



CIRCADIAN[®]
24/7 WORKFORCE SOLUTIONS

pepdays



MANAGING FATIGUE AND SLEEP

AUGUST 2019

AROUND THE CLOCK WORKERS SAY:



- 68% have seen poor performance or operational errors due to sleepiness
- 53% have seen poor safety practices or accidents due to fatigue
- 76% experience noticeable sleepiness on every night shift
- 20% experience at least one episode of sleepiness severe enough to actually fall asleep at work on *EVERY* night shift



EFFECTS OF WORKING IRREGULAR OR LONG HOURS



- Chronic sleep deprivation
- Reduced alertness, vigilance and performance:
 - Micro-sleep
 - Automatic behaviour syndrome
- Health and well-being
- Family and Social Life
- Performance on the job



HUMAN DESIGN SPECS

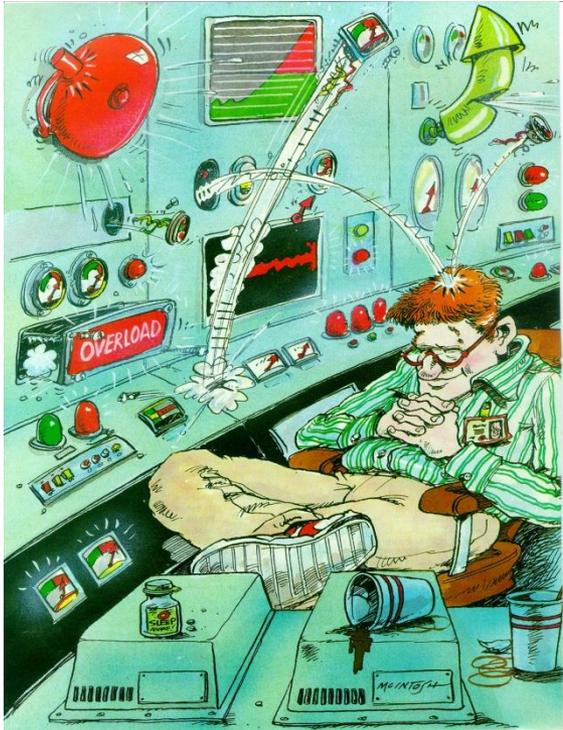


Humans were not designed for sustained vigilance at night

Then...

