CPL Theory
Human Factors (CHUF)

CHUF 5 – Stress, Fatigue & Sleep

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3. Disclaimer

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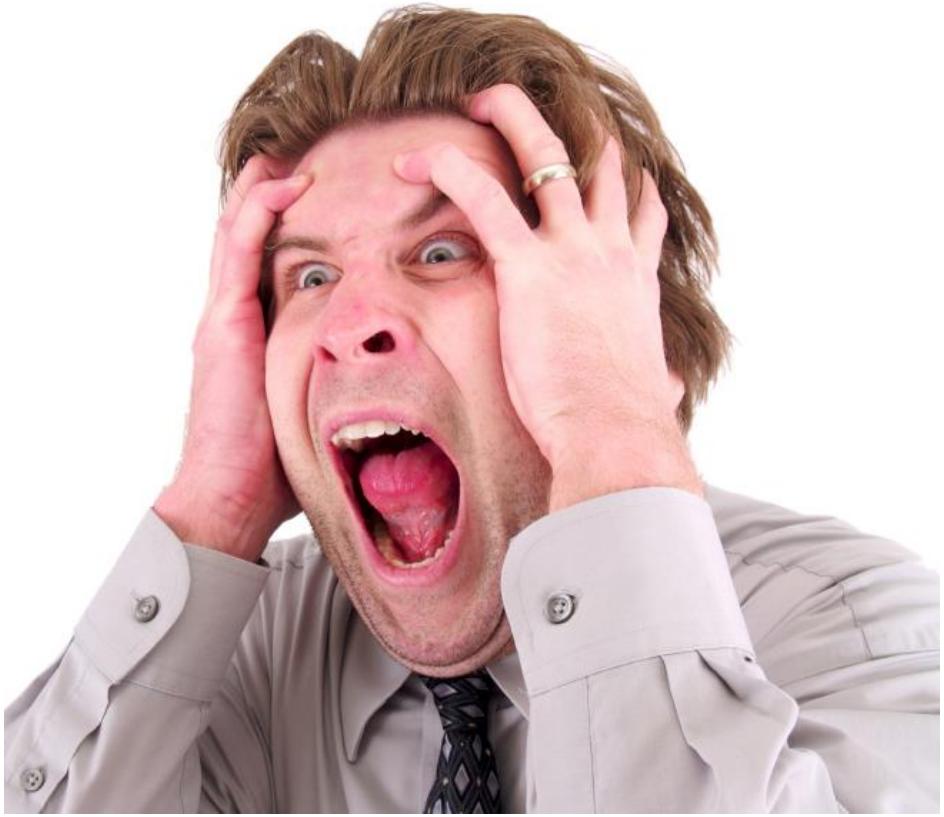
STRESS

Stress – What is it?

- Stress occurs when we are subjected to **physical or mental pressure, tension or strain**
- It can be physically, mentally and emotionally disruptive and therefore **affects the decision making process**
- The body tries to cope by releasing different chemicals into the body
- *Example – when we are nervous before a game of football or an exam, we feel "butterflies in our stomach" and a rush of adrenalin*
- When stress affects our body and minds, we react



- This is often viewed as a **"fight or flight"** response

Stress – What is it?

- Stress can be physical, physiological or emotional

- **Physical – environmentally induced**
  1. Heat/cold
  2. Vibration
  3. Noise

- **Physiological – biological factors**
  1. Lack of oxygen
  2. Unfitness

- **Emotional – result of personal matter**
  1. Relationships
  2. Work pressure

Acute Stress
(Short Term)
Related to particular circumstances

Chronic Stress
(Long Term)
Related to lifestyle

Stress – what causes it?

- Any event or situation that causes stress is known as a **stressor**

Stress – what causes it?

- One study of stress in USA produced the **Holmes/Rahe Survey of Recent Experience**

- This quantifies different stressors according to the amount of stress they produce

- Tick all the items that are stressing you currently and then add the total mean value to get your **"stress quotient"**

Stress Quotient < 150

- Low stress level / high resistance

150 < Stress Quotient < 300

- 50% chance of major health breakdown in next 2 years

Stress Quotient > 300

- Raises chance to 80%

Life Event	Mean Value
1. Death of spouse	100
2. Divorce	73
3. Marital Separation from mate	65
4. Detention in jail or other institution	63
5. Death of a close family member	63
6. Major personal injury or illness	53
7. Marriage	50
8. Being fired at work	47
9. Marital reconciliation with mate	45
10. Retirement from work	45
11. Major change in the health or behavior of a family member	44
12. Pregnancy	40
13. Sexual Difficulties	39
14. Gaining a new family member (i.e.. birth, adoption, older adult moving in, etc)	39
15. Major business readjustment	39
16. Major change in financial state (i.e.. a lot worse or better off than usual)	38
17. Death of a close friend	37
18. Changing to a different line of work	36
19. Major change in the number of arguments w/spouse (i.e.. either a lot more or a lot less than usual regarding child rearing, personal habits, etc.)	35
20. Taking on a mortgage (for home, business, etc..)	31
21. Foreclosure on a mortgage or loan	30
22. Major change in responsibilities at work (i.e. promotion, demotion, etc.)	29
23. Son or daughter leaving home (marriage, attending college, joined mil.)	29
24. In-law troubles	29
25. Outstanding personal achievement	28
26. Spouse beginning or ceasing work outside the home	26
27. Beginning or ceasing formal schooling	26
28. Major change in living condition (new home, remodeling, deterioration of neighborhood or home etc.)	25
29. Revision of personal habits (dress manners, associations, quitting smoking)	24
30. Troubles with the boss	23
31. Major changes in working hours or conditions	20
32. Changes in residence	20
33. Changing to a new school	20
34. Major change in usual type and/or amount of recreation	19
35. Major change in church activity (i.e.. a lot more or less than usual)	19
36. Major change in social activities (clubs, movies,visiting, etc.)	18
37. Taking on a loan (car, tv,freezer,etc)	17
38. Major change in sleeping habits (a lot more or a lot less than usual)	16
39. Major change in number of family get-togethers ("")	15
40. Major change in eating habits (a lot more or less food intake, or very different meal hours or surroundings)	15
41. Vacation	13
42. Major holidays	12
43. Minor violations of the law (traffic tickets, jaywalking, disturbing the peace, etc)	11

CHUF 5 – Stress, Fatigue & Sleep

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Stress – Signs of Stress

- The signs of stress can be categorised into 4 groups:

1. Mental Indicators

- Forgetfulness & memory blanks
- Inability to concentrate
- Reluctance to make decisions

