WHO SURVIVES DISASTERS AND WHY

Keith Parris
Hewlett-Packard Company

PART 1: PEOPLE

INTRODUCTION

- The word *disaster* comes from the Latin *dis* (meaning “away”) and *astrum* (meaning “stars”), and can be translated as "ill-starred.“
- Superstition and fear have often been associated with disasters.
- But there are real and tangible things you can do to improve your chances of survival.

"Did you know that most serious plane accidents are survivable? Of all passengers involved in serious accidents between 1983 and 2000, 56 percent survived… Moreover, survival often depends on the behavior of the passenger."

- Amanda Ripley, The Unthinkable

A TALE OF TWO CITIES, IN THE 2004 TSUNAMI

Jantang, coast of Sumatra:

– 20 minutes' after ground shook, 45-60 foot wave hit

– All village structures were destroyed

– Over 50 percent of the people died

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Langi, Island of Simeulue:

– Even closer to epicenter
– 8 minutes after earth quaked, 30-45 foot wave hit
– All village structures were destroyed
– Not a single person died

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A TALE OF TWO CITIES, IN THE 2004 TSUNAMI

Jantang, coast of Sumatra:

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Langi, Island of Simeulue:

– In 1907, a tsunami killed 70% of the population.

– Survivors had passed the lesson along through the generations. Every time the ground shook, for the next 97 years, everyone gathered on a hill 100 feet high.

FACTORS IN RISKS

- Where you live
- Who you are with
- Your experience
- Your general health
- Your training

WHERE YOU LIVE

"We flirt shamelessly with risk today, constructing city skylines in hurricane alleys and neighborhoods on top of fault lines. Largely because of where we live, disasters have become more frequent and more expensive."

- Amanda Ripley, The Unthinkable

FACTORS IN RISKS: GENDER

- More men die from lightning, hurricanes, and fires
- Men take more risks: walking toward smoke; driving through floods
- Women take fewer risks, and worry more
- Worry can help avoid disasters (e.g. evacuating early)
- Women are physically weaker
- Cultural factors:
  - On 9/11, women were twice as likely as men to be injured evacuating. Why? High-heeled shoes!
  - In the 2004 tsunami, more women died, due to women in many of those countries not knowing how to swim

FACTORS IN RISKS: MONEY

- Developed and undeveloped nations have the same rate of natural disasters, but
- In comparable disasters, less-developed countries have much higher death rates. One example: comparable earthquakes:
  - 1994 Northridge earthquake: 63 dead
  - 2005 Pakistan earthquake: 100,000 dead
- Many more fires occur in homes of poor people
  - Portable heaters are more dangerous
  - Smoke detectors more often absent or malfunctioning

CASE STUDY: HURRICANE KATRINA

- Victims: Who were they?
  - The poor? Those without transportation? No.
  - The elderly! ¾ of victims were over 60 years of age; 50% were over 75 years of age
    - Rode through Hurricane Betsy in 1965
    - Rode through Hurricane Camille in 1969 (Category 5)
  - Meanwhile, development drained wetlands which previously absorbed storm surges
  - Based on their experience, they didn't think Katrina would be as bad as it was

CASE STUDY: HURRICANE KATRINA

"I think Camille killed more people during Katrina than it did in 1969… Experience is not always a good teacher."

- Max Mayfield, director of the National Hurricane Center

CASE STUDY: HURRICANE KATRINA

Lessons learned:

– One decision can make all the difference.

– It's hard to evacuate when the sun is shining, when it's hard to imagine the risk.

CASE STUDY: HURRICANE RITA

- Happened less than a month after Katrina
- Struck many of the same places
- Authorities told 1.25 million people to evacuate
- Twice as many people (2.5 million) evacuated as were asked to
- Hundred-mile long traffic jams clogged freeways around Houston

HOW DO WE CALCULATE RISK?

- Rational, logical approach might be:
  - Risk = Probability X Consequence

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Dread = Uncontrollability + Unfamiliarity + Imaginability + Suffering + Scale of Destruction + Unfairness

PUTTING DISASTERS INTO PERSPECTIVE

- Most westerners do not die from disasters
- Leading causes of death in the US:
    1. Heart disease
    2. Cancer
    3. Stroke
- You are twice as likely to kill yourself (suicide) as to be killed by someone else

ARE PEOPLE RATIONAL OR INTUITIVE?

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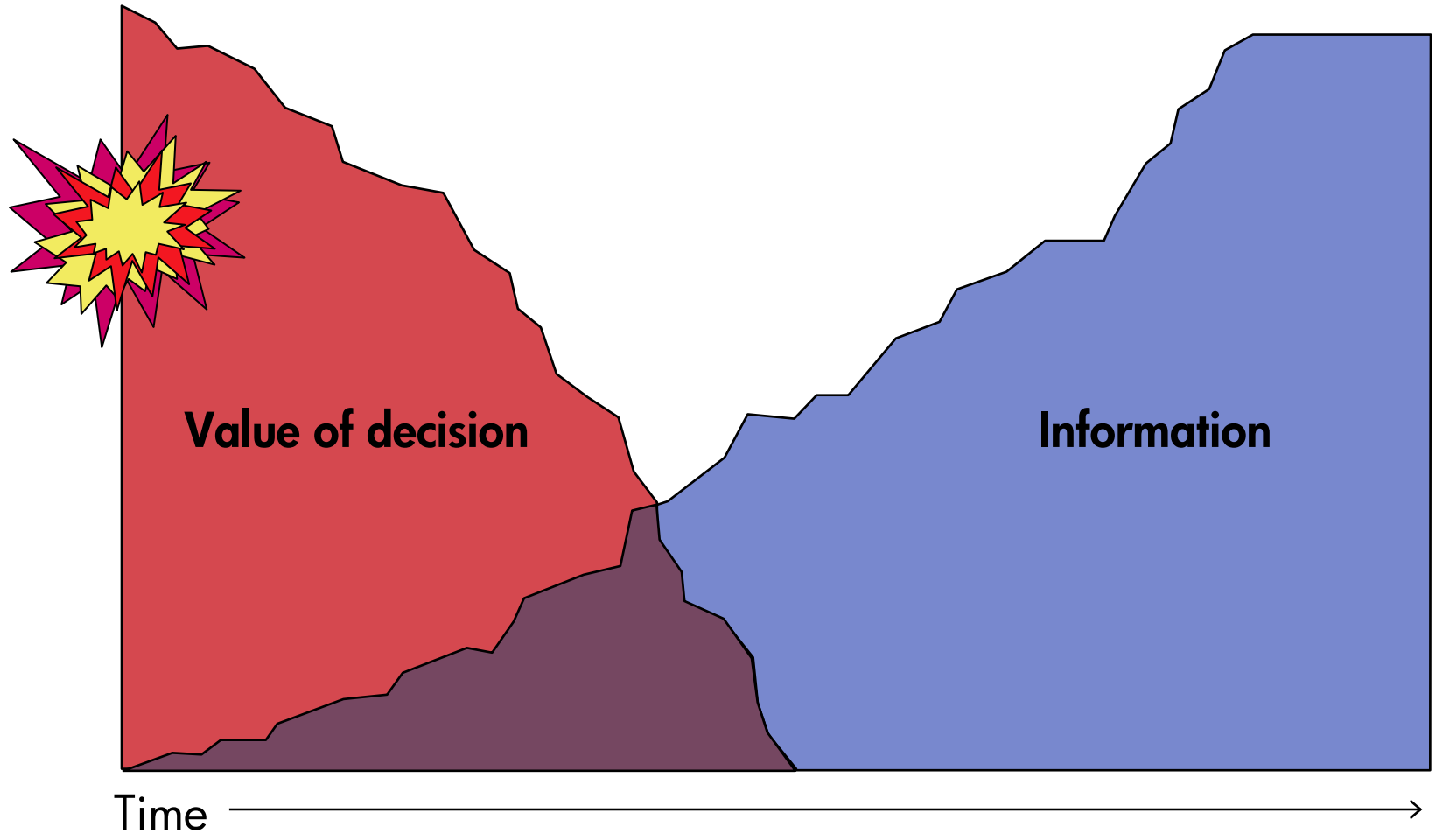
- If you said 15 cents, you were thinking rationally.