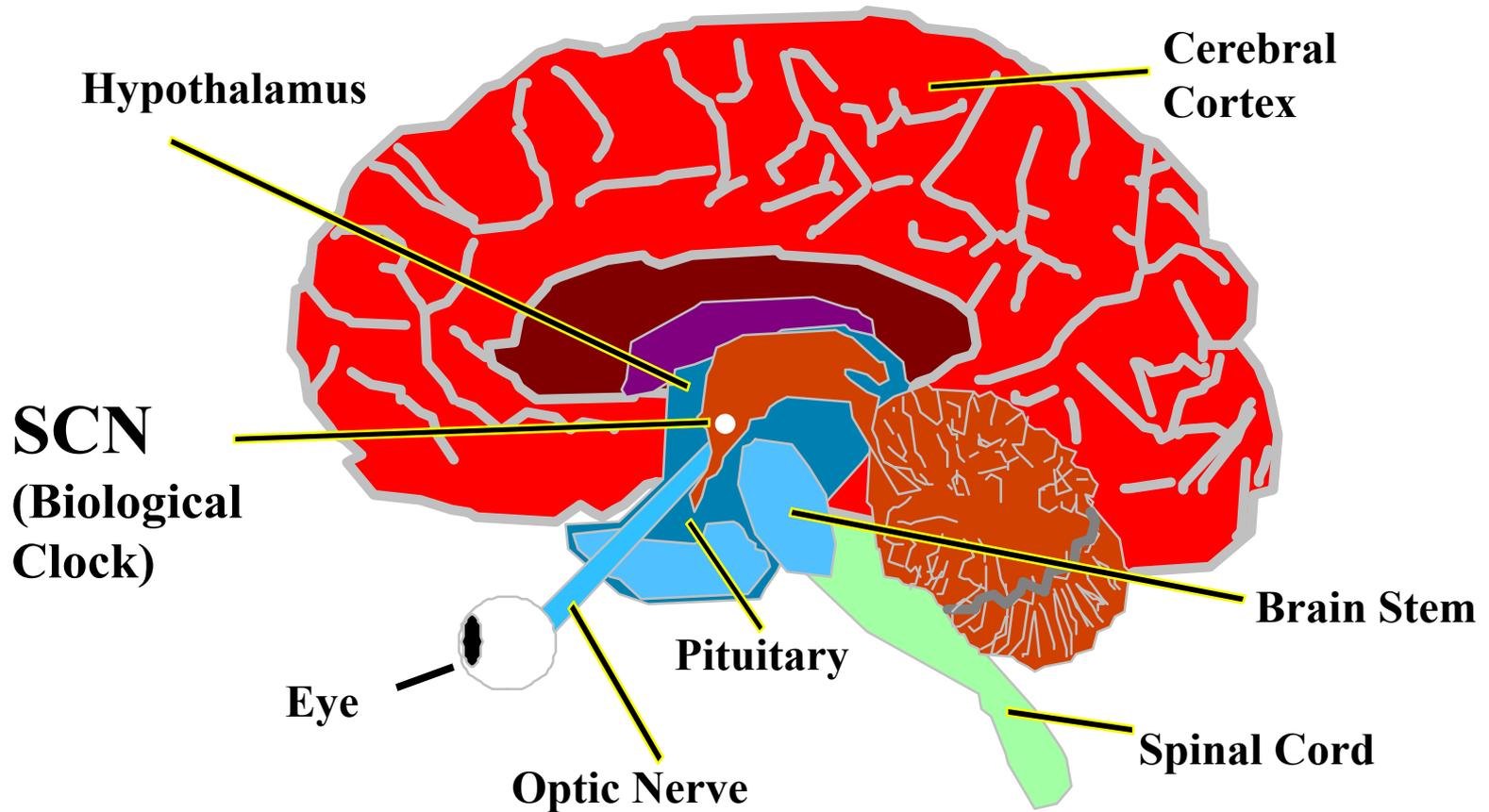


...and Now

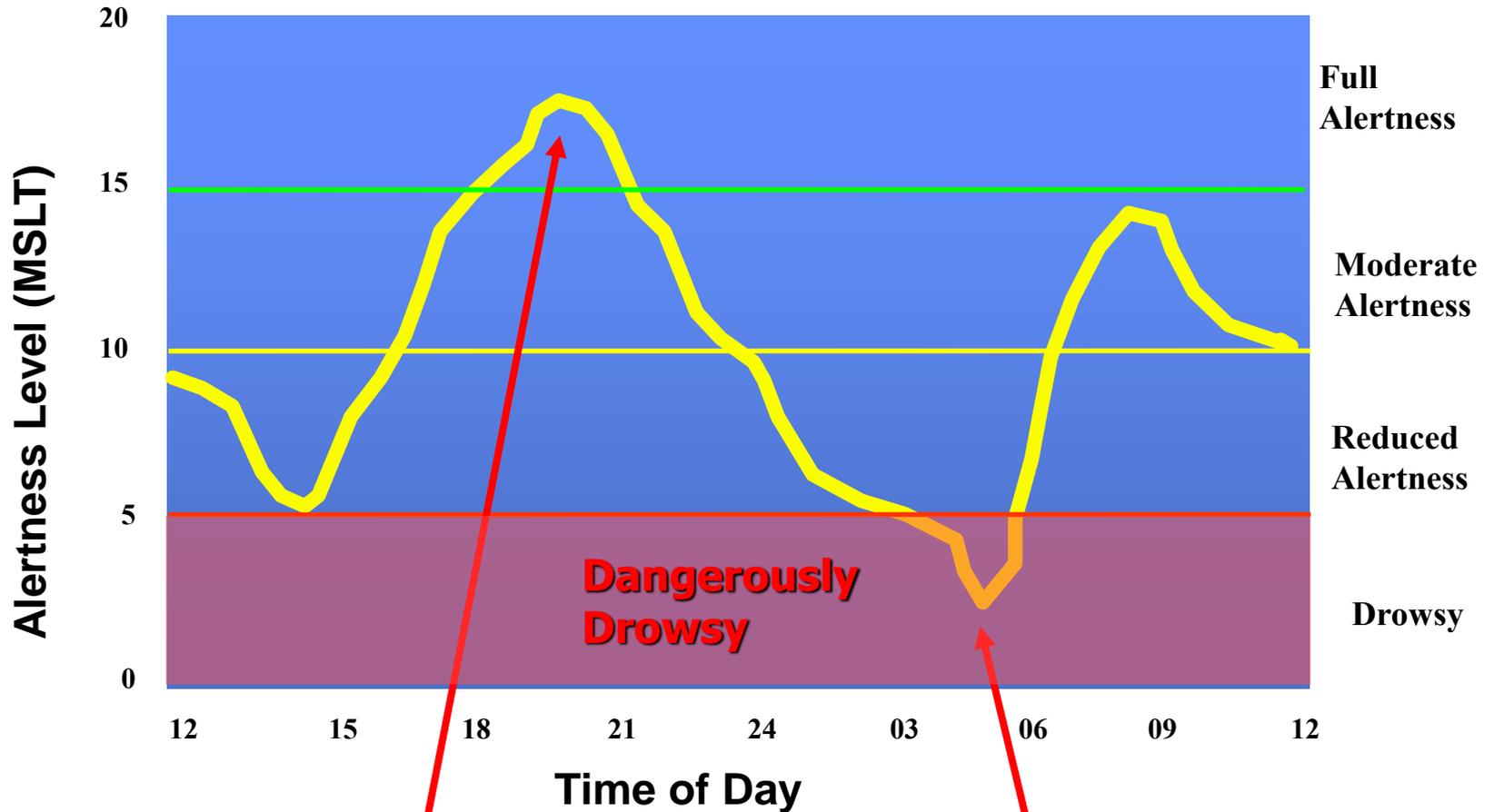


OUR BIOLOGICAL CLOCK

THE SUPRACHIASMATIC NUCLEUS



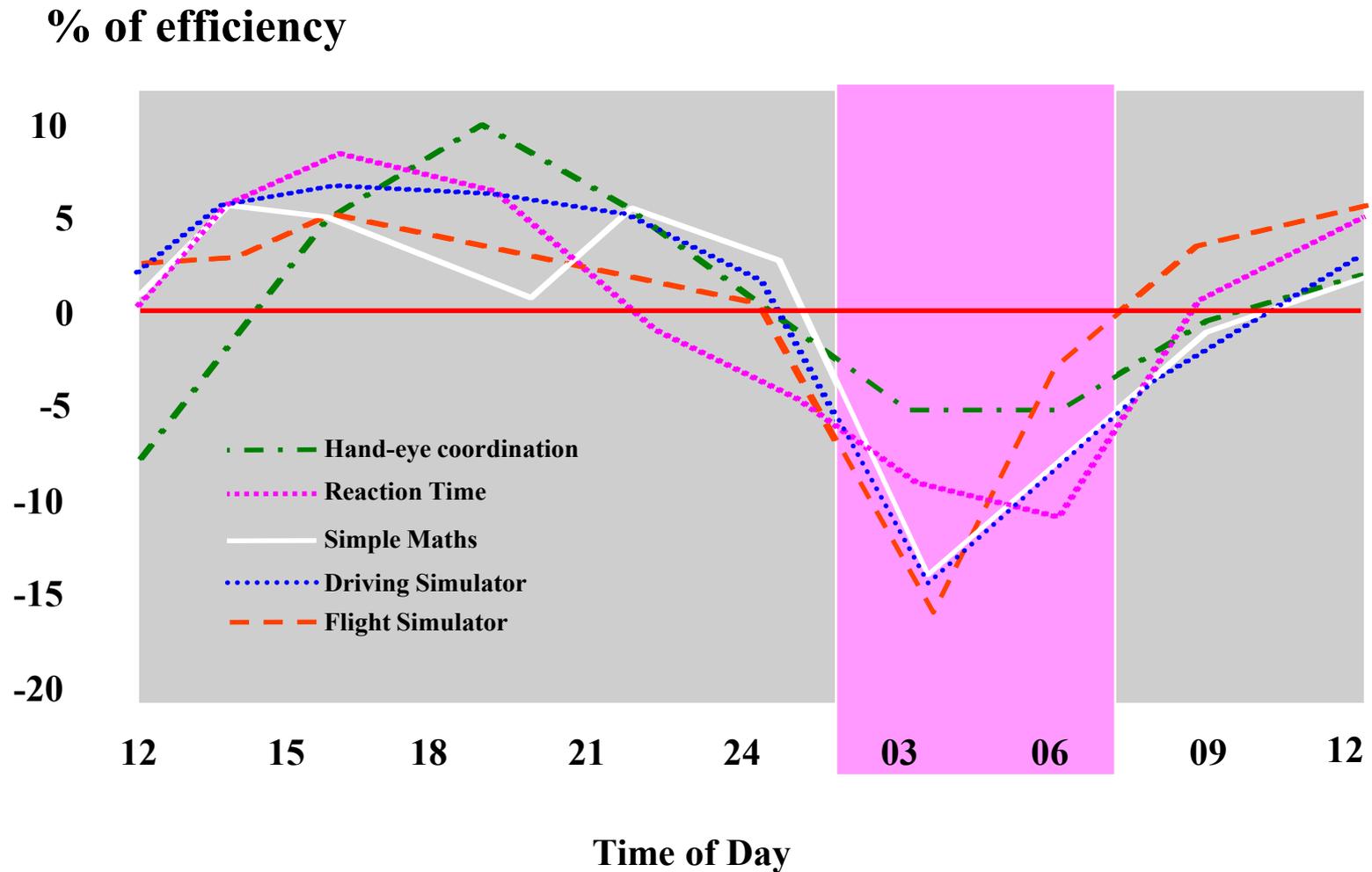
DAILY CIRCADIAN RHYTHM OF ALERTNESS



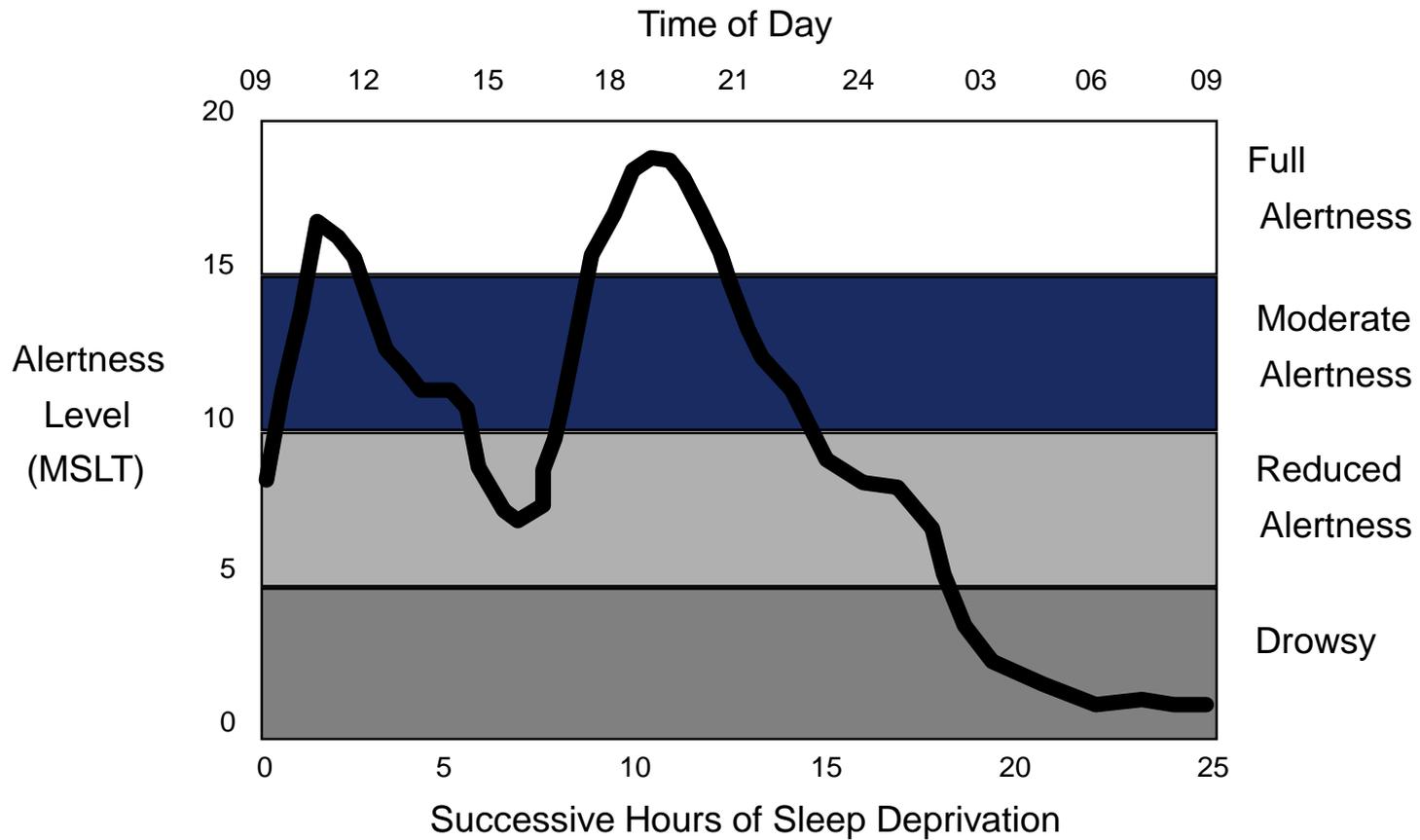
Most Olympic Track & Field Records Set

Fifteen-fold Increase In Industrial Accidents

PERFORMANCE AND CIRCADIAN RHYTHMS

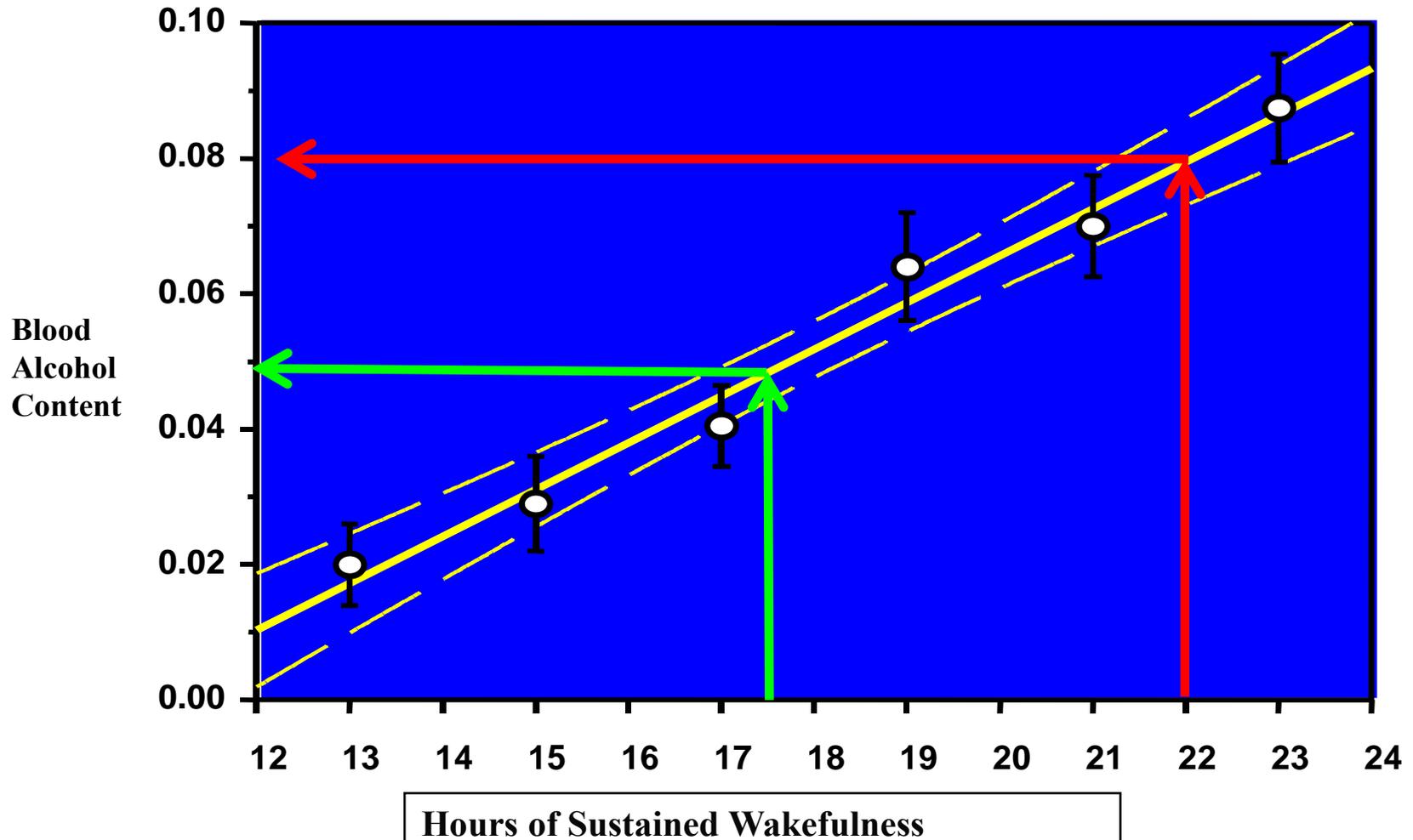