2. Physical Indicators

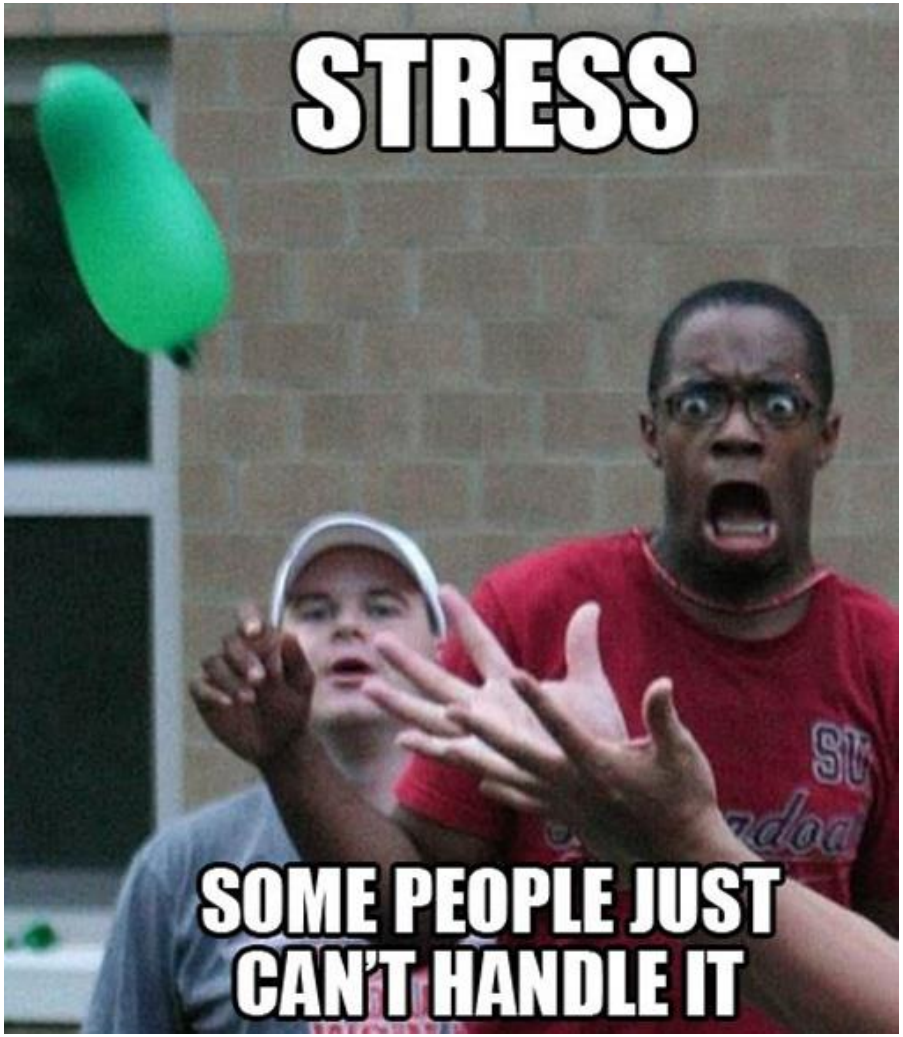
- Sweating & hot flushes
- Sleeplessness & nightmares
- Headaches

3. Emotional Indicators

- Apathy & depression
- Mood swings & short temper

4. Behavioural Indicators

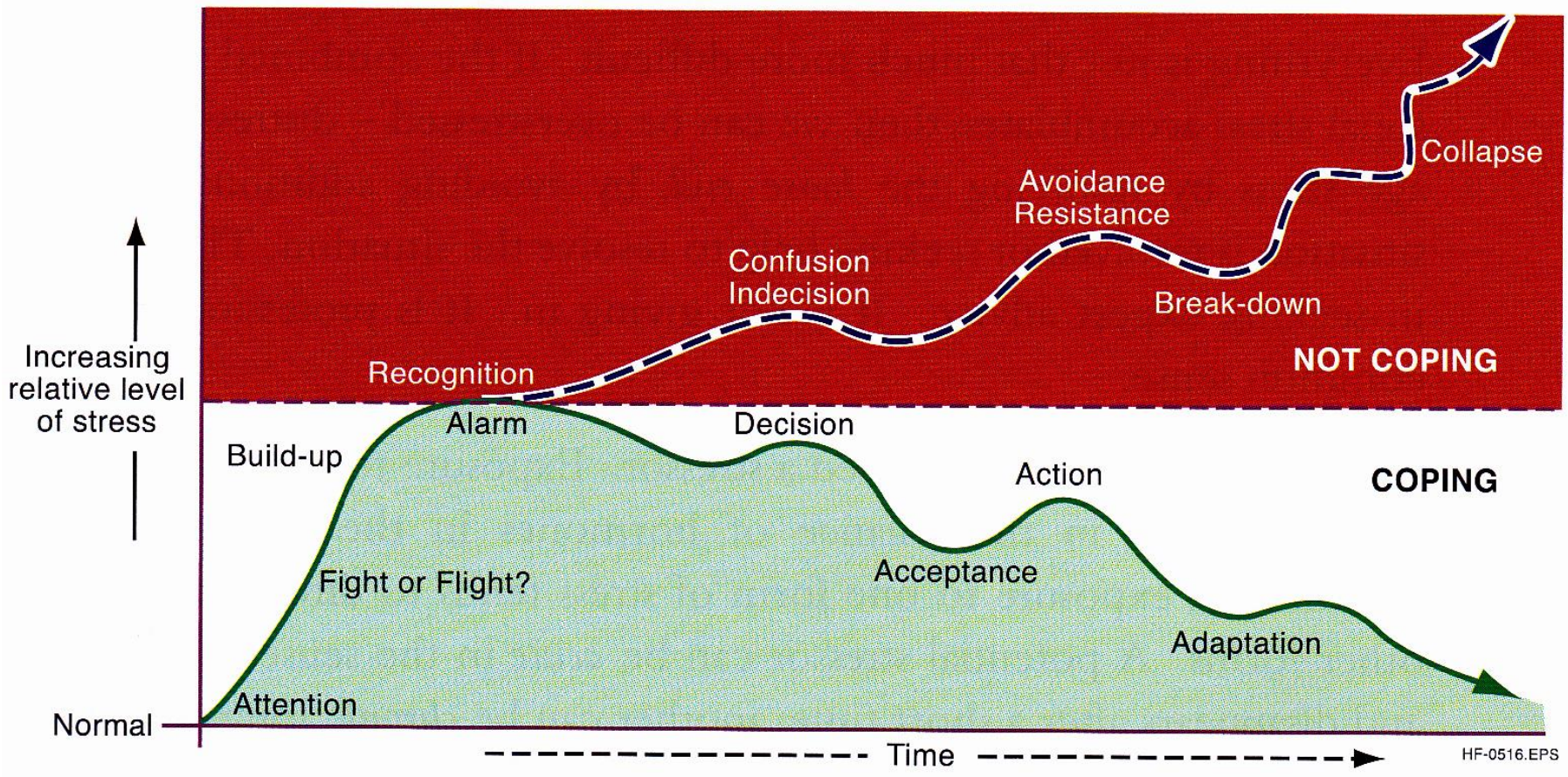
- Overeating
- Nervous laughter & fidgeting



Stress – how does the body deal with it?

- The body reacts to stress in 3 stages:

1. **Alarm –** At this stage, our **"fight or flight"** instinct kicks in
2. **Resistance –** We have to accept the situation can't be avoided & try not to "give in"
3. **Collapse –** Eventually our physical and psychological reserves will be depleted, leading to physical exhaustion, anxiety, reduced performance and even depression



Stress – how can we manage it?

