Fatal Distraction - how can we assist sleep deprived parents?

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Fatal distraction
“Forgotten Baby Syndrome”

- **Accidental leaving of a baby or young child**
  - A parent or carer through sleep deprivation, stress, distraction or confusion due to a change in routine, forgets their child is in the car – and can lead to tragic outcome.

- **Distinct from intentional leaving**

- **Cases grown since early 1990’s**
  - Approx 18 deaths per year in US
  - Passenger side front airbags dangerous for children
  - Child restraints moved to the rear of the car
  - Very young children rear facing
  - Temp in car 20-30° above ambient outdoor
  - Core temp 41.7° a threat to life

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A table showing elapsed time vs. outside air temperature:

<table>
<thead>
<tr>
<th>Elapsed Time</th>
<th>21.1</th>
<th>23.9</th>
<th>26.7</th>
<th>29.4</th>
<th>32.2</th>
<th>35</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 minutes</td>
<td>21.1</td>
<td>23.9</td>
<td>26.7</td>
<td>29.4</td>
<td>32.2</td>
<td>35</td>
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<tr>
<td>10 minutes</td>
<td>31.7</td>
<td>34.4</td>
<td>37.2</td>
<td>40</td>
<td>42.7</td>
<td>45.5</td>
</tr>
<tr>
<td>20 minutes</td>
<td>37.2</td>
<td>40</td>
<td>42.7</td>
<td>45.5</td>
<td>48.3</td>
<td>51.1</td>
</tr>
<tr>
<td>30 minutes</td>
<td>40</td>
<td>42.7</td>
<td>45.5</td>
<td>48.3</td>
<td>51.1</td>
<td>53.9</td>
</tr>
<tr>
<td>40 minutes</td>
<td>42.2</td>
<td>45</td>
<td>47.8</td>
<td>50.6</td>
<td>53.3</td>
<td>56.1</td>
</tr>
<tr>
<td>50 minutes</td>
<td>43.6</td>
<td>46.7</td>
<td>49.4</td>
<td>52.2</td>
<td>55</td>
<td>57.8</td>
</tr>
<tr>
<td>60 minutes</td>
<td>45</td>
<td>47.8</td>
<td>50.6</td>
<td>53.3</td>
<td>56.1</td>
<td>58.9</td>
</tr>
<tr>
<td>&gt; 1 hour</td>
<td>46.1</td>
<td>48.9</td>
<td>51.7</td>
<td>54.4</td>
<td>57.2</td>
<td>60</td>
</tr>
</tbody>
</table>

-Noheatstroke.org
Who are these parents?
It can happen to anyone

No consistent character profile of parents or carers involved in these tragedies
• Caregivers can be male or female
• 1st child, nth child
• Well educated, poorly educated
• Employed, unemployed; Wealthy, poor
• Good parents – same parents who buy baby gates, block their outlets, read their safe sleep materials

Consistent factors across fatal distraction cases a combination of:
• Sleep deprivation
• Stress
• Change to normal daily routine
• Distraction
• No ‘cue’ for jogging memory (e.g., child asleep in rear seat)
So is this poor parenting or the tragic consequence of poor human memory?

**Bryce Balfour**
- Mother up all night looking after two children, one grumpy with a cold
- Mother drove Father to work as second car unavailable – in her mind ‘drop off done’
- Stressful phone conversations (young relative in trouble, crisis at work)
- Forgot to stop at babysitter and went straight to work

**Tyler Costello**
- Parents stressed and distracted preparing for cross country flight and family wedding
- Father to take Tyler to daycare as usual sitter unavailable
- Backup daycare on route to Father’s place of work
- Father forgot to turn left to daycare and turned right ‘on autopilot’, parking at work
Just like any other parent

So is this poor parenting or the tragic consequence of poor human memory?

- **Bella Poole**
  - Mother had poor night’s sleep
  - Bella was grizzly during afternoon so accompanied Mother and Brother on drive to get dinner (this was not their normal routine)
  - Normally Bella would be in her cot
  - Returned home from well-travelled drive, entered house for dinner
  - On seeing empty cot later in evening, thought Bella had been kidnapped, until devastating discovery

- **Noah Zunde**
  - Mother severely sleep deprived due to illness (children and herself)
  - Stress in the family due to injured pets, illness and forgotten Myki
  - Change in complex daycare and school drop off routine – mother due to drop Noah at daycare but instead drove home
  - Mother thought Noah was at daycare – went to pick him up that afternoon
Neuroscience of forgetting

Parents have not forgotten they have a child – they have forgotten to remove their child from a car.

