

Theorizing on the Neurobiology of “Forgotten Baby Syndrome”

One aspect of my research program is the study of how different brain memory systems appear to cooperate, as well as to compete against each other. Two brain structures, the hippocampus (HC) and prefrontal cortex (PFC), work together to optimize decision-making and multi-tasking, and to form and retrieve new memories. Two other brain structures, the basal ganglia (BG) and amygdala, can interfere with the functioning of the HC-PFC memory system. The BG controls habit-based behaviors and the amygdala controls emotional memory processing. In the following I provide two conditions in which the HC-PFC, BG and amygdala interact to cause memory failures, with potentially tragic outcomes. The failure to remember that a child is in one’s car, which can have a tragic outcome, is referred to as “*Forgotten Baby Syndrome*”.

Condition 1: The BG can suppress the functioning of the HC-PFC. In a situation which is considered predictable and safe, as when a person is performing a routine activity such as driving a car to work, the BG can dominate the HC-PFC memory system. The BG enables automated behaviors (habits) to occur with minimal mental effort. When the BG dominates memory processing, a person is less likely to interrupt habit-based behaviors to do something that is consciously planned. A benign example of BG domination over the HC-PFC system is when a person forgets to stop at a store to pick up groceries on the way home from work; the BG (habit-based memory system) suppresses the HC-PFC system from interrupting the drive home to stop at the store. A similar, but tragic, example of BG dominance over the HC-PFC system is when a parent drives to work, and in the process forgets to drop off a child at daycare. Our hypothesis is that parents forget to stop at the daycare because bringing the child to daycare either is not a part of the parent’s daily routine, or the parent inconsistently takes the child to daycare. On the day in which the parent forgets the child, the BG memory system has dominated control over the HC-PFC memory system, thereby causing the parent to drive straight from home to work. In the process of BG memory system dominance, the parent loses awareness of the sleeping (quiet) child in the back seat of the car.

Condition 2: The amygdala is activated under high stress conditions, thereby enabling a person to remember a stress-provoking event very well. When the amygdala is activated it has two effects on brain memory systems. First, it interferes with the functioning of the HC-PFC system. The amygdala-driven suppression of the HC-PFC can result in an individual becoming completely focused on a stressful event, causing him or her to lose track of other information which was held in memory by the HC-PFC system. This loss of memory may involve a relatively benign situation, such as a stressful event causing someone to forget where he or she parked their car. A comparable, but tragic, example of a stress-induced memory impairment is when a parent becomes so preoccupied with a stressful event during a drive to work that he or she forgets that a child is in the back seat of the car; the child is left in the car, resulting in death caused by hyperthermia. Second, activation of the amygdala, and/or sleep deprivation, enhances the functioning of the BG (habit-based) memory system. This enhancement of the BG enables subconscious habit-based memories to be expressed efficiently in times of stress. Thus, a stressed person is able to efficiently drive to work while focusing on a stressful event, but in the process, the suppression of the HC-PFC system interferes with the recollection of new information, and the person’s awareness of the child is lost.

Expert Witness Testimony, Service as a Scientific Consultant and Discussion of my Research Regarding “Forgotten Baby Syndrome”

November, 2004

Interactivedads.com

Good Dads Leaving Kids In Cars: What’s causing dads to forget the kids they love?

October 24, 2006

Dallas Morning News

A child's death in a vehicle: Unthinkable, yet so real

July, 2007

Sentences vary when kids die in hot cars

Yahoo News:

http://news.yahoo.com/s/ap/20070728/ap_on_re_us/left_to_die

Fox News:

<http://www.foxnews.com/wires/2007Jul29/0,4670,LefttoDie,00.html>

July, 2007

Associated Press:

PUZZLING TRAGEDY: CHILDREN LEFT TO DIE IN CARS

<http://www.poconorecord.com/apps/pbcs.dll/article?AID=/20070729/NEWS/707290355>

January, 2008

**Defense Expert Consultant on Brain, Memory and Stress to
Zwerling, Leibig & Mosely, P.C.**

Commonwealth of Virginia v. Balfour

(A child died when a caretaker forgot him in a hot car)