- Stress can be managed depending on its type

- **Physical Stress:**

1. Remove yourself from the source of the stress

2. Take a break if necessary

- **Physiological Stress:**

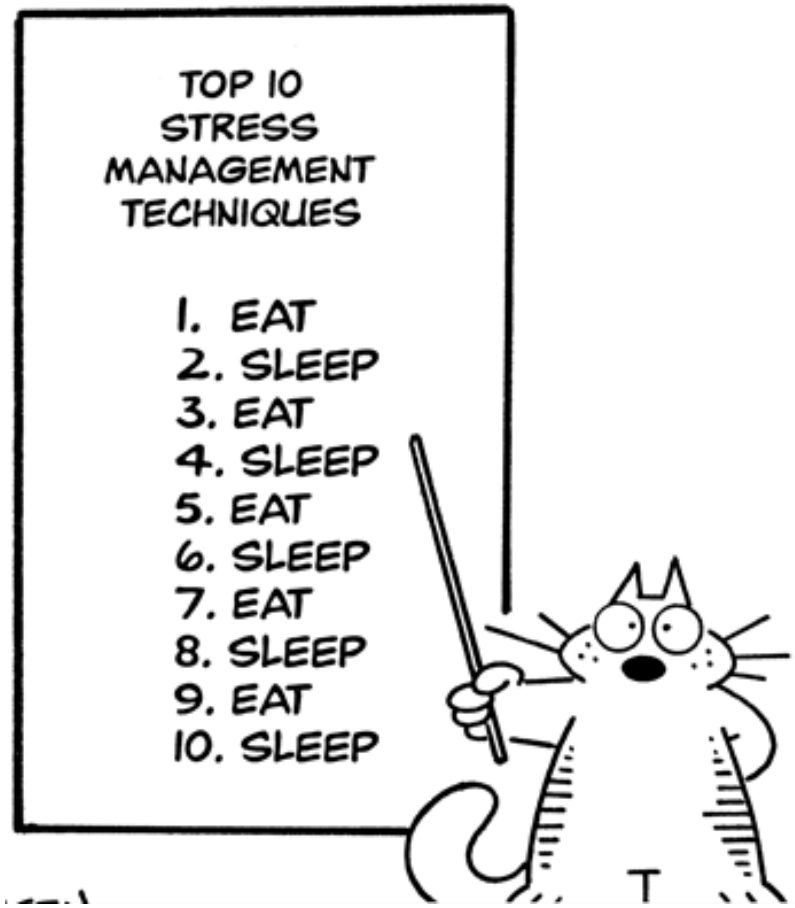
1. Keep fit and healthy

2. Ensure you are fed and hydrated

- **Emotional Stress:**

1. Tackle the underlying issue

2. Talk your problems through with trusted people



Stress – how can we manage it?

- There are also other ways to categorise stress management:

Action Coping

- This refers to "escapism" – we remove ourselves from the source of stress
- *E.g. changing jobs, ending a relationship or handing over control to another pilot*

Cognitive Coping

- This refers to "mind over matter" – rationalisation or detachment from the stress
- *E.g. counselling to change your perspective on the situation*

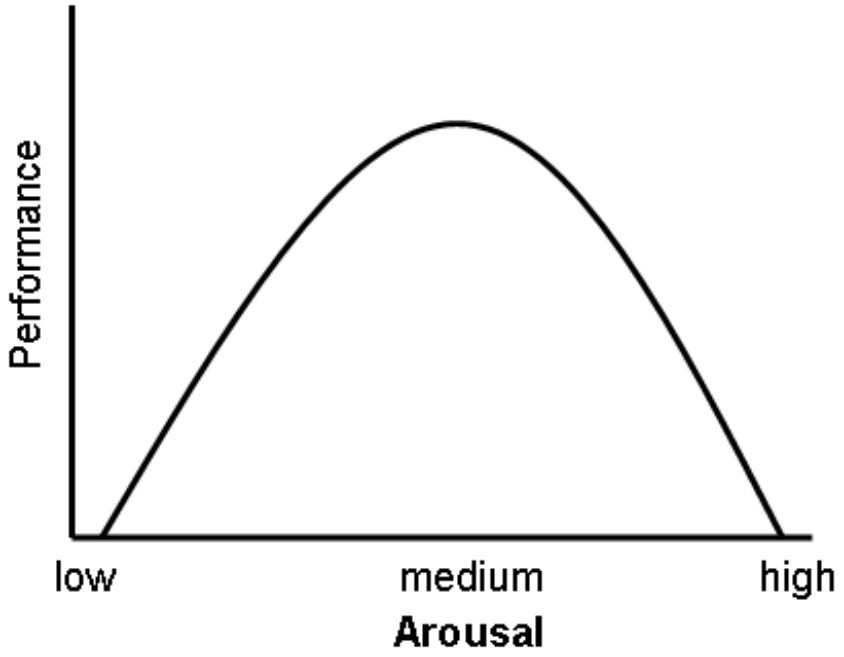
Symptom-Directed Coping

- This refers to seeking help to alleviate the symptoms
- *E.g. prescription or recreational drugs, alcohol, coffee, fitness or meditation*

Sometimes it is difficult to determine the exact cause of our stress – regardless, it is a good idea to address and modify these 3 areas: **behaviour, attitude and fitness**

Stress – is it always bad?

- Many people don't realise that **stress isn't necessarily a bad thing**
- Stress is normal & healthy. **Unresolved stress** is not.
- One definition of stress is "**the physical state of arousal in our bodies**"
- If we had 0 stress, there would be no blood flow, no brain activity etc.
- So, **we need some level of stress to keep ourselves motivated and engaged**
- However, when stress increases from a moderate level to a high or extreme level, stress does become negative



FATIGUE

Fatigue – What is it?

- Fatigue can be defined as "**weariness from physical or mental exertion**"

Fatigue

- There are in fact two types of fatigue

- **Acute Fatigue**

  1. **Occurs due to physical or mental exhaustion** – continuing a task until performance starts to deteriorate

  2. This is **cured by a good night's sleep** or a few days rest

- **Chronic Fatigue**

  1. A much bigger problem for pilots – lifestyle related

  2. Builds up over long periods of weeks, months or even years

  3. It can be caused by things like difficult rosters, work or social pressure and problems at home

  4. **The only cure is to attend to these underlying issues – change in lifestyle!**

Fatigue – What are the effects?

- If we fly whilst fatigued, we have:

1. A lower ability to take in information

2. A tendency to overlook or forget things

3. An irritable mood

4. A reduction in our ability to think clearly and make decisions

Fatigue – Rules to avoid it!

