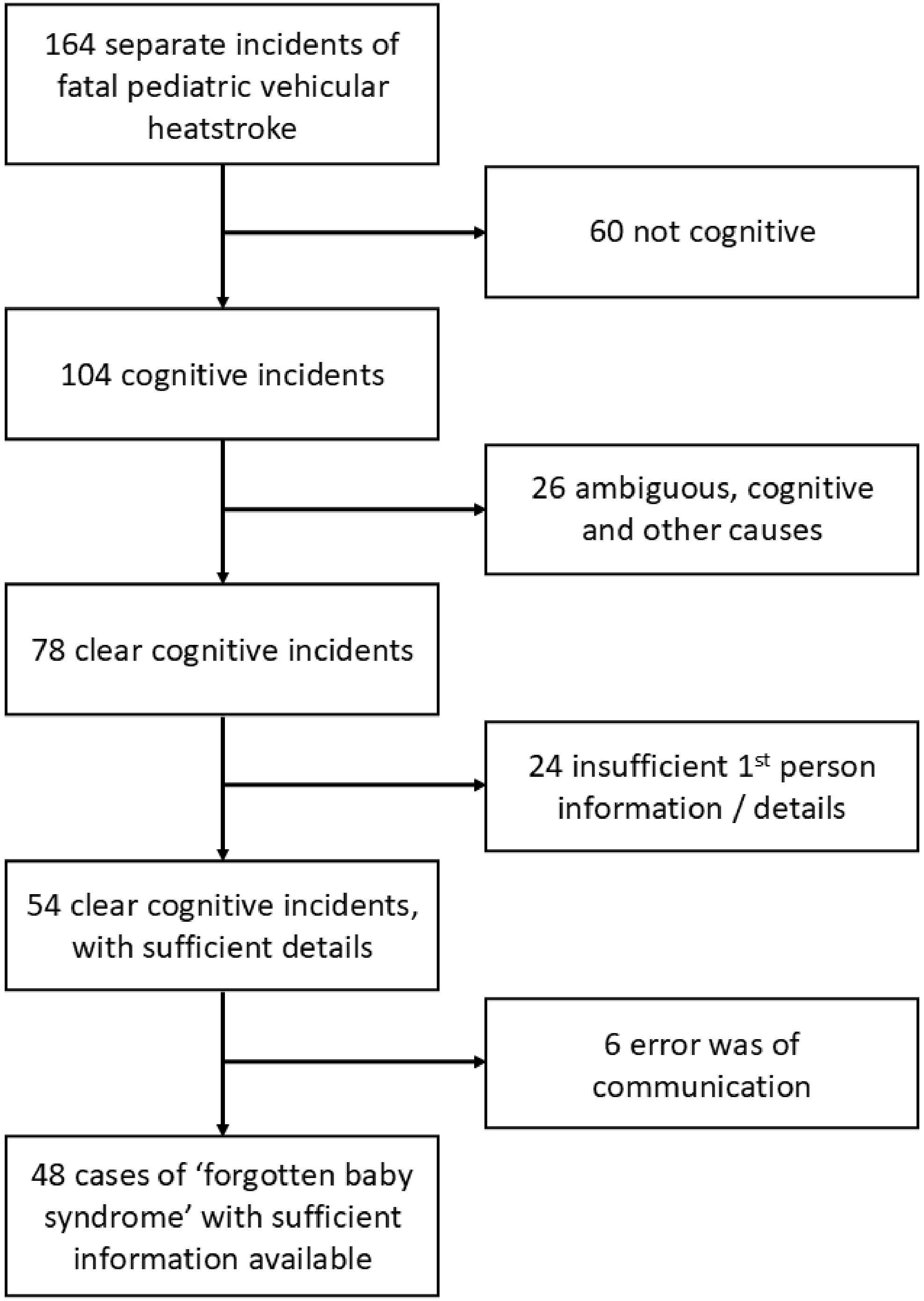
Pluck, G, Kittikamron, P, Cerone, A & Garcés MS (in preparation) A survey of cognitive errors leading to fatal pediatric vehicular heatstroke. *Cognitive Research: Principles and Implications.*

Assumption errors are when the adult incorrectly assumes that the child left the vehicle.

False memories

- Several legal analyses have mentioned that the drivers report false memories of having removed the child, despite knowledge that they did not.
- No statistics available, just anecdotes.
- False memories, if present may have implications for cognitive interpretations.





From those 48 incidents there was good evidence that at least one case had false memories.