ARE PEOPLE RATIONAL OR INTUITIVE?

- Intuitive thinking is very quick and can save your life, if the answer is close enough to being correct.
- Rational thinking takes longer but results in more-correct results.

THINK TIME IMPACTS SURVIVAL



ARE PEOPLE RATIONAL OR INTUITIVE?

– 90% of drivers think they are safer than the average driver
– ¾ of baby boomers think they are better looking than their peers

KEEPING RISKS IN PERSPECTIVE

- You are more likely to die of Alzheimer's than a fire
- You are more likely to die of food poisoning than of drowning
- The total number of people killed by international terrorism is less than the number killed by food allergies

KEEPING RISKS IN PERSPECTIVE

- After 9/11, many people drove instead of flying.
- Experts estimate in the two years after 9/11, more than 2,300 additional people died because they chose to drive instead of fly.
- Driving the equivalent distance is about 65 times as risky as flying.

FIRES

- In fires, smoke is the killer
- Fires double in size about every 90 seconds
- Flashover occurs 5-8 minutes after flames appear
- Most fatal fires:
  - occur in December or January
  - occur between midnight and 5 AM
- Smoke detectors and sprinklers are key
- After you check into a hotel, always take the stairs down the first time

TOP CAUSES OF ACCIDENTAL DEATH

1. Car crashes

   40,000 people are killed and 2 million injured each year in car accidents

2. Poisoning
3. Falls

HUMAN BEHAVIOR

"'If an engineer wants to know about what he's designing, he puts it under great amounts of stress,' says Peter Hancock, who has been studying human performance for more than twenty years for the U.S. military. 'It's the same with human beings. If you want to find out how things operate under normal conditions, it's very interesting to find out how we operate under stress.' Without too much trouble, we can teach our brains to work more quickly, maybe even more wisely, under great stress. We have more control over our fates than we think."

- Amanda Ripley, The Unthinkable

PHASES OF RESPONSE TO A DISASTER

1. Denial
2. Deliberation
3. Decisive moment

PHASES OF RESPONSE TO A DISASTER

- Denial
  - 'This can't be happening'
  - 'It may be happening, but surely it's not that bad'
  - 'It may be bad, but most likely there's nothing I can do about it'

DENIAL PHASE

- Denial often takes the form of delay
- Gathering objects before leaving is common
- Delay can be fatal
- How long we delay can depend on how we calculate risk

DENIAL PHASE

"Actual human behavior in fires is somewhat different from the 'panic' scenario. What is regularly observed is a lethargic response... People are often cool during fires, ignoring or delaying their response."

-- Guyliene Proulx, Canadian National Research Council, in Fire Protection Engineering Journal

PHASES OF RESPONSE TO A DISASTER

- Deliberation
  - Information-gathering phase

"We know something is wrong, but we don't know what to do about it."

-- Amanda Ripley, "The Unthinkable"

  - "Milling" is common
  - People basically just wish someone could tell them what to do

PHASES OF RESPONSE TO A DISASTER

– Deliberation
  - People tend to coalesce in groups
  - There is a feeling of safety in numbers; companionship lowers stress
  - People hesitate to go against the group consensus

  "How well our group functions depends largely on who is in the group. Whom we live and work with matters."

  --Amanda Ripley, "The Unthinkable"
  - People on a burning airplane have even ignored a closer exit to follow the crowd

PHASES OF RESPONSE TO A DISASTER

– Decisive moment
  - We've accepted that we are in danger; we've deliberated over our options. Now we take action.
  - Panic?

"Many -- if not most -- people tend to shut down entirely in a disaster, quite the opposite of panicking."

-- Amanda Ripley, The Unthinkable

THE BODY'S REACTION TO FEAR

- Blood chemistry changes so as to coagulate easier
- Blood vessels constrict so as to bleed less
- Body creates its own painkillers
- Blood pressure and heart rate go up dramatically
- Hormones are released -- particularly cortisol and adrenaline -- giving gross motor muscles a bionic boost

THE BODY'S REACTION TO FEAR

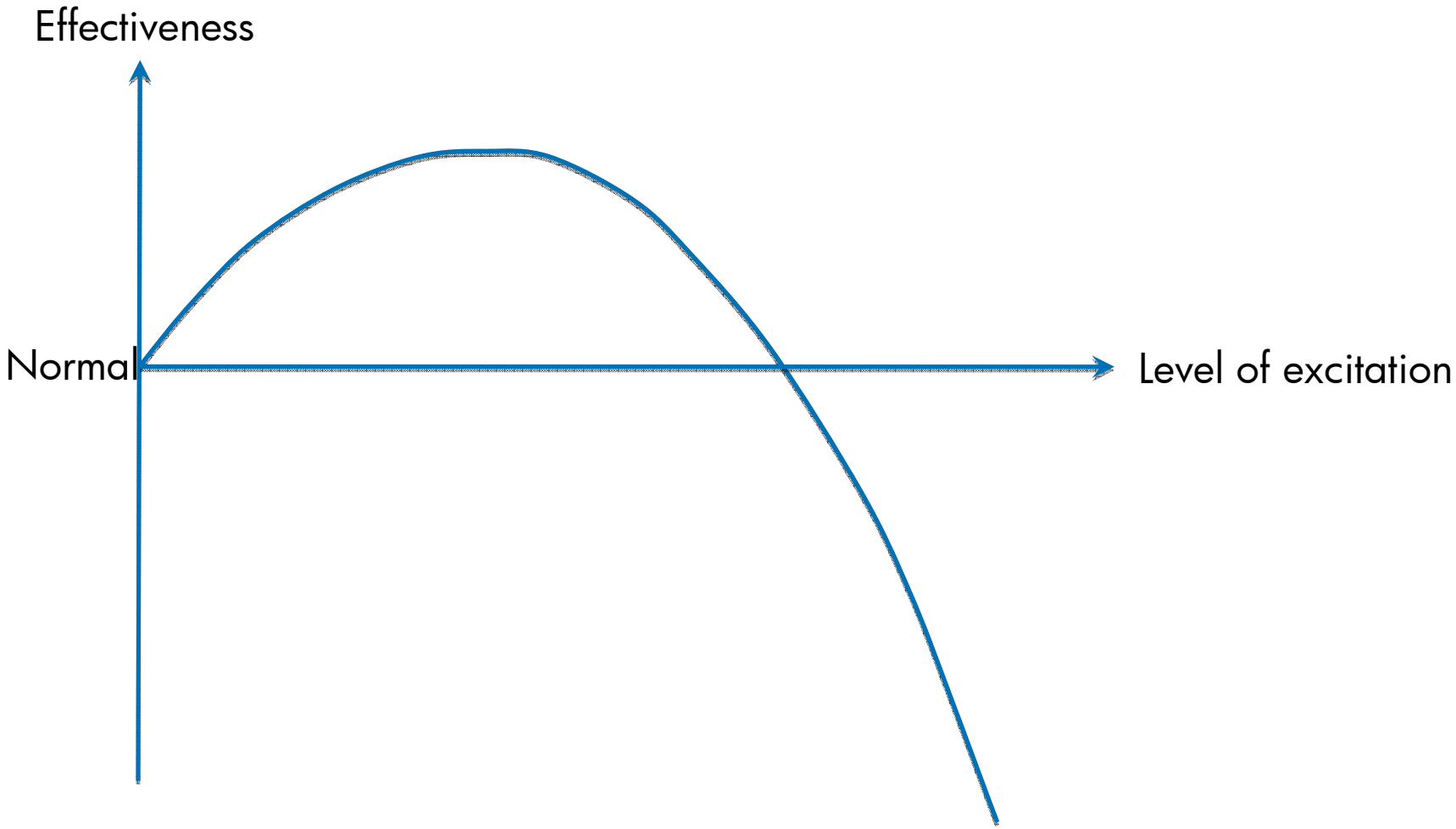
- Body resources start being prioritized, increasing focus
- Reactions quicken
- Vision becomes clearer
- Complex motor skills (like driving) remain manageable