Three memory brain areas involved in these cases:

- **Hippocampus** (long term memory)
- **Prefrontal cortex** (working/short-term memory, prospective memory)
- **Basal Ganglia** (habitual or procedural memory)

Baddeley and Hitch, 1974; Tulving, 1985; Squire and Zola, 1996; Squire 2004
Neuroscience of memory

Parents have not forgotten they have a child – they have forgotten to remove their child from a car

Three memory brain areas involved in these cases:

**Basal Ganglia (habitual or procedural memory)**

- Very old part of the brain in evolutionary terms
- Learns and executes routinely performed actions
- Automatic and subconscious
- Memory used when we are “on autopilot”
- Tying a shoelace; making tea; driving a car; navigating route to work; morning routine
- No direct route to consciousness - no new memories formed each time habit is performed.
- Does not encode ‘importance’
Neuroscience of memory

Parents have not forgotten they have a child – they have forgotten to remove their child from a car

Three memory brain areas involved in these cases:

Hippocampus and associated structures (long term memory)

- Storage for memories about ourselves and long term goals
- Holiday in Spain, 1998; name of favourite schoolteacher; friend’s face; that time you went to the post office and there was a long queue
- Long term memories require repeated learning and rehearsal over time (re-remembering; discussion; consolidation)
- These memories can be edited each time they are recalled – can result in ‘false memories’
Neuroscience of memory

Parents have not forgotten they have a child – they have forgotten to remove their child from a car.

Three memory brain areas involved in these cases:

Prefrontal cortex (working/short-term memory, prospective memory)

- Short term storage for items that need to be acted upon soon
- Shopping list; telephone number read out to us; retrieve butter from fridge; stop at post office on the way home; turn left to daycare instead of right to office
- Limited in capacity – 5 to 9 items at any time
- Limited in duration – memory only functions while neurons are active (so we must actively rehearse)
- Highly susceptible to interference
Everyday memory examples
If you can forget your phone, you can forget your child

- **Breakfast distraction - mobile phone**
  - Breakfast routine in progress
  - Little one is playing with your phone, leaves it on the table, instead of your bag – you must remember to put it back
  - Someone spills their milk just before you leave the house
  - Basal ganglia are running your breakfast routine
  - Your phone is normally in your bag, but the distraction overloads the short term memory of its new location.
  - Basal ganglia carry on regardless.
  - Get to work, open bag to use phone – it’s not there.
  - Your long term memory says it should be, you must have lost it.
Everyday memory examples
If you can forget the post, you can forget your child

**Post office drop off**

- Urgent parcel – must stop at PO on way to work
- Stressful work day ahead, begin drive thinking of all the things to be done today
- Roadworks – distraction (no rehearsal)
- Phone call – new meeting (memory overload)
- Basal ganglia are driving the car and navigating to work
- Short term memory fails to interrupt the habit
- No memory of error
- Parcel in car provides ‘cue’ for memory jog later
Memory examples - FBS
If you can forget the post, you can forget your child

**Daycare drop off**

- Carer sick – must stop at CC on way to work\(^1\)
- Stressful work day ahead, begin drive thinking of all the things to be done today
- Roadworks – distraction (no rehearsal)
- Phone call – new meeting (memory overload)

- Basal ganglia are driving the car and navigating to work
- Short term memory fails to interrupt the habit\(^2\)
- No memory of error\(^3\)
- Baby is asleep and not visible – no ‘cue’

\(^1\) Child care drop off becomes one of the items in short term memory as it is not part of the normal routine (habit) and therefore must be recalled at the correct time.

\(^2\) As this action is in short term memory it becomes susceptible to interference

\(^3\) A false memory can be created from previous drop offs
Neuroscience of how we can all forget

“But a child is far more important than your post? I could never forget my child.”

- **Our habit memories are there to automate repeated activities - not prioritise**
  - The basal ganglia are shared by all vertebrates
  - They free up higher brain structures to process new or more complex behaviour
  - Remembering each time we perform a habit would be inefficient, as would conscious awareness of those actions - they do not communicate with long term memory, nor do they receive information from it

- **Our short term memories are limited and there’s little we can do to change that**
  - Short term and prospective memories require significant ‘brain power’ to maintain (large volumes of brain activity means there is a hard limit on the number of items that can be remembered)
  - By nature they store transient tasks – so there is usually no need for them to remembered beyond their execution
  - We are programmed to forget them once they are no longer useful (hence their limited duration)
  - We can engage in memory maintenance (e.g., rehearsal), but that is susceptible to distraction
  - We can engage in memory enhancement (e.g., chunking), but that is difficult with many memories
Parenting is the perfect storm for memory
Parents have not forgotten they have a child – they have forgotten to remove their child from a car