- **Be fit** – a fit pilot has more resistance to fatigue
- **Be rested** – have a good night's sleep
- **Know when to stop** – make a command decision before it becomes critical

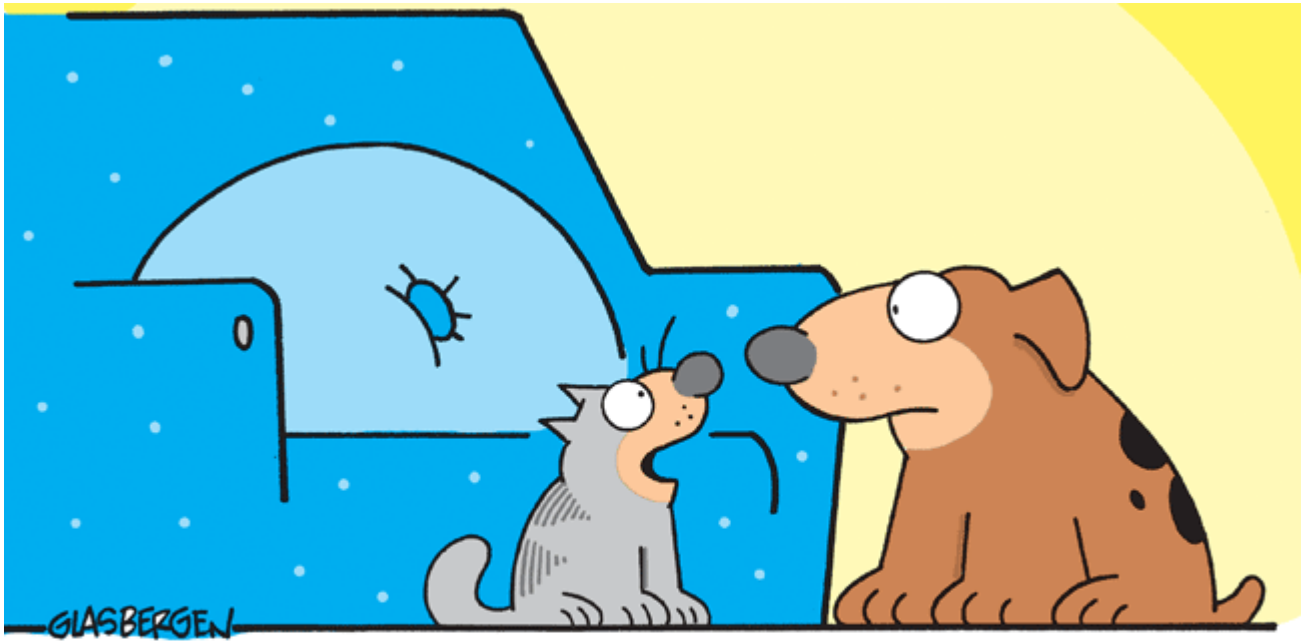
SLEEP

Sleep

- The purpose of sleep is to **revitalise your mind and body** in preparation for the activities of the following day

- On average, a person requires **8 hours** of restful sleep in preparation for **16 hours of activity**

- This means that **1 hour of sleep** gives you sufficient energy for **2 hours of activity**



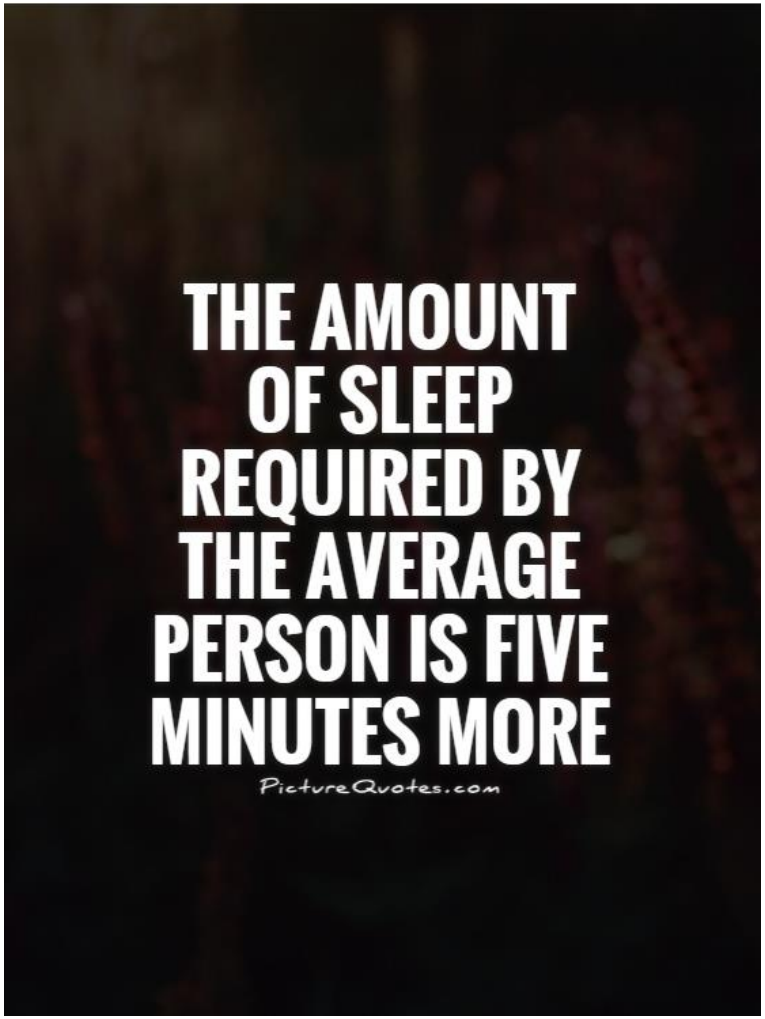
"I can get by on just 2 hours of sleep every day, as long as I nap for 14 hours."

Sleep

- It should be noted that this is **only a general rule**
- Different people require different amounts of sleep to function
- The requirements for sleep also **vary with age**
- In general, **older people need less sleep**
- However:

1. This is required on a more regular basis

2. The time at which we sleep becomes less flexible



STAGES OF SLEEP

Stages of Sleep

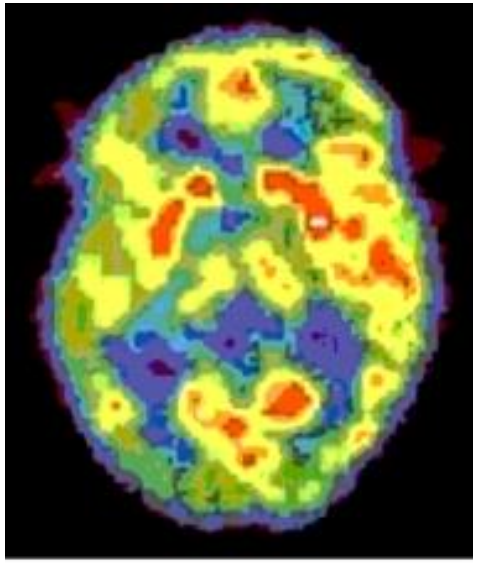
- During sleep, there are 5 different stages:

Stages 1-4 (Non-REM Sleep)

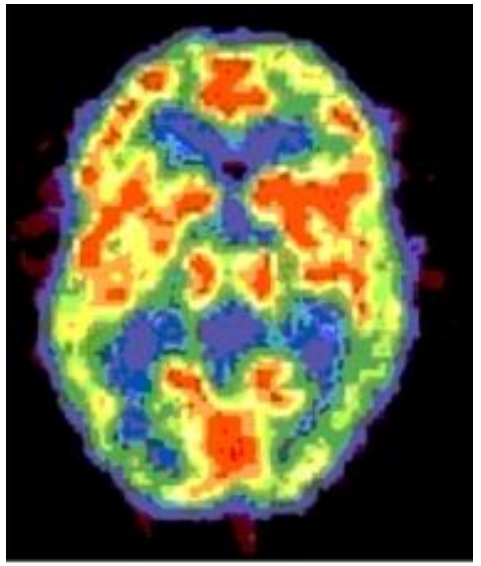
- These stages **rest and repair the body**
- Required after strenuous physical activity

Stage 5 (REM Sleep)