THE BODY'S REACTION TO FEAR

As fear grows:

- Body resources continue being prioritized
- Hearing, depth perception, & vision start to deteriorate; Tunnel vision -- sometimes even temporary blindness -- can occur
- Under extreme duress, inessential functions get shut down: digestion, salivation, sometimes bladder and sphincter control
- Under intense stress, some amnesia may occur
- Ability to reason and perceive surroundings diminishes
- Problem-solving skills deteriorate

LEVEL OF EXCITATION VS. EFFECTIVENESS



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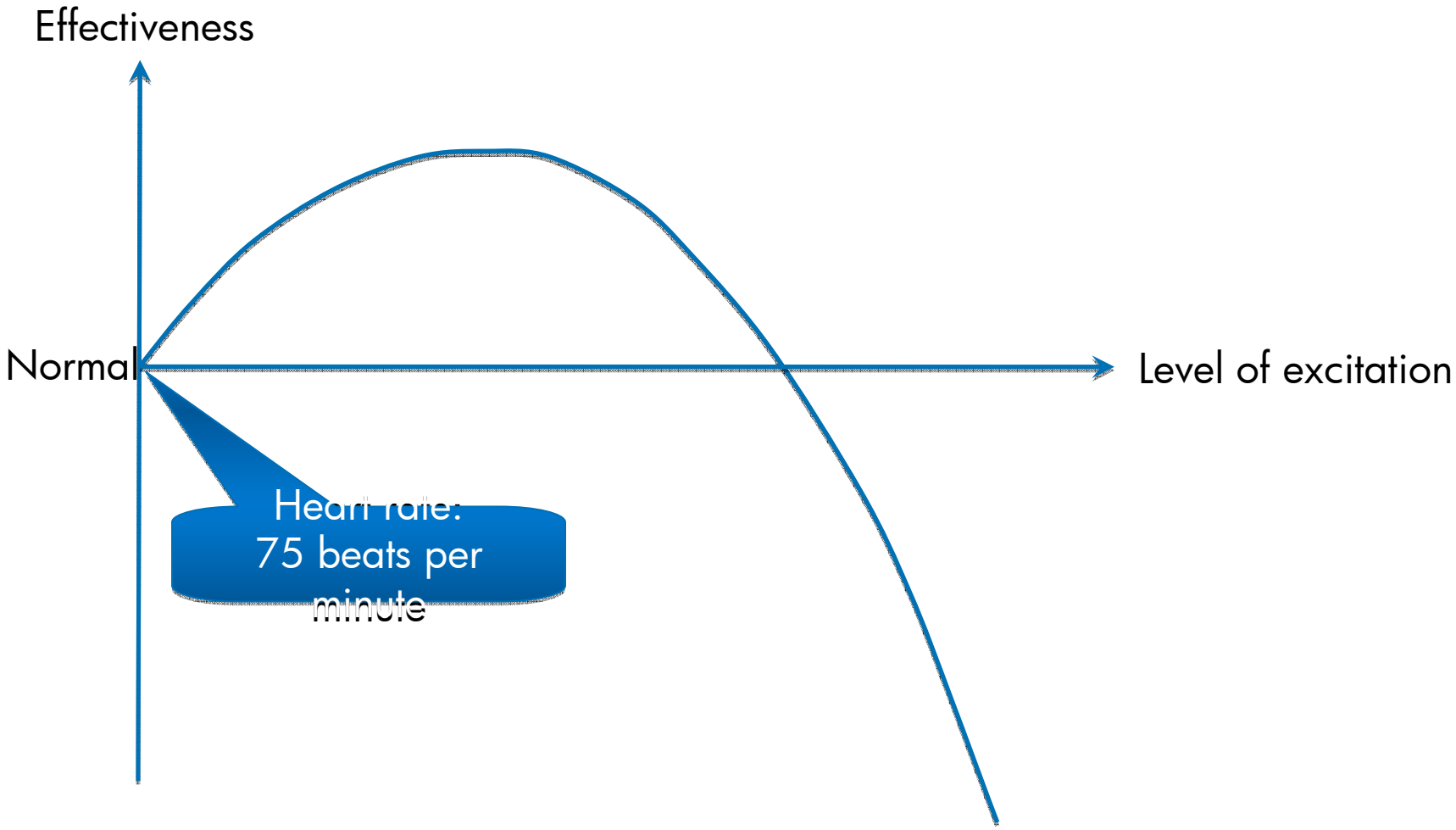

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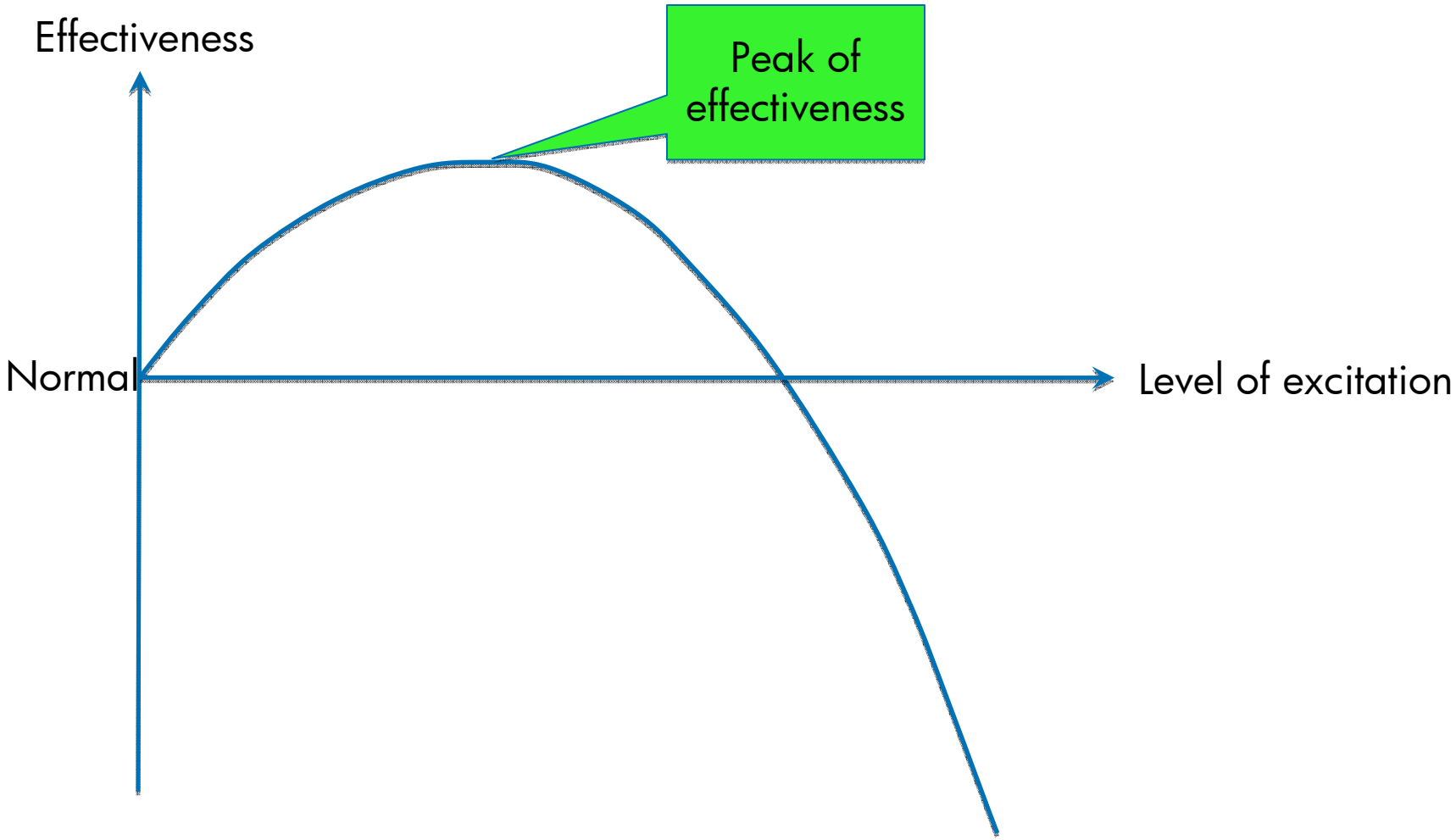