Several factors we know impair our memory systems in addition to those built-in limitations
• Distraction
• Sleep deprivation
• Stress
• Changes in routine

Distraction - happens to all of us, even more so for parents
• Short term memory needs constant brain activity to persist
• Adding items to short term memory can overload its capacity
• These distractions can come from almost anywhere
Parenting is the perfect storm for memory

Sleep deprivation alters chemical and neural processes of memory – reducing capacity

- **There are several factors we know impair our memory systems**
  - Distraction
  - Sleep deprivation
  - Stress
  - Changes in routine

- **Sleep deprivation**
  - The frontal brain regions involved in short term ‘working’ memory are known to be impacted by sleep deprivation (e.g., Horne, 1993; Thomas et al., 2000; Chee et al., 2006). Such studies have shown that cognitive performance and short-term/working memory integrity are reduced following sleep deprivation, although it is not currently known the exact method of action that sleep deprivation has on this brain region.
  - Hippocampal function (implicated in long term memory) is impaired following a lack of sleep. Sleep is required for the normal chemical and neural processes in the hippocampus to take place in order to ‘consolidate’ memories – make them ‘stick’ in the brain (e.g., Abel et al., 2013; Havekes et al., 2016; Maquet, 2001).
Parenting is the perfect storm for memory

Stress releases hormones that suppress or interfere with memory – reducing capacity

- **There are several factors we know impair our memory systems**
  - Distraction
  - Sleep deprivation
  - Stress
  - Changes in routine

- **Stress**
  - Both acute and chronic stress have been shown to negatively affect both long term memory and short term memory. Chronic stress (stress that is manifest over a period of days or months) increases the release of hormones called ‘glucocorticoids’. It is well-known that these hormones negatively affect memory by impairing the retrieval of memories from storage (Wolf, 2003; Newcomer et al., 1999).
  - Acute stress (stress that is manifest at a specific time) – such as the stress which is created by being late, has also been shown to negatively affect both long term memory and short term memory (e.g., Elzinga et al., 2005; Lupien et al., 1999), again via stress hormones. For example, Dunko et al., (2009) showed that acutely stressed individuals made more mistakes in a short term memory test. This occurs because glucocorticoids change the way that prefrontal cortex functions.
Parenting is the perfect storm for memory

Changes in routine require a well-functioning memory

- There are several factors we know impact or impair our memory systems
  - Distraction
  - Sleep deprivation
  - Stress
  - Changes in routine

- Changes in routine
  - Our basal ganglia run well known routines without our conscious intervention
  - When this routine needs to be changed, we must arrange to break it at a specific step
  - In order to do this our short term or procedural memory must intervene at the correct time
  - The previous risk factors all impact the likelihood of this intervention to be successful
  - As our basal ganglia do not create new conscious memories, we do not ‘remember’ we have ‘forgotten’, until we get a cue or reminder.
How can we help parents?
Small changes can make a big difference – assume you might forget and make a change now

Provide a ‘cue’ to jog memory
- Leave a bag, phone or wallet in the back of the car
- Place a child’s bag or cuddly toy in the front seat as a reminder
- Ask childcare centre, babysitter or other carer to call if they have not dropped off their child off on time

Fixed control measure in cars
- Using a mirror or video monitor for rear-facing car seats
- Using technology by installing electronic controls that are permanently fitted to the car or car restraint which create an audio reminder to the parent when they stop the car.

Avoid driving when sleep deprived!
- Being awake for 18 hours straight makes you drive like you have a blood alcohol level of .05
- If you’ve been awake for a full 24 hours and drive, it’s like you have a blood alcohol level of .10

sleepfoundation.org
How can we help parents?
Small changes can make a big difference

Make a new routine

- create a mental list of the things to check each time you leave the car – e.g. baby, keys, wallet, phone
- make it routine to open the back door of the car every time you park, even if there is no one in the back seat

Explain the science – change the attitude

- “It could never happen to me, I’m a good parent”
- We don’t like to think we are vulnerable, or not in control – need to recognise this is reality
- Common response is to demonise parents – put them in another category to ourselves
- Explain these are failures of memory, not of love
- Reinforce the need to prepare and prevent, regardless of how much your child is loved
Contacts

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Victorian Department of Education and Training

Prof David M Diamond – US based FBS expert
http://psychology.usf.edu/faculty/data/ddiamond/baby-sy.pdf

Other links
https://www.kidsandcars.org/