January, 2008

The Hook: COVER-

The perfect storm: Family tragedy plays out in court

<http://www.readthehook.com/stories/2008/01/31/COVER-balfourtrial-REFEED-D.rtf.aspx>

August, 2008

Cincinnati Enquirer Editorial:

“We must remember: Forgetting a baby’s not an impossible lapse”

<http://news.cincinnati.com/apps/pbcs.dll/article?AID=/20080822/EDIT01/808220365/1019/EDIT>

March, 2009

INFANT HYPERTHERMIA-Baby deaths: Tragic failures of memory, not failures of love

<http://www.parentcentral.ca/parent/article/603836>

March, 2009

**Washington Post: Fatal Distraction: Forgetting a Child in the
Backseat of a Car Is a Horrifying Mistake. Is It a Crime?**

http://www.washingtonpost.com/wp-dyn/content/article/2009/02/27/AR2009022701549_pf.html

July, 2009

**Scientific Advisor and Expert Testimony on Memory and Stress to
Duane, Morris, LLP**

State of Pennsylvania v. Rimma Shvartsman

(A child died when a caretaker forgot him in a hot car)

Fall 2009

Research Cited in: **Criminal Law** (Course Materials)

Professor Blaze, University of Tennessee, Knoxville

http://www.law.utk.edu/course-materials/fall2009/20094_809_Blaze_265.pdf

September, 2009

Austin American Statesman

Psychology professor says forgetting kids is not negligence

Dad faces jail in hot-car tragedy

<http://www.chron.com/disp/story.mpl/hotstories/6627317.html>

<http://www.chron.com/disp/story.mpl/hotstories/6627317.html>

October, 2009

Day care operator to stand trial

<http://www.msnbc.msn.com/id/33322784>

December, 2009

Day care owner will seek mental infirmity defense

http://www.phillyburbs.com/news/local/courier_times/courier_times_news_details/article/28/2009/december/30/day-care-owner-will-seek-mental-infirmity-defense.html

January, 2010

Expert Witness testimony (Forgotten Baby Syndrome):

Harrison v Division of Child Services (State of Virginia)

March, 2010

Expert Witness testimony (Forgotten Baby Syndrome):

Shvartsman v Commonwealth of Pennsylvania

USA Today: *Toddler's van death in jury's hands*

http://www.philly.com/philly/news/breaking/20100319_Bucks_day-care_trial_goes_to_closing_arguments.html

http://www.buckslocalnews.com/articles/2010/03/20/the_advance/news/doc4ba518ofde563959778961.txt

<http://content.usatoday.com/topics/article/Places,+Geography/States,+Territories,+Provinces,+Islands/U.S.+States/Pennsylvania/09wZ3gyezMc5Y/1>

Philly Blurbs: *Shvartsman acquitted in tot's hyperthermia death*

http://www.phillyburbs.com/news/news_details/article/92/2010/march/22/shvartsman-acquitted-in-tots-hyperthermia-death.html

April, 2010

USF News: USF Experts, Pulitzer Prize Lucky Charm?

<http://usfweb3.usf.edu/absolutenm/templates/?a=2283&z=45>

May, 2010

Parenting Magazine: Tragedy in the Backseat: Heartbreaking stories of hot-car deaths -- and how you can avoid them

<http://www.parenting.com/article/Baby/Health/Tragedy-in-the-Backseat-Hot-Car-Deaths/1>