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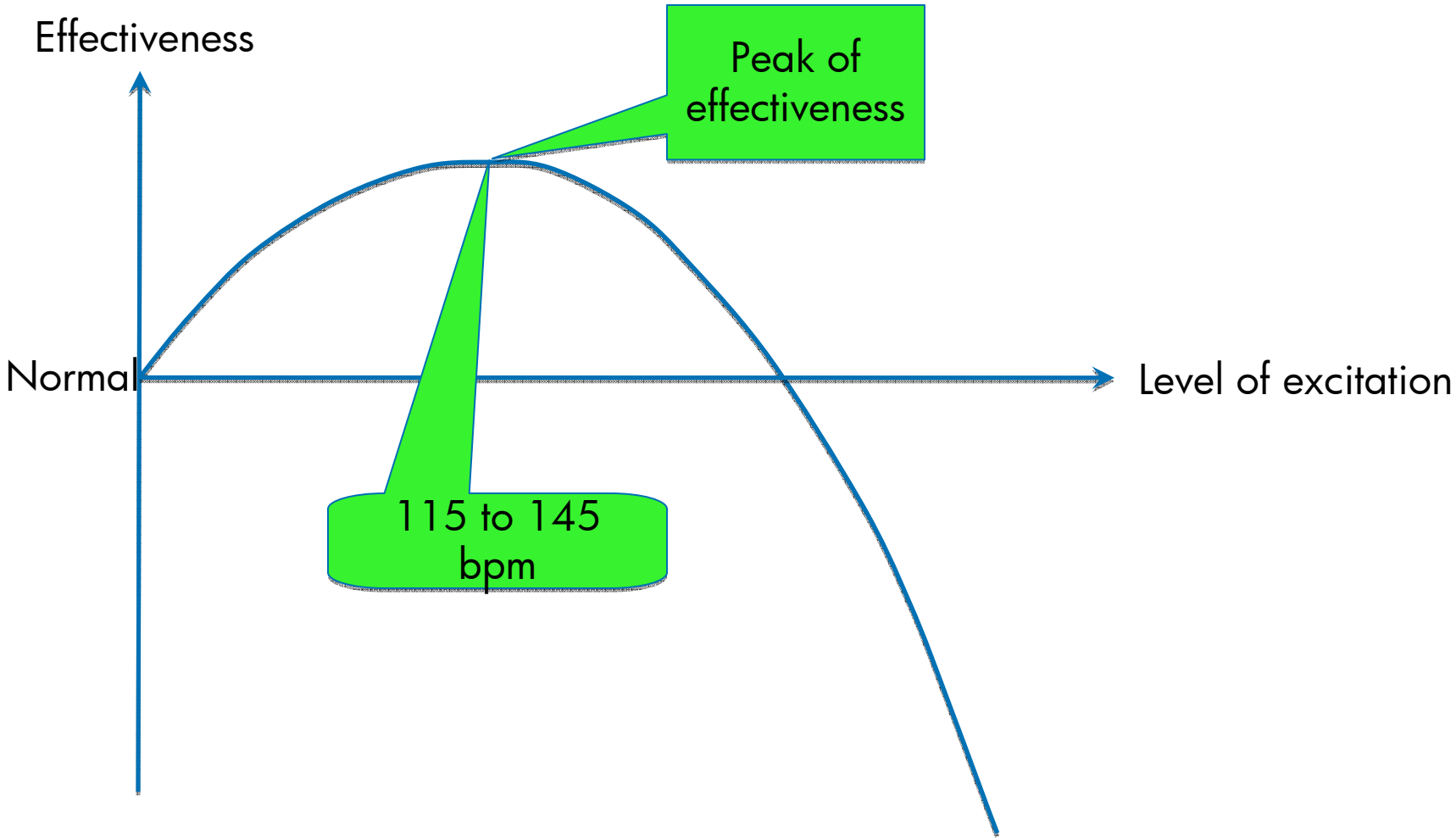

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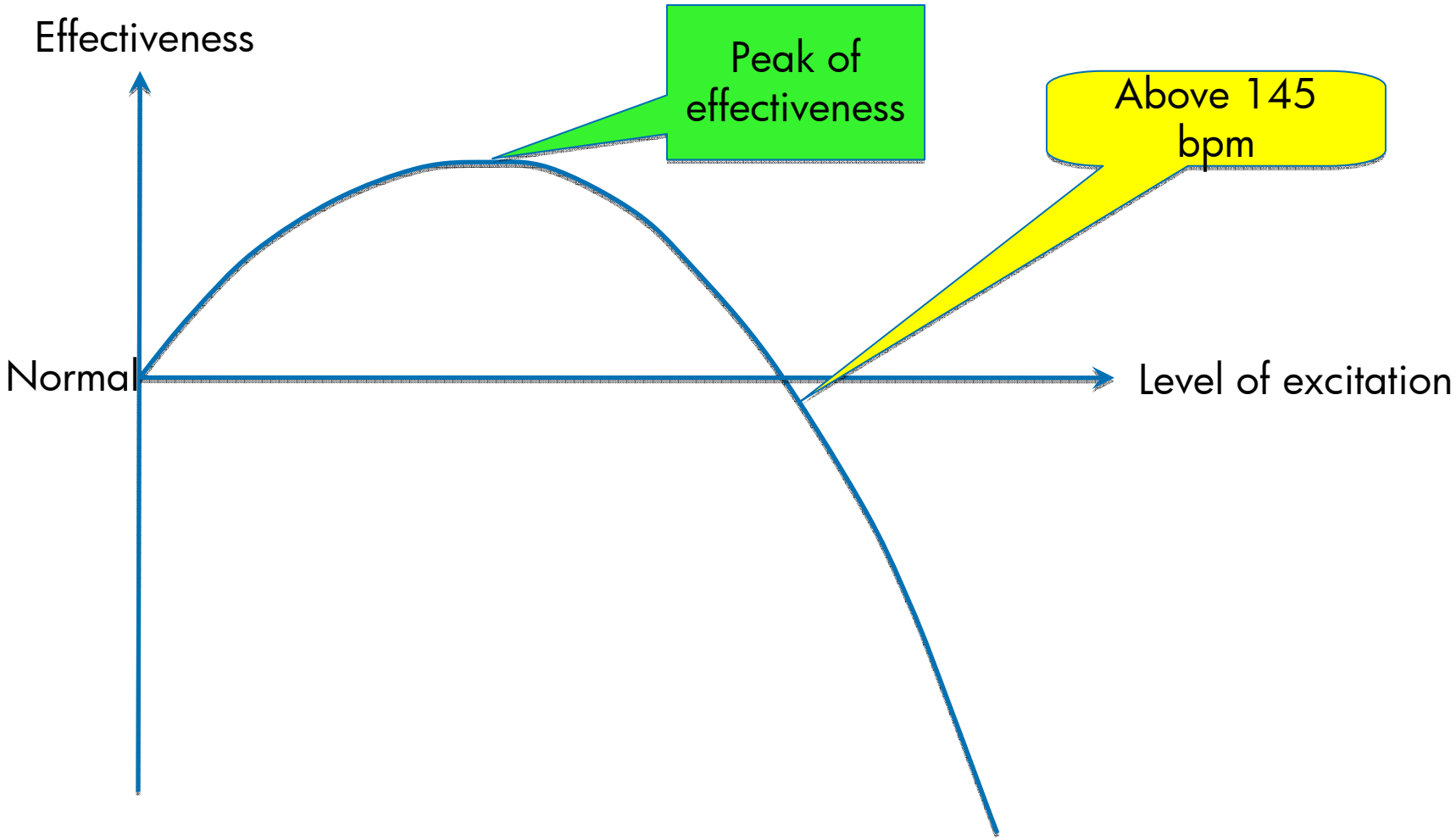