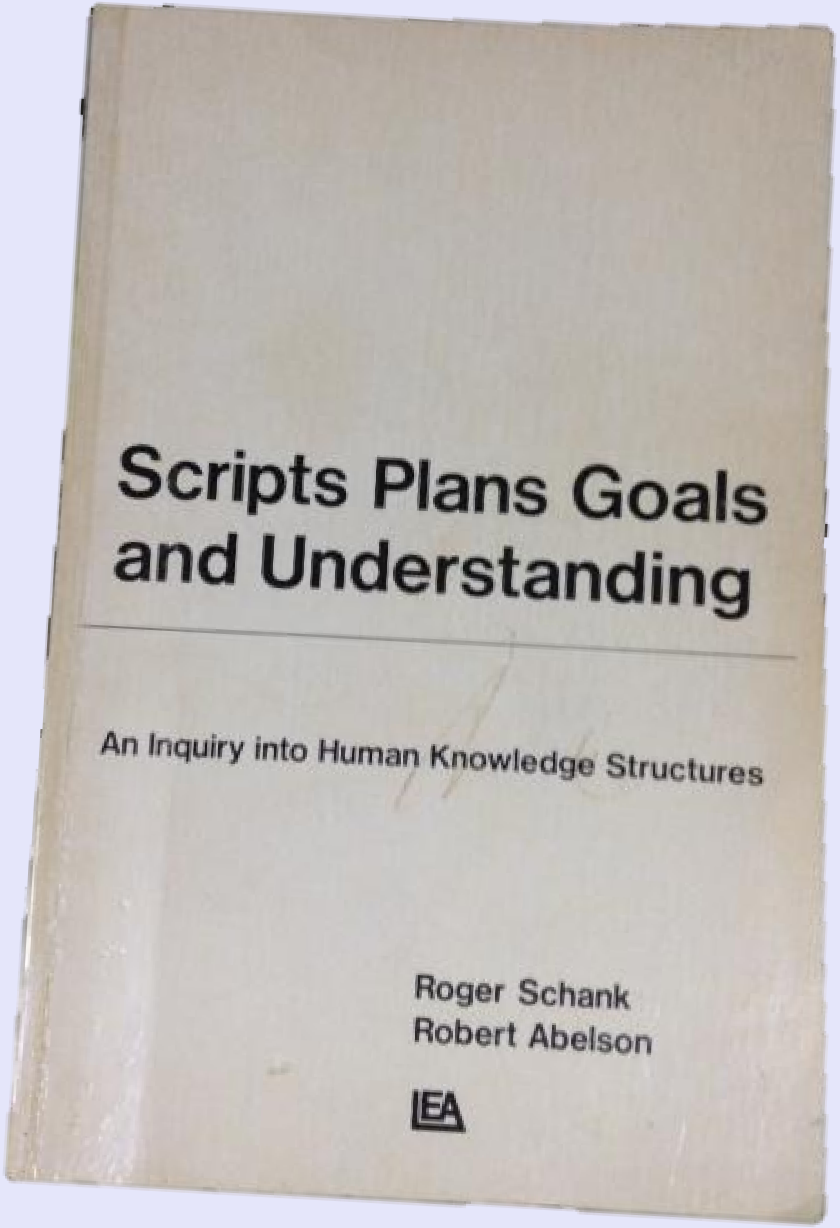
The sheriff commented that "In his mind, he really believed he dropped the two boys off at day care. There was no doubt in his mind that he'd done that."

- There were ten incidents that possibly involved false memories. Possible false memories linked to:
- Victims were more likely to be boys ($p = .02$).
- There was often > 1 child fatality ($p = .04$).
- This may indicate greater psychological trauma linked to false memories.

Pluck, G, Kittikamron, P, Cerone, A & Garcés MS (in preparation) False Memories in Forgotten Baby Syndrome. Psychology International.

- Classic work in cognitive science.
- Script theory used in cognitive psychology and AI.
- Memory structures contain probable aspects from well-known routines.