- Rapid-Eye Movement Sleep
- **Restores the brain**
- Required after strenuous mental activity
- Brain activity is similar to a person who is awake
- REM sleep is when we dream
- **Alcohol reduces REM sleep**



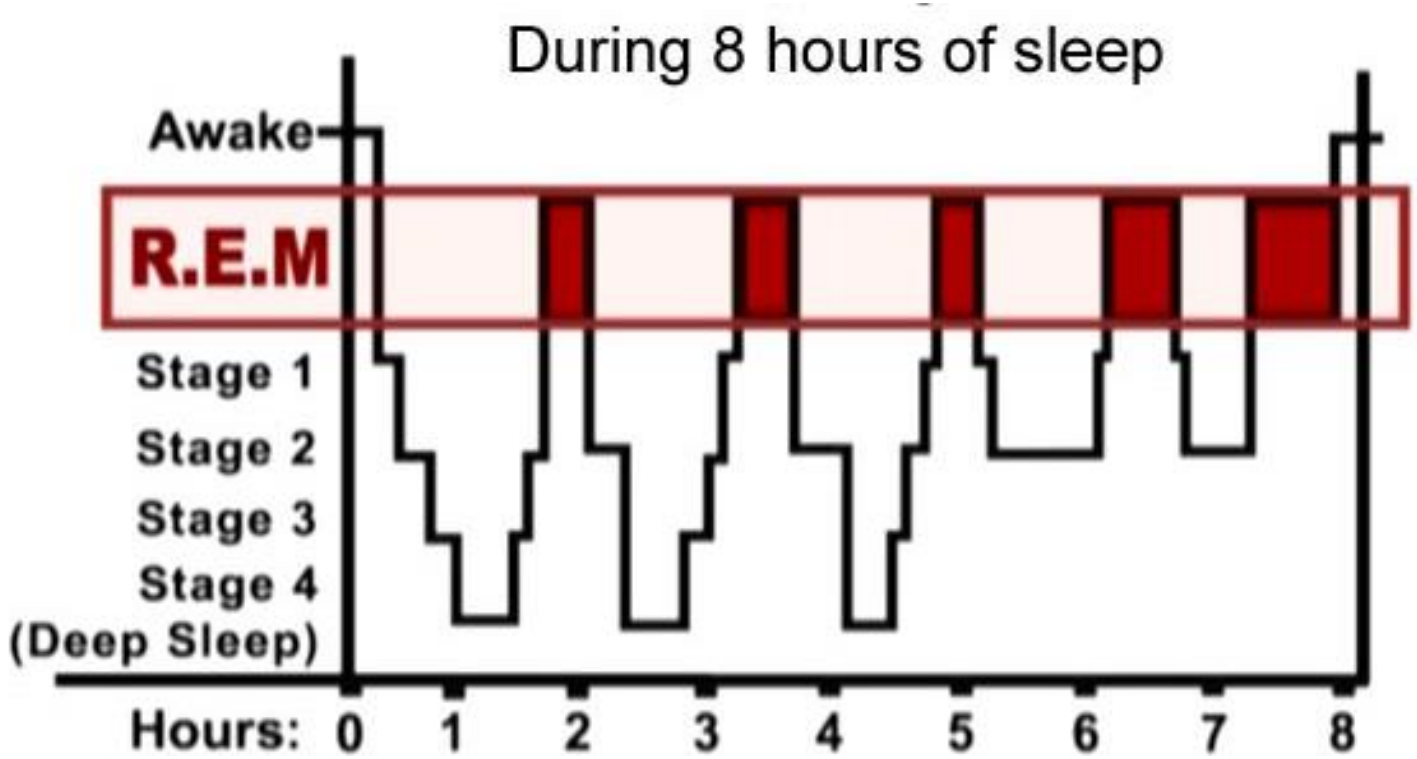
NREM



REM

Stages of Sleep

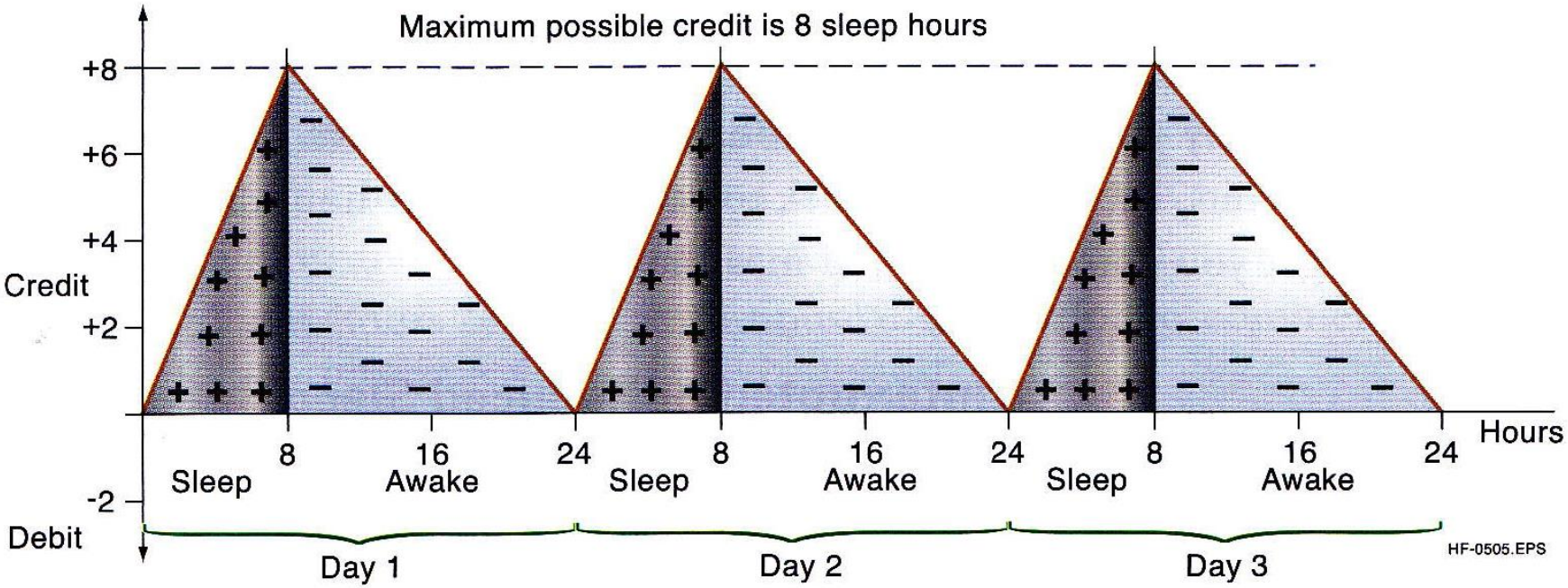
- In the course of a long sleep period, you alternate between **REM** and **non-REM sleep**
- It takes about **90 minutes** to have a **full cycle through Stages 1-4**
- In a normal night, you might go through about 4-5 cycles, each one maybe slightly different, with some stages missing or lasting for shorter or longer periods