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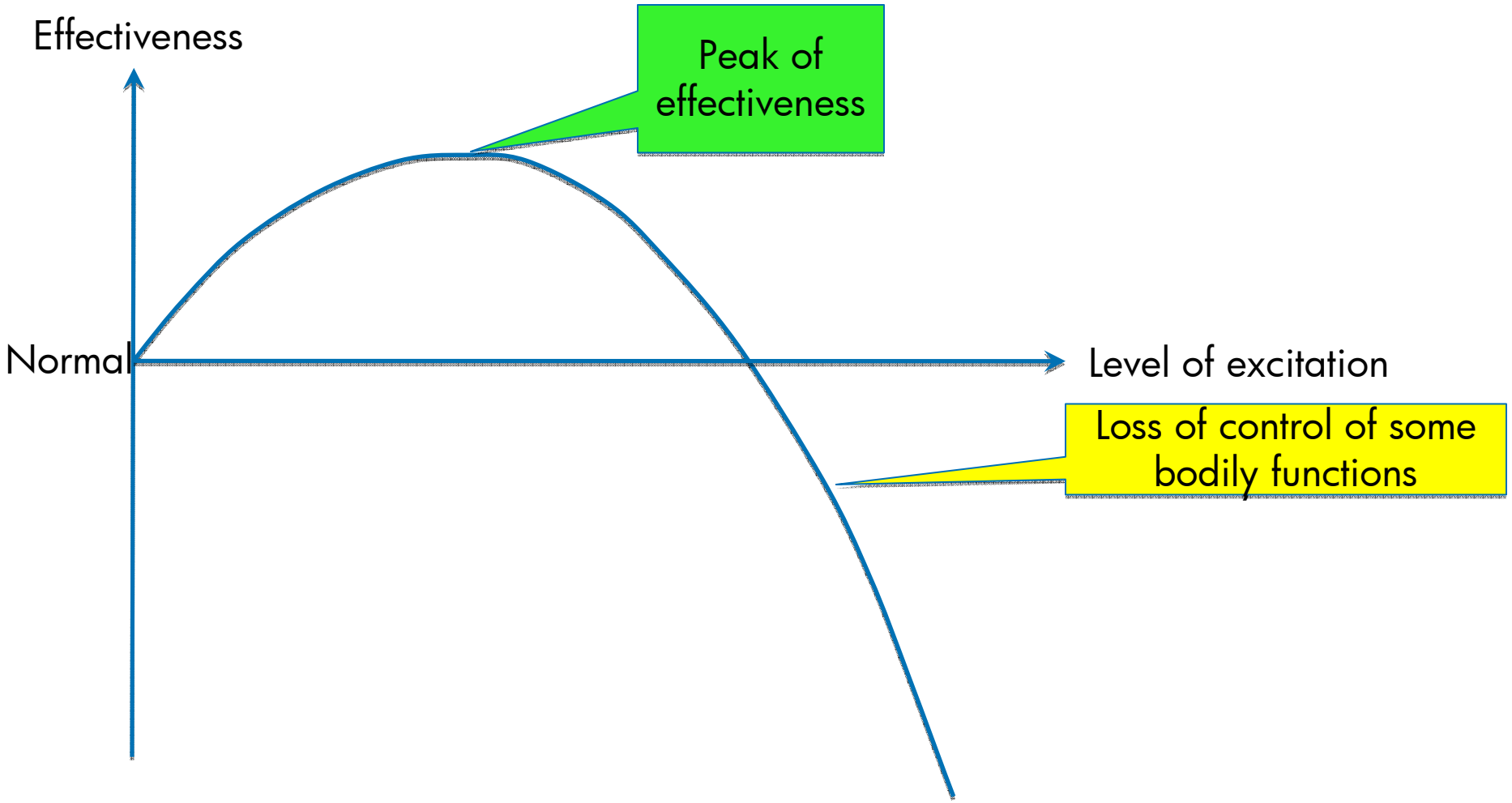

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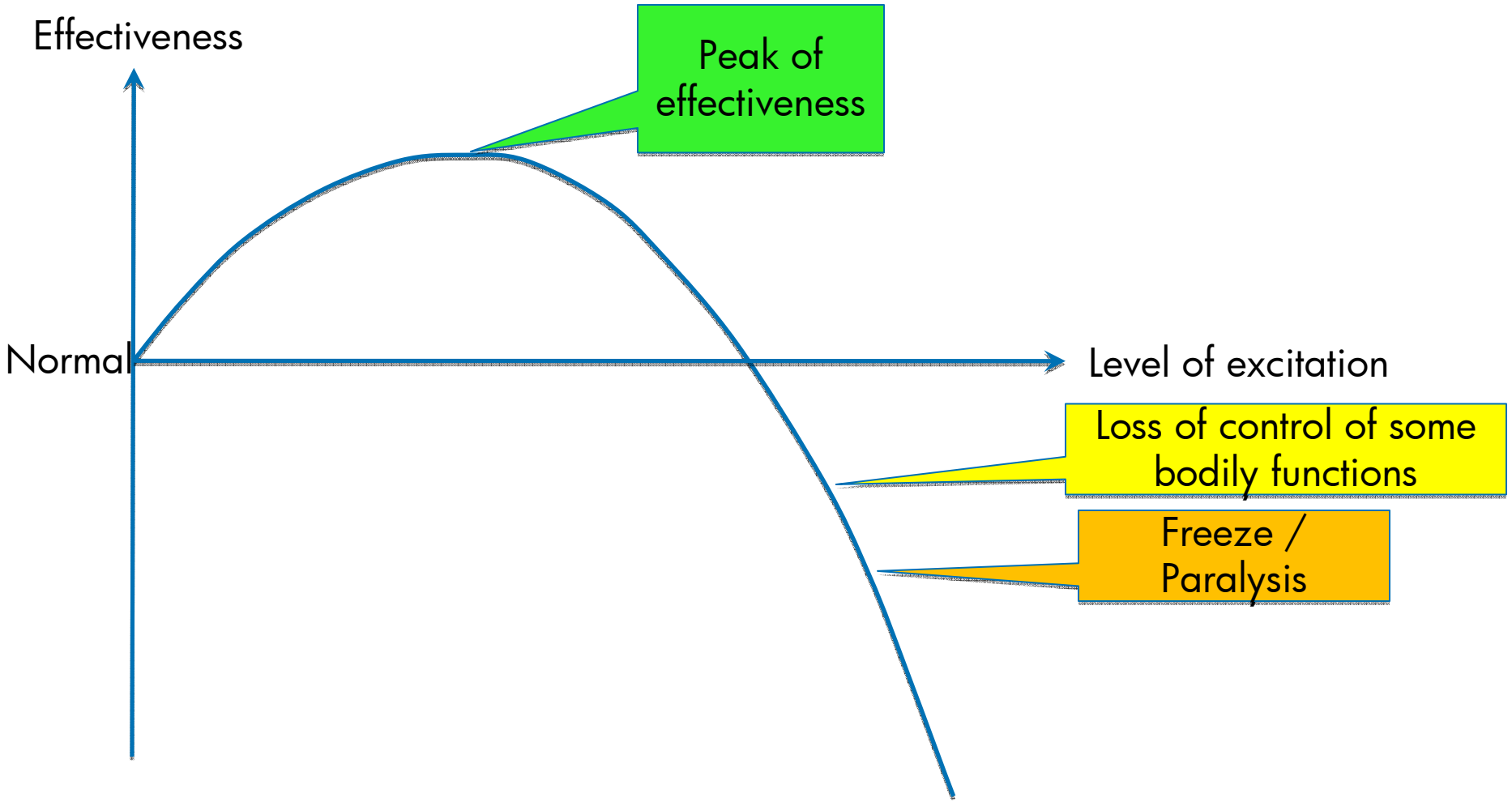