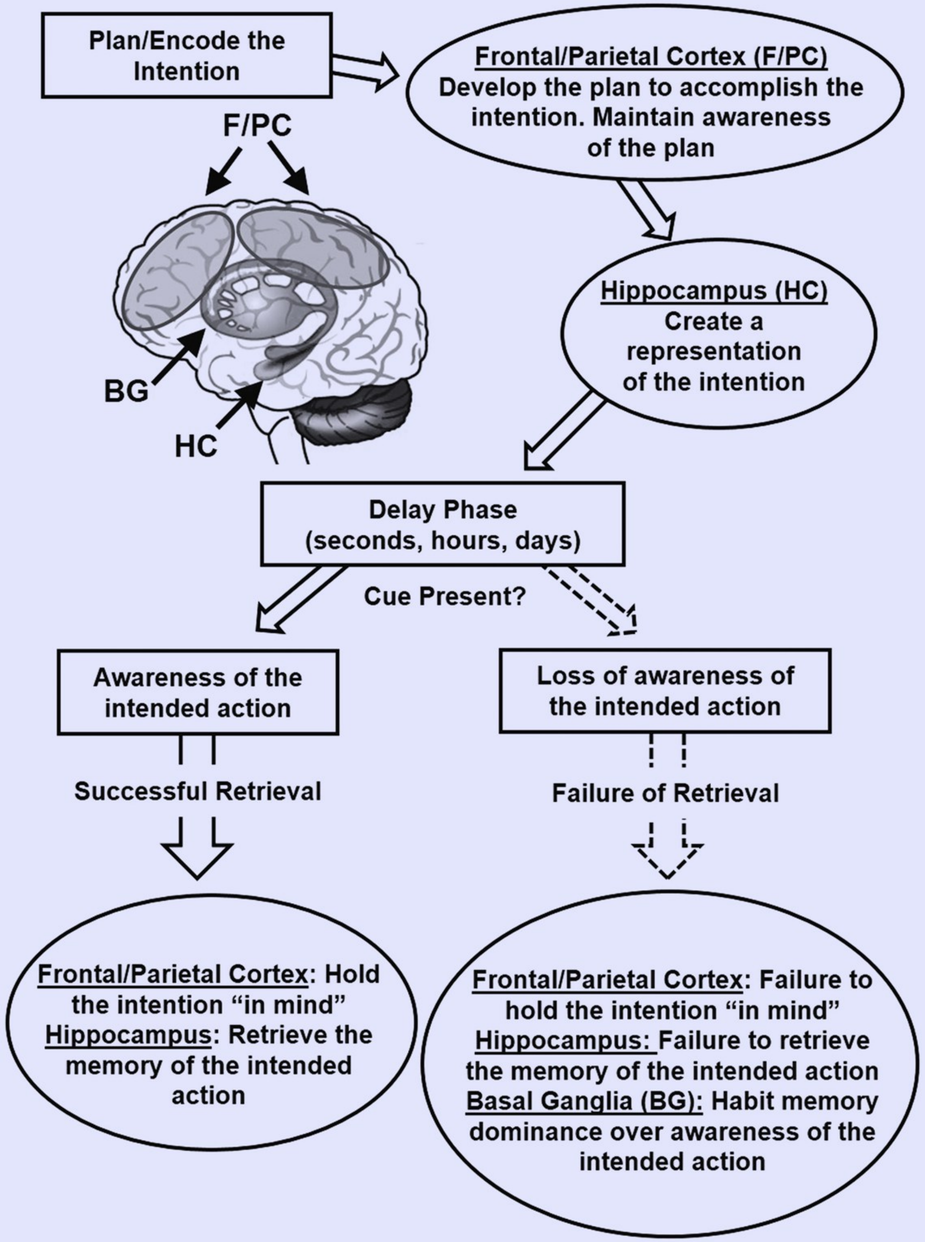
- Script-based recall errors are very common among drivers on routine journeys.



Schank, R. C., & Abelson, R. P. (1977). Scripts, plans, goals, and understanding: An inquiry into human knowledge structures. Lawrence Erlbaum Associates.

Conclusions

- Most of the errors that result in child heatstroke deaths can be understood from cognitive theories.
- Post-completion errors and goal-neglect are the most important factors.
- Some rarer errors are less well understood.
- The neurocognitive theory of Diamond (2019) is too simple to account for the variety of incidents.
- False memories are reasonably common and point to action scripts as an alternative model.



This is a team effort

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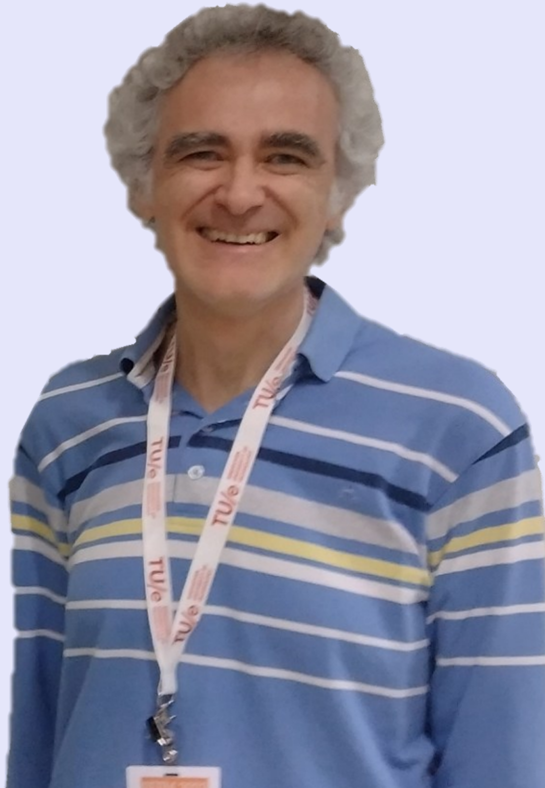

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