April, 2010

The Mom Houston Blog: *You could leave a baby to die in a car*

http://blogs.chron.com/momhouston/2010/04/you_could_leave_a_baby_to_die_1.html

August, 2010

“The Fiddler in the Subway” by Gene Weingarten; Simon and Schuster Books

http://books.google.com/books?id=Vx6CHHo8pz8C&pg=PA299&lpg=PA299&dq=%22david+diamond%22+memory+brain+expert&source=bl&ots=4k5JnyJsn0&sig=BAoAaJaX_jhuwVULqb5EFKBTkI&hl=en&ei=K2KATrbhAdC_gQeqoMwq&sa=X&oi=book_result&ct=result&resnum=4&ved=0CDIQ6AEwAw#v=onepage&q=%22david%20diamond%22%20memory%20brain%20expert&f=false

September, 2010

Consultant to Prosecutor Ron O'Brien (Columbus, Ohio) on Brain, Stress and Memory

(A child died when a caretaker forgot him in a hot car)

September, 2010

Defense Team Expert Consultant on Brain Functioning to Captain Elizabeth A. Ramsey, US Army Trial Defense Services

United States v. Sergeant Tina M. Laboy

(A child died when parents did not notice that their child drowned in a pool)

October, 2010

Fox News 21/27 Roanoke, VA

Mom Shares Tragedy of Leaving Son in Car

http://www.fox2127.com/dpp/news/metro/10.07.2010_wfxr_news_mom-shares-tragedy-of-leaving-son-in-car

March, 2011

Lawyers in Rochester.com:

What in hell is wrong with this picture?

why is this not going up for manslaughter?

<http://lawyersinrochester.com/what-in-hell-is-wrong-with-this-picture-why-is-this-not-going-up-for-manslaughter-she-forgot-her-child-but.html>

May, 2011

Participation in a Film Documentary on Forgotten Baby Syndrome:

"Stop all the Clocks" (Mahjong Pictures)

June, 2011

Healthy State.org

How Loving Parents Can Leave Their Kids in a Hot Car

<http://healthystate.org/archives/12678>

Kansas City Star

Danger of kids left in hot cars could grow worse

<http://www.kansascity.com/2011/05/31/2917758/danger-of-kids-left-in-hot-cars.html#storylink=misearch>

The Korea Herald

Number of kids dying in hot cars spikes

<http://www.koreaherald.com/national/Detail.jsp?newsMLId=20110609000866>

August, 2011

New England Cable News

Painful tragedy gives Cape Coral father purpose

http://www.necn.com/08/29/11/Painful-tragedy-gives-Cape-Coral-father-landing_health.html?&apID=8a38406cadf14fea8b201271c99b79a5

September, 2011

Kids and Cars.org

Memory and Brain Expert Addresses Federal Government on *"Forgotten Baby Syndrome"* to help prevent hot car tragedies

<http://www.kidsandcars.org/upload/press-release/PR-09-23-11.pdf>

October, 2011

Healthy News From Florida Public Media

How Loving Parents Can Leave Their Kids in a Hot Car

<http://healthystate.org/archives/12678>

October, 2011

Florida Department of Transportation

Forgetting a Child —How Can this Happen?

<http://www.dot.state.fl.us/PublicInformationOffice/districtnewsletters/d7fall11.pdf>

July, 2012

CNN Living/Parenting

Tragedy in the backseat: Hot-car deaths

<http://www.cnn.com/2012/07/12/living/hot-car-deaths-parenting/index.html>

February, 2013

Expert Witness Testimony: State of Wyoming v. Kaleb Laatsch

Man found guilty of child endangerment

<http://www.gillette newsrecord.com/stories/Laatsch-found-guilty-of-child-endangerment.86394>

March, 2013

Gillette News Record

Man found guilty of child endangerment

<http://www.gillette newsrecord.com/stories/Laatsch-found-guilty-of-child-endangerment.86394/>

October, 2013

The AUSTRALIAN: Boy dies inside car after dad's memory lapse

<http://www.theaustralian.com.au/news/nation/boy-dies-inside-car-after-dads-memory-lapse/story-e6frg6nf-1226732566622>