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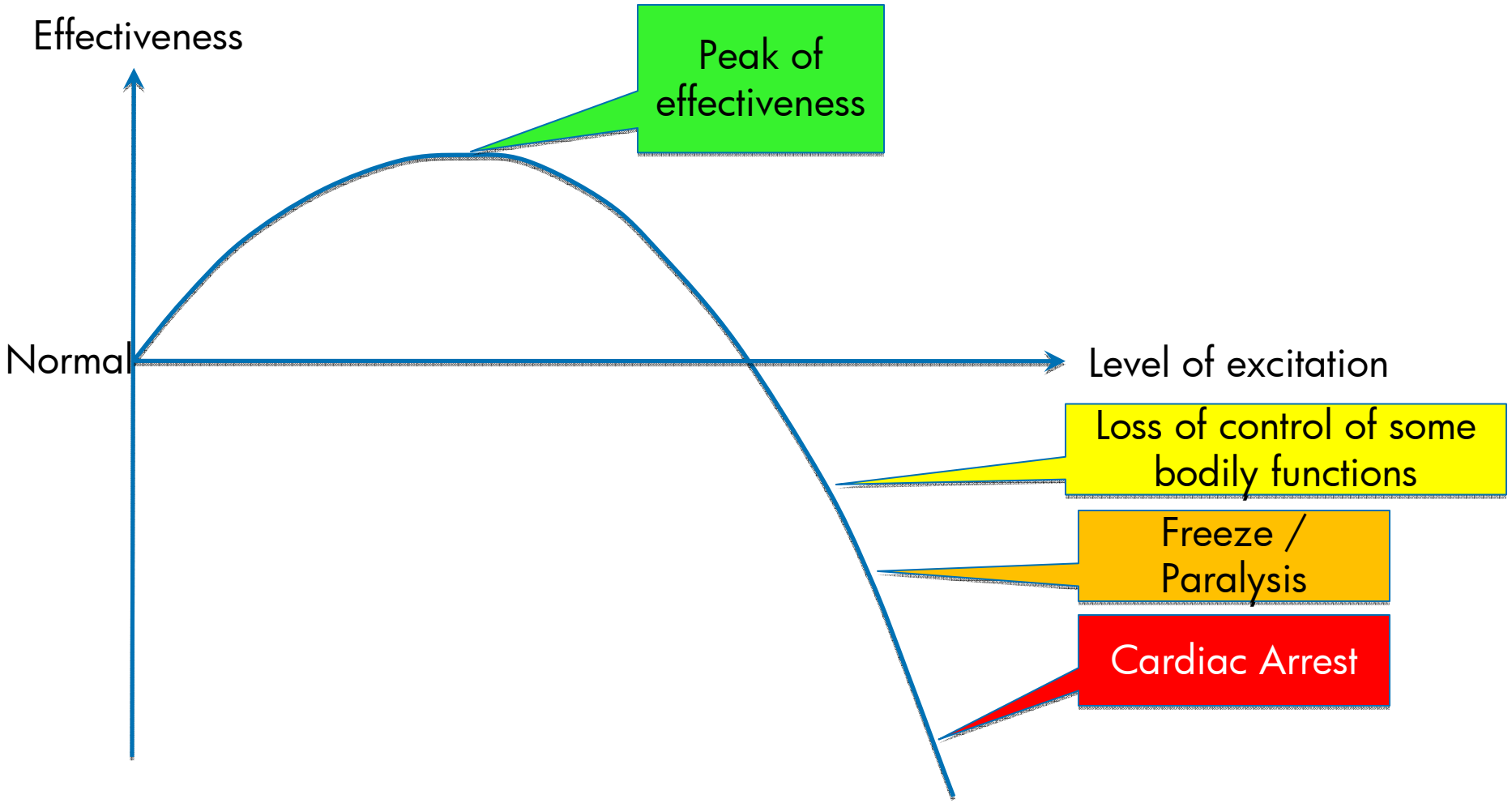
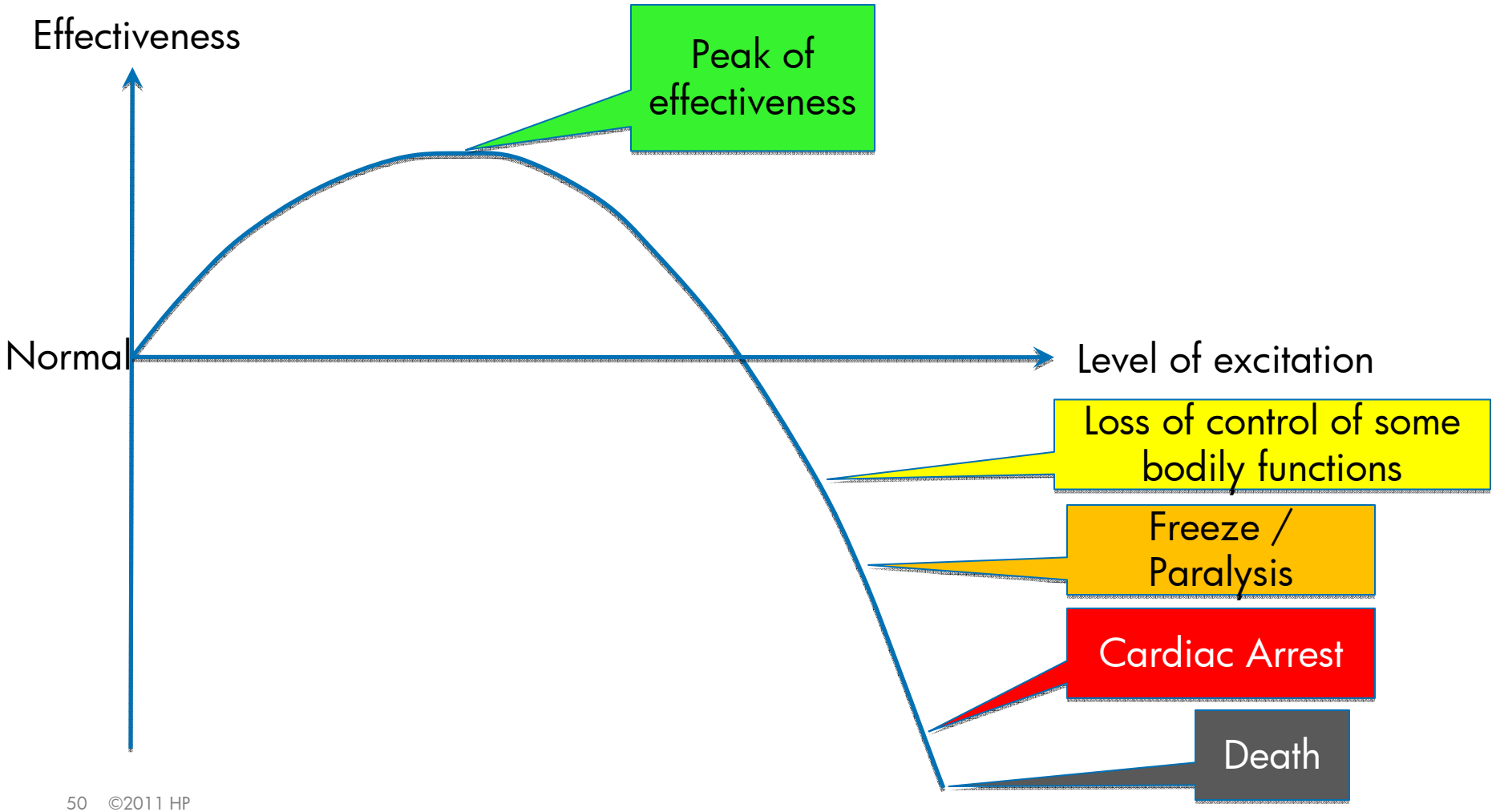


HEART RATE



COUNTERING FEAR

Fear requires two things:

1. Awareness of a threat
2. Feeling of powerlessness

"If we understand dread, we can starve it."