SLEEP CREDITS

Sleep Credits

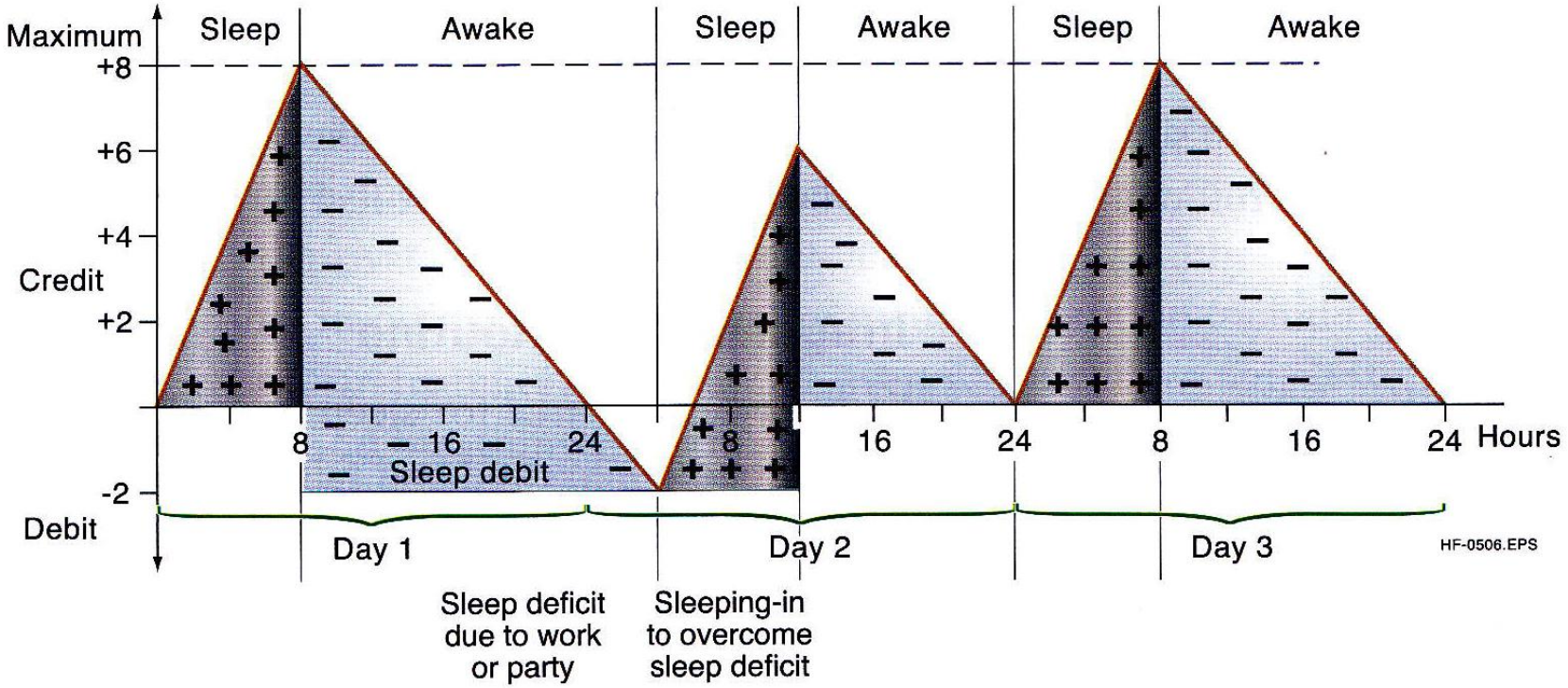
- Our need for sleep works on a sleep credit/debt system
- **When we sleep, we gain sleep credit at the rate of 1 credit per hour**
- **When we are awake, we lose sleep credit at the rate of 1 credit per 2 hours**



- If you do not go to sleep when your credit reaches 0, you will be in **"debt"** and your **alertness and performance will be reduced**

Sleep Credits

- As you can see, **the maximum amount of sleep credit we can hold is 8**



- In the example above, a person has stayed up late and gone into sleep debt

- To correct this, they have slept their normal 8 hours but then gone to bed early the next day (going to bed once their reduce sleep credit reaches 0)

NAPS

Naps

- The best quality sleep occurs at **“normal”** times – **between 2200 and 0800 LMT**
- However, if we do not achieve enough sleep credits in this period, napping can allow us to “catch up” on sleep
- Despite this, not all people are able to nap effectively
- Some may find that after napping they suffer from **drowsiness** and even **headaches**
- To be **effective**, a nap must be at least **10-15 minutes** in duration
- A **90 minute** nap will allow a **full sleep cycle**

SLEEPING DISORDERS

Sleeping Disorders

Narcolepsy

- Unable to prevent yourself suddenly falling asleep – even when you have enough sleep credits!
- https://www.youtube.com/watch?v=X0h2nleWTwI

Apnoea

- Stop breathing during sleep – can occur as much as **100 times a night** and may be **seconds to a minute in duration**
- https://www.youtube.com/watch?v=UwjeVRdy5u4

Somnambulism

- Sleepwalking
- https://www.youtube.com/watch?v=dhNMrPIfcT0

Insomnia

- Inability to fall asleep – even when sleep credits are low!
- When conditions for sleep are favourable → **clinical insomnia**
- When conditions are not favourable e.g. jet lag & discomfort → **situational insomnia**

JET LAG

Jet Lag

- Jet Lag is a condition also known as **Transmeridian Dyschronism**
- As the name suggests, it occurs when we cross meridians **(travel east or west)**
- Before we can understand why jet lag occurs, we need to understand the **natural rhythm of the body**
- The body actually has many natural rhythms, including:

  1. Sleep/Wakefulness

  2. Body Temperature

  3. Digestive

- These are all **approximately** 24 hours and are known as **circadian rhythms**

"I'm the Apnea Fairy. I have orders to give you a wake up call at 10:30, 10:47, 10:53, 11:02, 11:17, 11:26..."

Jet Lag

- Although approximately 24 hours, these rhythms are actually around **25 hours**
- However, the sleep-wakefulness rhythm is regularly **pulled back into a 24-hour time span** by a succession of **time-of-day reminders** known as **zeitgebers**
- Zeitgebers include:

  1. Sun rising & setting

  2. Our alarm clocks

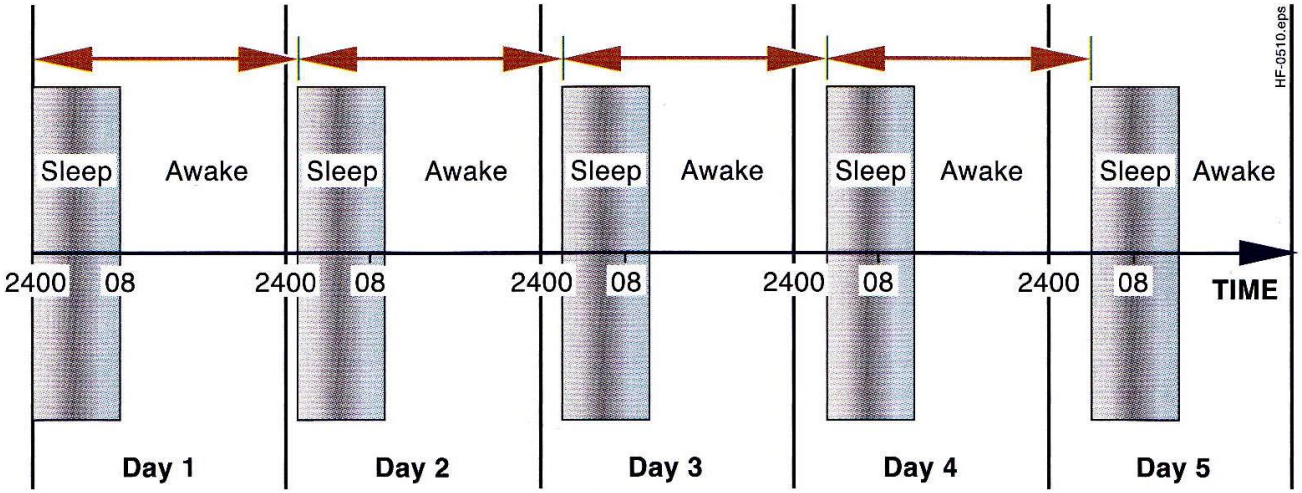
  3. Lunch time

  4. Late-night news

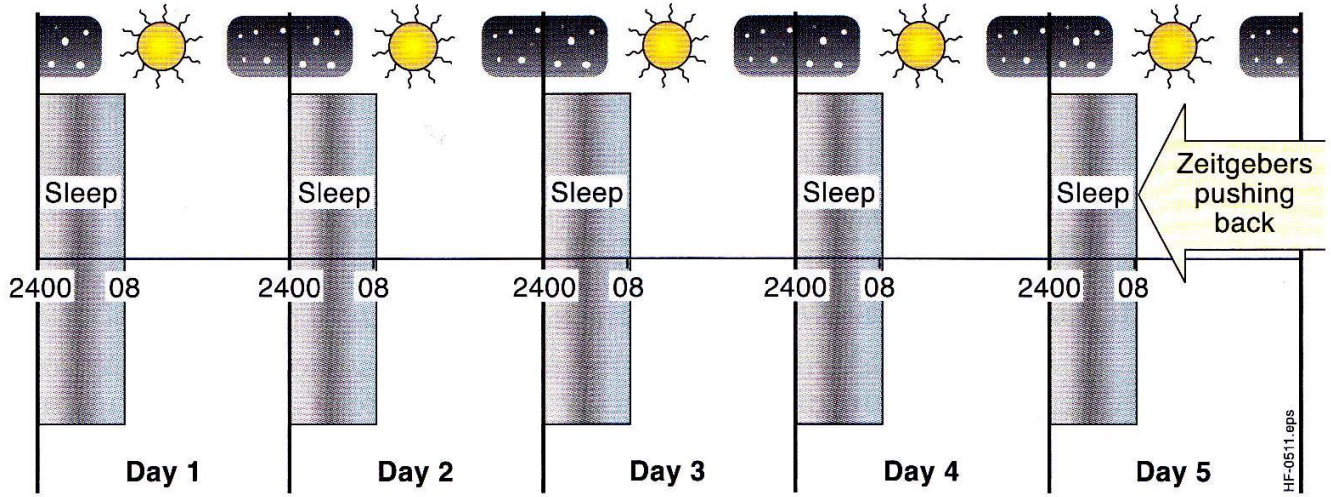
- In short, these are reminders of the time of day and we associate these with when we should be awake or asleep

Jet Lag

- Without zeitgebers (time clues), the body would adopt its **natural rhythm (25 hours)**