December, 2013

Australian Broadcasting Corporation

The lethal consequences of forgetting young children in cars

<http://www.abc.net.au/7.30/content/2013/s3916750.htm>

January, 2014

Herald Sun News - Australia

What happened when a mum forgot her baby was in the car

<http://www.heraldsun.com.au/news/law-order/what-happened-when-a-mum-forgot-her-baby-was-in-the-car/story-fni0fee2-1226810417252>

May, 2014

Global News

What kind of person could forget a child in a car? Anyone, experts say

<http://globalnews.ca/news/1356247/what-kind-of-person-could-forget-a-child-in-a-car-anyone-experts-say/>

June, 2014

Contemporary Pediatrics

“Good parents” denial puts kids at risk for heat stroke

<http://contemporarypediatrics.modernmedicine.com/contemporary-pediatrics/news/good-parents-denial-puts-kids-risk-heat-stroke?page=full>

June, 2014

Parents Magazine

You'd Never Forget Your Child In The Car, Right?

<http://www.parents.com/baby/safety/car/danger-of-hot-car-for-children/>

July, 2014

CNN – Breaking News

After leaving a child in a car, 'that pain...never goes away'

<http://www.cnn.com/2014/07/03/us/hot-car-deaths/>

CNN – Breaking News

Op-ed: Can parents really forget kids in cars?

David Diamond is a neuroscientist and frequent consultant on Forgotten Baby Syndrome cases

He says parents forget kids in cars when their memory systems clash

He also explains how flawed memory could have played a role in Justin Ross Harris' case

http://www.hlntv.com/article/2014/06/30/cooper-harris-child-dies-hot-car-why-parents-forget?hpt=hln10_1

HLN NOW

This is how a parent can forget a kid in the car - A psychology professor explains how parents can forget their children in the car

<http://www.hlntv.com/video/2014/07/11/forgotten-baby-syndrome-hot-car-study>

NBC Today Show: Parents recall daughter's tragic hot car death

Kristie Reeves-Cavaliero and Brett Cavaliero join TODAY to talk about losing their daughter when they accidentally left her in a hot car, and their efforts to prevent similar deaths. Dr. David Diamond joins to help viewers understand how a parent could forget a child.

<http://www.today.com/video/today/55642762/#55642762>

ABC Eyewitness News: KidsAndCars.org launches White House petition drive to prevent needless child deaths in hot vehicles

KidsandCars.org works with David Diamond, Ph.D., a neuroscientist at the University of South Florida who studies the brain and memory, including people who have unknowingly forgotten children.

<http://abc7.com/family/petition-aims-to-prevent-child-deaths-in-hot-cars/184019/>

Technology That Prevents Death

Forgotten Baby Syndrome is real. David Diamond, PhD discusses here this syndrome and its role in vehicular heat stroke.

<http://www.thebadassbreastfeeder.com/>

WTSP-TV CBS Tampa

Science behind parents leaving kids in cars

<http://www.wtsp.com/story/news/local/2014/07/15/science-behind-parents-leaving-kids-in-hot-cars/12691899/>

Kids group wants White House to address hot-car deaths

<http://www.autoblog.com/2014/07/14/kids-group-wants-white-house-address-hot-car-deaths/>

KidsandCars.org works with David Diamond, Ph.D., a neuroscientist at the University of South Florida who studies the brain and memory, including people who have unknowingly forgotten children.

Health News Florida

Hot Car Deaths: Tragedy or a Crime?

<http://health.wusf.usf.edu/post/hot-car-deaths-tragedy-or-crime>

When a child dies people feel someone should pay the price," said Dr. David Diamond, a professor of neuroscience at the University of South Florida. He studies memory and forgetting. He thinks parents leaving their kids in cars is a tragedy, but he doesn't think it's a crime.