- Stephen Flynn, Homeland Security expert

COUNTERING FEAR

- Fear is negotiable. It can be affected by preparation and by your reactions.
- Controlled breathing can reduce heart rate and blood pressure. Rule of Count of 4:
  - Breathe in for four counts
  - Hold for four counts
  - Breath out for four counts
  - Hold for four counts
  - Repeat
- Laughter reduces fear and makes us feel more in control
- Religious beliefs tend to reduce fear as well

COUNTERING FEAR

Remember Dread = **Uncontrollability** + Unfamiliarity + Imaginability + Suffering + Scale of Destruction + Unfairness

– Planning ahead of time what to do in a disaster increases the sense of having some control.

"The single strongest [weapon] is a mental plan of what you'll do in a certain crisis."

– Massad Ayoob, veteran police officer

COUNTERING FEAR

Remember Dread = Uncontrollability + **Unfamiliarity** + Imaginability + Suffering + Scale of Destruction + Unfairness

– Training increases confidence through familiarity

– Repetition builds reflexes; automatic reactions don't require time to think

COUNTERING FEAR

Remember Dread = Uncontrollability + Unfamiliarity + **Imaginability** + Suffering + Scale of Destruction + Unfairness

– Making a plan for what you will do in a disaster allows you to visualize yourself in the scenario of a disaster but taking positive action

COUNTERING FEAR

- People perform better under stress if they even ***think*** they can handle it
- Studies say people who are *unrealistically* confident tend to fare *spectacularly* well in disasters
  - They may be better suited to crises than they are to ordinary life ☺

COUNTERING FEAR

"Resilience is a precious skill. People who have it tend to also have three underlying advantages:

1)a belief that they can influence life events;

2)a tendency to find meaningful purpose in life's turmoil, and

3)a conviction that they can learn from both positive and negative experiences.

These beliefs act as a sort of buffer, cushioning the blow of any given disaster. Dangers seem more manageable to these people, and they perform better as a result."

– Amanda Ripley, "The Unthinkable," p. 91

SUMMARY

- Knowledge helps us overcome our natural tendencies
- The brain has an ability to do much, much better, with just a little help
- You must take initiative to save yourself

RESOURCES

- US Government Website: http://ready.gov/
- Scientists critical of the above: http://ReallyReady.org/
- Amanda Ripley: http://theunthinkable.com/

PART 2: ORGANIZATIONS

THE COST OF DOWNTIME GOES BEYOND DOLLARS LOST

- 93 percent of companies that suffer a significant data loss are out of business within five years

  - U.S. Bureau. of Labor

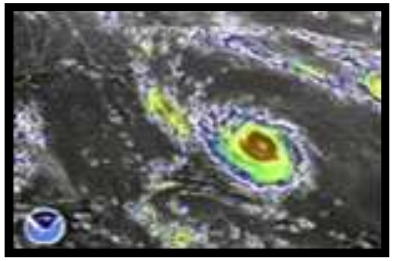
- 43 percent of U.S. businesses never reopen after a disaster, and 29 percent (more) close within two years.

  - University of Wisconsin

- "Two out of five companies that experience a catastrophe or an extended system outage never resume operations, and of those that do, one-third go out of business within two years"

  - GartnerGroup



AMAZINGLY ENOUGH…

- "More than 60% of businesses in the U.S. do not have a basic plan to mediate the effects of a disaster should they occur. "
  – Gartner Group
- "90% of European enterprises with global revenues in excess of €100M have no formal business continuity plans in place. "
  – International Data Corporation

SO WHAT COMPANIES HAVE SURVIVED DISASTERS?

– And how did they do it?

ALFRED P. MURRAH BUILDING, OKLAHOMA CITY

ALFRED P. MURRAH BUILDING, OKLAHOMA CITY

- Truck-bomb attack April 19, 1995
- Most destructive act of terrorism on American soil until the September 11, 2001 attacks
- 168 deaths and more than 680 injured
- Estimated damage of $652 million

FEDERAL EMPLOYEES CREDIT UNION

- Located on 3rd floor of Alfred P. Murrah Building
- Lost in the attack:
  - All IT systems, all records and all files
  - Hundreds of thousands of dollars of checks, travelers checks, and cash
  - Worst of all: Staff — 18 of the 33 employees of the credit union died, and 5 were hospitalized, and many of the remaining survivors were too traumatized to return to work.
- With only 3 employees, plus many volunteers, the credit union opened for business on Friday, April 21st, just over 48 hours after the disaster

FECU RECOVERY

- CEO Florence Rogers, VP/Comptroller Raymond Stroud, and data processing specialist Brad Grant all survived.
- Grant and Stroud were both out of town at the time.
- Florence Rogers was in the building but miraculously survived.
- Despite the horrific loss of employees, FECU did have the three key people it needed for recovery there to help restore it.

FECU RECOVERY

- Oklahoma's other credit unions volunteered help, providing facilities and additional staff.
- FECU had a DR strategy in place, which saved their data.
- Backups were stored off-site.
- A hot site had been arranged with a company in Pennsylvania, which handled the bulk of the computer recovery work, off-loading the FECU staff

FECU RECOVERY

Lessons learned:

- Off-site backups were essential. Without them, FECU would have been lost.
- Outside assistance was crucial, offloading traumatized employees
- Public relations and media relations were crucial, assuring members they would have prompt access to their funds, and reassuring local businesses that checks drawn on FECU would be honored

FECU RECOVERY

Lessons learned:

- Communications was essential. Cellphones had to be quickly acquired to take the place of FECU's phones which had all been destroyed. 800 numbers had to be re-routed.
- Backup tapes were not copied before being shipped to the recovery site. None were lost, but in retrospect the risk was great.
- The business was tempted to restore IT systems exactly as they had been, but finally decided to use the need to purchase replacements as a chance to upgrade its technology at the same time.

MUNICIPAL CREDIT UNION, MANHATTAN

MCU BEFORE 9/11

- $918 million credit union provided financial services to 300,000 of New York's firemen, police officers and healthcare workers
- Headquarters located across the street from the World Trade Center
- Tape-based DR strategy was in place

"Before Sept. 11," MCU Chief Technology Officer Barry Grant says, "the thought was that if it took a couple of days to recover, it wasn't that critical a situation -- we could work offline."

MCU AFTER 9/11

- After 9/11, MCU was forced to evacuate to a site in nearby Battery Park
- Backup tapes were retrieved from the dust and debris littering the company's headquarters
- The credit union was forced to work offline for a week, logging transactions on paper
- Because of the dire situation after 9/11, and out of the goodness of their hearts, they decided to allow withdrawals by their customers despite the inability to check account balances. For their kindness, they were rewarded by having 4,000 people bilk them of 15 million dollars.

MCU AFTER 9/11

"Prior to 9/11 we hadn't really considered a disaster recovery program – we thought it would be too costly for a company our size," said MCU chief technology officer Barry Grant. "But after the tragedy, and the pain and anguish we went through trying to recover, we realized that losing even a few days' worth of work was significant in terms of customer satisfaction."

"We didn't have any trouble getting money after Sept. 11," says Barry Grant, CTO

–MCU put in place storage subsystem-based synchronous mirroring to a site in New Jersey

"Business continuity is now an integral part of our operations," Grant says. "When we are asked about bringing up new applications, part of it is: How do we recover from a failure?"