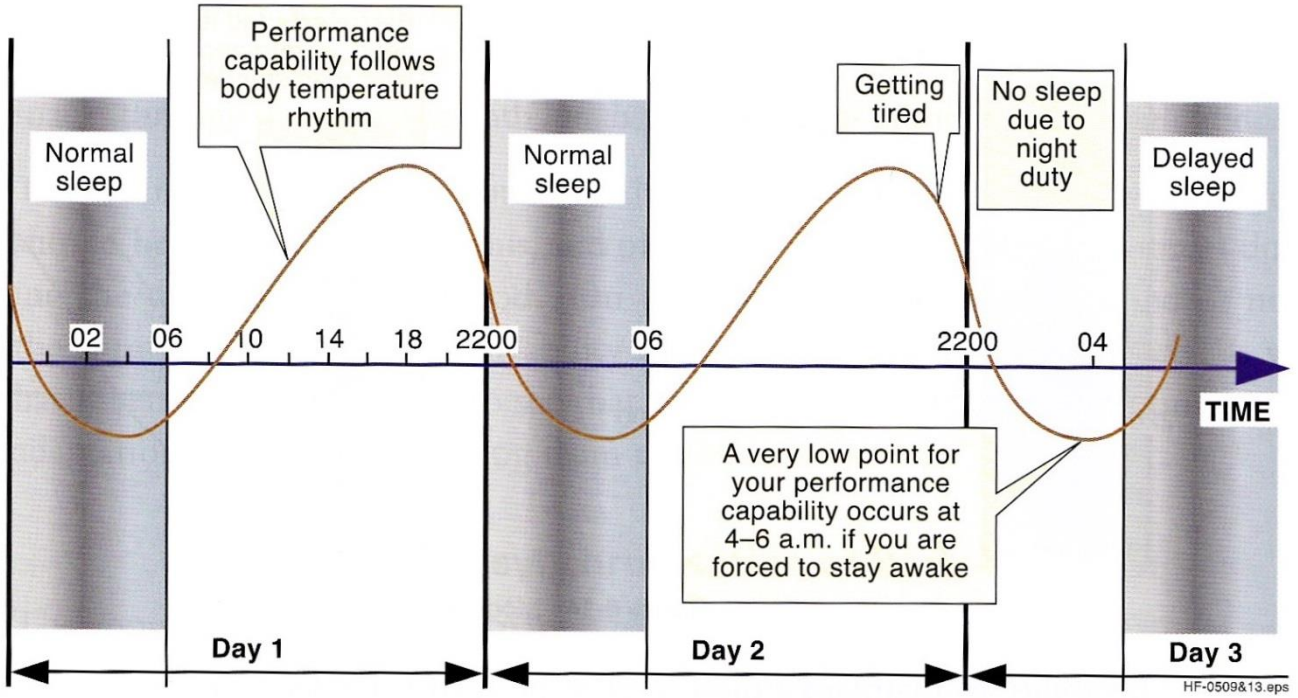


- However, with zeitgebers, the body clock is pushed back into a 24 hour cycle



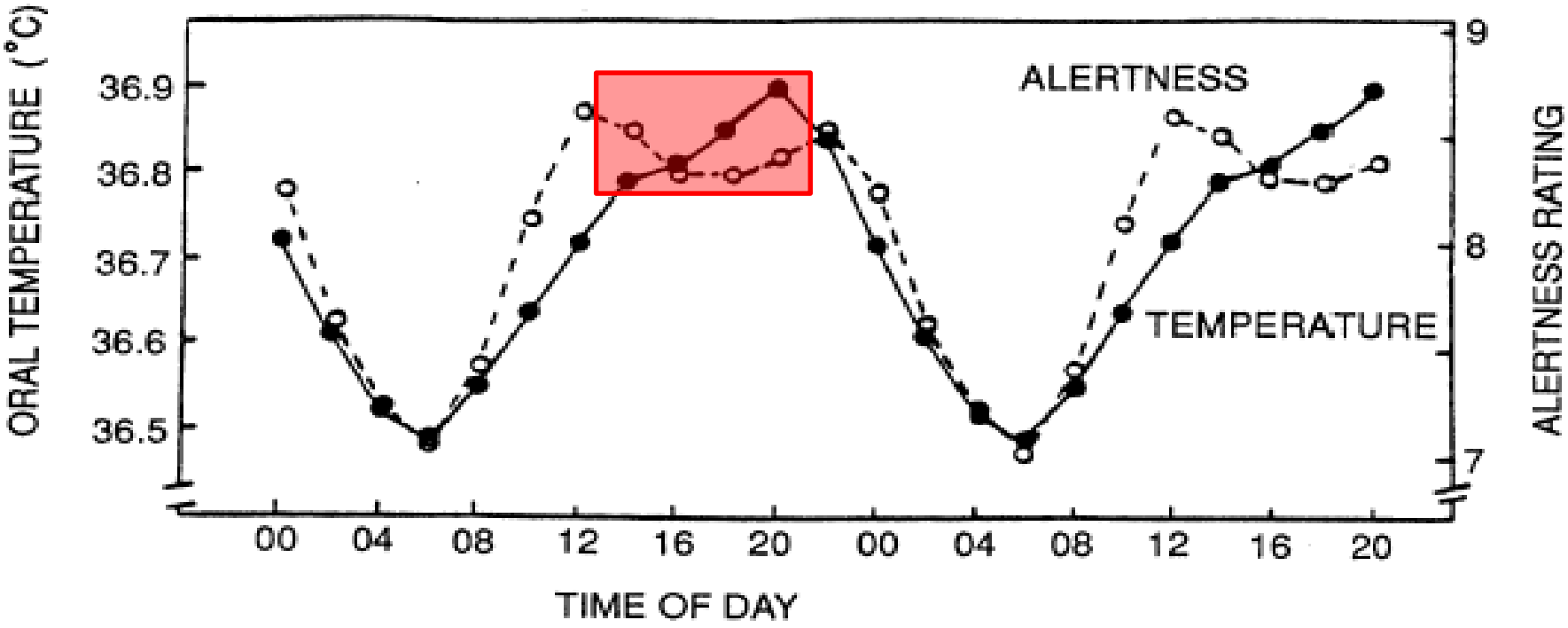
Jet Lag

- The various rhythms of the body are related to each other
- For example, the body temperature cycle roughly follows sleep/wakefulness
- This also allows us to map our **performance against body temperature/alertness**
- **Average body temperature is 36.5° C and varies by about 0.3 around that**
- A high body temperature is linked to alertness
- A low temp. is linked to low performance and drowsiness



Jet Lag

- You may have also noticed that your alertness reduces in the early afternoon
- This is known as the post-lunch or **post-prandial dip** and is connected with the subtraction of body energy from the overall system in order to digest lunch (but this is not the sole factor)



Jet Lag

- Now that we understand more about the body's natural rhythms, we can examine jet lag in more detail

- **Jet Lag primarily causes fatigue and can be created by:**

  1. **Dry, oxygen-deficient cabin environment**
  2. **Vibration**
  3. **Noise**
  4. **Lack of exercise**
  5. **Stress**
  6. **Arriving in a place where the local time differs from your home time**

- The average person will adjust to the new time zone at a rate of about **1.5 hrs/day**
- *E.g. If you travelled to a time zone 6 hours different, it would take you 4 days to adjust*

Jet Lag

- Jet Lag is:

Best when you are travelling West

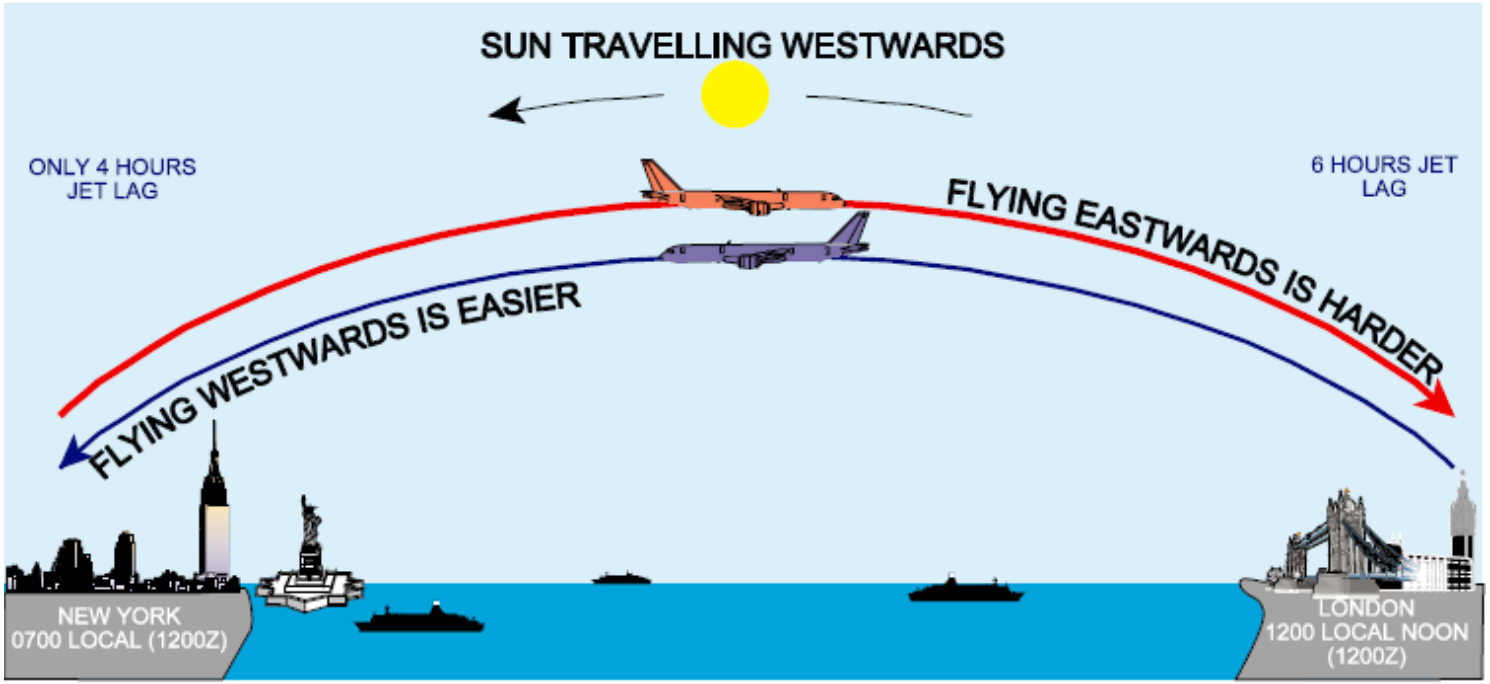
- This is because you are travelling with the sun
- Your body rhythms must retard to match the new time
- "West is best"

Worst when you are travelling East

- This is because you are travelling opposite to the direction of the sun
- Your body rhythms must advance to match the new time

Jet Lag

- Let's examine jet lag on a flight route between New York and London



- New York is 5 hours behind London
- So, noon occurs 5 hours later – this means a person arriving from London experiences a **29-hour day**
- The body clock is **25 hours** – so there is only **4 hours jet lag**

- London is 5 hours ahead of New York
- So, noon occurs 5 hours earlier – this means a person arriving from New York experiences a **19-hour day**
- The body clock is **25 hours** – so there is **6 hours jet lag**