Mother Of Ridgefield Boy Who Died In Hot Car Speaks Out

Fox News - CT

<http://foxct.com/2014/07/31/mother-of-ridgefield-boy-who-died-in-hot-car-speaks-out/>

Rogers-Seitz started reading anything she could get her hands on about child heatstroke in cars. She talked to nonprofit advocacy groups such as KidsAndCars.org, read what experts such as David Diamond, a psychology professor at the University of South Florida, have written about a phenomenon known as Forgotten Baby Syndrome, and studied the legislative stops and starts to try and save lives.

Dr. Sara responds to reader comments on Forgotten Baby Syndrome

<http://www.bundoo.com/community-blog/dr-sara-responds-to-reader-comments-on-forgotten-baby-syndrome/>

Dr. Diamond is arguably the national expert on Forgotten Baby Syndrome. His research formed the basis of the article

'Forgotten baby syndrome': expert witness called in Jayde Poole baby in car death case

Giving evidence via videolink from the US as a defence witness, neuroscientist Professor David Diamond, an expert on memory from the University of South Florida, told a Supreme Court jury on Wednesday that the case was similar to a phenomenon known as "forgotten baby syndrome".

Professor Diamond said 200 children had died worldwide over the past 15 years from the phenomenon after being left behind in cars.

<http://www.theage.com.au/victoria/forgotten-baby-syndrome-expert-witness-called-in-jayde-poole-baby-in-car-death-case-20140723-zwo6r.html#ixzz38HoXwg4Y>

<http://www.heraldsun.com.au/news/law-order/experts-say-jayde-poole-may-have-suffered-forgotten-baby-syndrome-when-she-left-her-baby-in-fatally-hot-car/story-fniofee2-1226998939674>

<http://www.bendigoadvertiser.com.au/story/2436360/jayde-poole-trial-day-5-starts/?cs=80>

Jayde Poole found not guilty over death of baby Bella, who died after being forgotten in a hot car

<http://www.heraldsun.com.au/news/law-order/jayde-poole-found-not-guilty-over-death-of-baby-bella-who-died-after-being-forgotten-in-a-hot-car/story-fniofee2-1227000198424?nk=9e4da9b6193cf727f62c9136fd803c07>

http://www.mamamia.com.au/news/jayde-poole-forgotten-baby-syndrome/?utm_source=feedburner&utm_medium=%24{email}&utm_campaign=Feed%3A+typepad%2FKsWc+%28%24{Mamamia+-+rss}%29

Professor Diamond told the court the short drive to and from Hungry Jack's was one Ms Poole had done many times before so her dominant brain system, known as basal ganglia, would have put her in auto-pilot mode.

Neuroscientist David Diamond explains forgotten baby syndrome on The Today Show (Australia)

<http://www.youtube.com/watch?v=KtjCWDvrQLs>

The World Today – ABC News Australia

'Forgotten Baby Syndrome' could explain Bendigo manslaughter case

<http://www.abc.net.au/worldtoday/content/2014/s4053707.htm>

An American neuroscientist says a Victorian woman whose baby died after being left in a hot car had suffered a case of the little known "Forgotten Baby Syndrome"

The Wichita Eagle

Hot-car deaths could happen to any parent, experts say

"These tragedies are unfortunately occurring on a regular basis," said David Diamond, a neuroscientist and professor at the University of South Florida who has been researching vehicular child hyperthermia deaths for the past 10 years.

<http://www.kansas.com/2014/07/26/3569471/hot-car-deaths-can-happen-to-any.html>

WTSP-TV CBS Tampa

Science behind parents leaving kids in cars

<http://www.wtsp.com/story/news/local/2014/07/15/science-behind-parents-leaving-kids-in-hot-cars/12691899/>

Health News Florida

Hot Car Deaths: Tragedy or a Crime?

<http://health.wusf.usf.edu/post/hot-car-deaths-tragedy-or-crime>

When a child dies people feel someone should pay the price," said Dr. David Diamond, a professor of neuroscience at the University of South Florida. He studies memory and forgetting. He thinks parents leaving their kids in cars is a tragedy, but he doesn't think it's a crime.