CANTOR FITZGERALD, 9/11

CANTOR FITZGERALD ON 9/11

- Cantor Fitzgerald occupied floors 101 to 105 of One World Trade Center
- This was 2 floors above the impact zone of the first hijacked airliner to hit the Towers
- These offices housed a datacenter as well as facilities for brokers and traders

CANTOR FITZGERALD ON 9/11

First alert:

– Immediately after the first 9/11 attack, at approximately 8:46:46 AM, six seconds after the first plane hit the tower, a Goldman Sachs server sent out an alert page stating that a Goldman Sachs trading system server had gone offline because it was unable to interface with a Cantor Fitzgerald server

CANTOR FITZGERALD ON 9/11

- The impact destroyed all 3 exit stairways at the crash zone
- At the time of the 1993 WTC bombing incident, some people had been airlifted from the roof, but after stunts in later years, the doors to the roof were locked
- Cantor Fitzgerald lost all of the employees in that building at the time of the attacks, 658 employees (about two-thirds of its workforce)
- These included brokers, traders, technology specialists, and secretaries

CANTOR FITZGERALD ON 9/11

- CEO and Chairman Howard Lutnick, whose brother was among those killed, vowed to keep the company alive
- A recently-developed electronic trading system had to be immediately pressed into active service to replace the human brokers and traders who were lost
- The company was able to bring its trading markets back online within a week
- Even their competitors assisted them

CANTOR FITZGERALD ON 9/11

- On September 19, Cantor Fitzgerald made a pledge to distribute 25 percent of the firm's profits for the next five years, and committed to paying for ten years of health care, for the benefit of the families of its 658 former employees (profits which would otherwise have been distributed to the Cantor Fitzgerald partners).
- In 2006 the company completed its promise, having paid a total of more than $180 million

CANTOR FITZGERALD ON 9/11

- Before the attacks, Cantor handled about one-quarter of the daily transactions in the multi-trillion dollar Treasury securities market.
- Cantor has since rebuilt its infrastructure and now has its headquarters in midtown Manhattan. It now has more employees than before the attacks.
- The company's effort to regain its footing is the subject of Tom Barbash's 2003 book *On Top of the World: Cantor Fitzgerald, Howard Lutnick, and 9/11: A Story of Loss and Renewal*

CANTOR FITZGERALD ON 9/11

– "Lutnick, who lived because he was taking his son to his first day of kindergarten, calls the recovery 'miraculous' and credits those whose lives were spared and stayed with Cantor. 'The normal course of events is you have a crisis, and you go for weeks sorting it out. But in the fall of 2001, we'd have a crisis at nine and another at eleven and then another at one. We were in crisis mode for basically a year.'

  Survivors are quick to share stories of 90-hour weeks, of adrenaline-fueled problem-solving, and of an unshakable belief in one another. Work was not just a distraction; most say it healed them."

  • Business Week, "A Tale of Renewal," Sept. 11, 2006

- eSpeed, the IT arm of Cantor Fitzgerald, had OpenVMS systems in place
- A disaster-tolerant OpenVMS cluster was in place, with data shadowed to a datacenter across the Hudson River, in Rochelle Park, NJ
- A triangular network of DS-3 links connected the WTC, Rochelle Park, and London, England. When the WTC corner went down, the other two kept going.

COMMERZBANK, 9/11

COMMERZBANK BACKGROUND

- Before 1995, they used an outside vendor for their hot site
- After 1995, they used their own facility as their hot site

- This is a trend we have seen at many businesses since

- (A survey from the Federal Reserve showed that banks that had their own DT sites handled September 11 much better than those that didn't.)

COMMERZBANK BACKGROUND

- Servers were 8 nodes of Alphaserver GS-160 partitions using Galaxy technology to migrate CPUs between soft partitions, with 4 GS-160 nodes per site
- Storage was on Fibre Channel SAN; just under 1 TB
- Two Alphaserver 4100s at the Business Continuity site were members of the cluster at the Production Site and MSCP-served the remote disks to the main site.
- Storage was mirrored between sites with Host-Based Volume Shadowing Software
- Inter-site link was DS-3

COMMERZBANK BUSINESS CONTINUITY SITE

Under normal circumstances, BC facility was used for:

- An alternate site for business users holding meetings or undergoing training
- Disaster Recovery simulation testing
- Conducting mandatory testing for New York Clearing House and Federal Reserve
- Testing for Systems, Applications, Network
- Application Development

COMMERZBANK'S DISASTER EXPERIENCE

This was not Commerzbank's first disaster.

– First Interstate Building fire in Los Angeles, 1988
  - Commerzbank LA Branch was located on 36th floor. Fire started several floors below but was contained within 4 floors.

– Chicago Flood, 1992
  - Commerzbank Chicago was on 46th Floor of Mid Continental Plaza. Retaining wall of Chicago River broke; building had no electricity and was inaccessible for a day.

COMMERZBANK'S DISASTER EXPERIENCE

- World Trade Center Bombing: 1993
  - Commerzbank had presence on 40th Floor of WTC Tower 1. Terrorists blew up a truck in the WTC parking garage.
- NYC Metro Blizzard: 1996
  - Record 20+ inch snowfall made most roads impassable. Only emergency vehicles allowed on road for cleanup. Arranged for staff to work from home on critical processes.

COMMERZBANK ON 9/11

- Commerzbank was located on floors 31 to 34 at the World Financial Center, west of the World Trade Center, across the West Side Highway, only 100 yards away.
- When the second jet hit, the bank personnel evacuated the area immediately.

COMMERZBANK ON 9/11

- The primary site was well-protected, with its own generator, fuel storage tank, cooling tower, UPS, batteries, and fire suppression system.
- As a result, when the World Trade Center area lost power, the generator and cooling tower kicked in, so none of the systems were down initially.
- However, dust and debris from the collapse of the World Trade Center towers caused the A/C units to fail during the day.

COMMERZBANK ON 9/11

- Because of the intense heat in the data center, all systems crashed except for one hard partition of the AlphaServer GS160.
- One hard partition was lost in this system due to the heat, which was reported as 104 degrees in the QBBs (Quad Building Blocks).
- The other partition kept on running with remote drives only, since the local drives became unavailable as well.
- OpenVMS wide-area clustering and volume shadowing technology kept the primary system running off the drives at the remote site 30 miles away.

COMMERZBANK ON 9/11

- While most computers were having difficulties in the data center, the OpenVMS Galaxy configuration and the AlphaServer GS160 were so robust that even though one of the hard partitions, housed in the upper two QBBs, crashed due to heat, the other hard partition, housed in the lower two QBBs, kept on running multiple instances of OpenVMS.
- The money transfer system never went down and they actually remained operational that day.

COMMERZBANK ON 9/11

- Main challenge that day was to get people from downtown to Rye; subways, trains and bridges were all closed.
- In a pinch, the bank can operate with only 10 people for about 2 days. They were able to get 16 people out to Rye that day.
- More came on later days as transportation became available.

COMMERZBANK AFTER 9/11

– For the next eight months, approximately two-thirds of the bank's staff worked in Rye, and the other third worked at a subsidiary in mid-town Manhattan until the primary site was ready for re-occupancy in mid-May 2002.

COMMERZBANK AFTER 9/11

Things which really helped a lot:

- Decision had been made to just shadow everything, rather than excluding some storage from the protection of shadowing; made recovery much simpler
- Regular testing had been done
- Follow-the-sun personnel staffing model meant help was available from around the world

CREDIT LYONNAIS, PARIS, 1996

CREDIT LYONNAIS

- Credit Lyonnais fire in Paris, May 1996
- Volume Shadowing of data to a remote site using an OpenVMS Cluster saved the data
- The fire occurred over a weekend, and the DR site plus quick procurement of replacement hardware allowed the bank to reopen on Monday

ONLINE STOCK BROKERAGE

- 2 a.m. on Dec. 29, 1999, an active stock market trading day
- UPS Audio Alert alarmed security guard on his first day on the job, who pressed emergency power-off switch, taking down the entire datacenter
- Disaster-tolerant cluster continued to run at opposite site; no disruption
  - Ran through that trading day on one site alone
  - Performed shadow full-copy to restore redundancy in the evening, after trading hours
  - Procured replacement for the failed security guard by the next day

Q&A

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