ALERTNESS CURVE WHEN DEPRIVED OF SLEEP



Source: Circadian Technologies, Inc. (1993)

FATIGUE IMPAIRMENT VS. ALCOHOL IMPAIRMENT



SO WHAT CAN WE DO?



- Evaluate the schedule and the impact on staff
- Change the schedule – the right way and manage the risk
- Support staff & their families



HOW ARE STAFF COPING?



- Evaluate common health and adaptation issues such as:
 - Gastrointestinal problems
 - Sleep
 - Metabolic problems
 - Excessive medication use
 - Sleepiness and fatigue
 - Lifestyle factors
 - Overall adaptation
- Consider a confidential reporting system
- Include time, time into work, actual work pattern in your Accident Reporting System
- Consider a Fatigue Risk Management System (FRMS)

WHAT AFFECTS ALERTNESS?



- **homeostatic factors** (build up of sleepiness during wakefulness and dissipation during sleep)
- **circadian factors** (the phase of the human biological clock and its adjustment to time zones)
- **sleep inertia** (the transitory impairment of alertness on arousal from sleep depending on circadian phase, length of sleep and level of prior sleep deprivation)

Waking up to the risks of workplace fatigue

MORE THAN 1 IN 10 INJURIES ON THE JOB MAY BE LINKED TO INSUFFICIENT SLEEP, EXPERTS SAY

The article discusses the dangers of workplace fatigue, citing a study by the National Institute for Occupational Safety and Health (NIOSH) that found that fatigue is a leading cause of workplace injuries and illnesses. It also mentions that fatigue can impair judgment, slow reaction times, and increase the risk of errors. The article includes quotes from experts and a small photo of a construction worker.

MODELLING FATIGUE



Circadian Alertness Simulator (CAS) is based on the laws of circadian & sleep physiology:

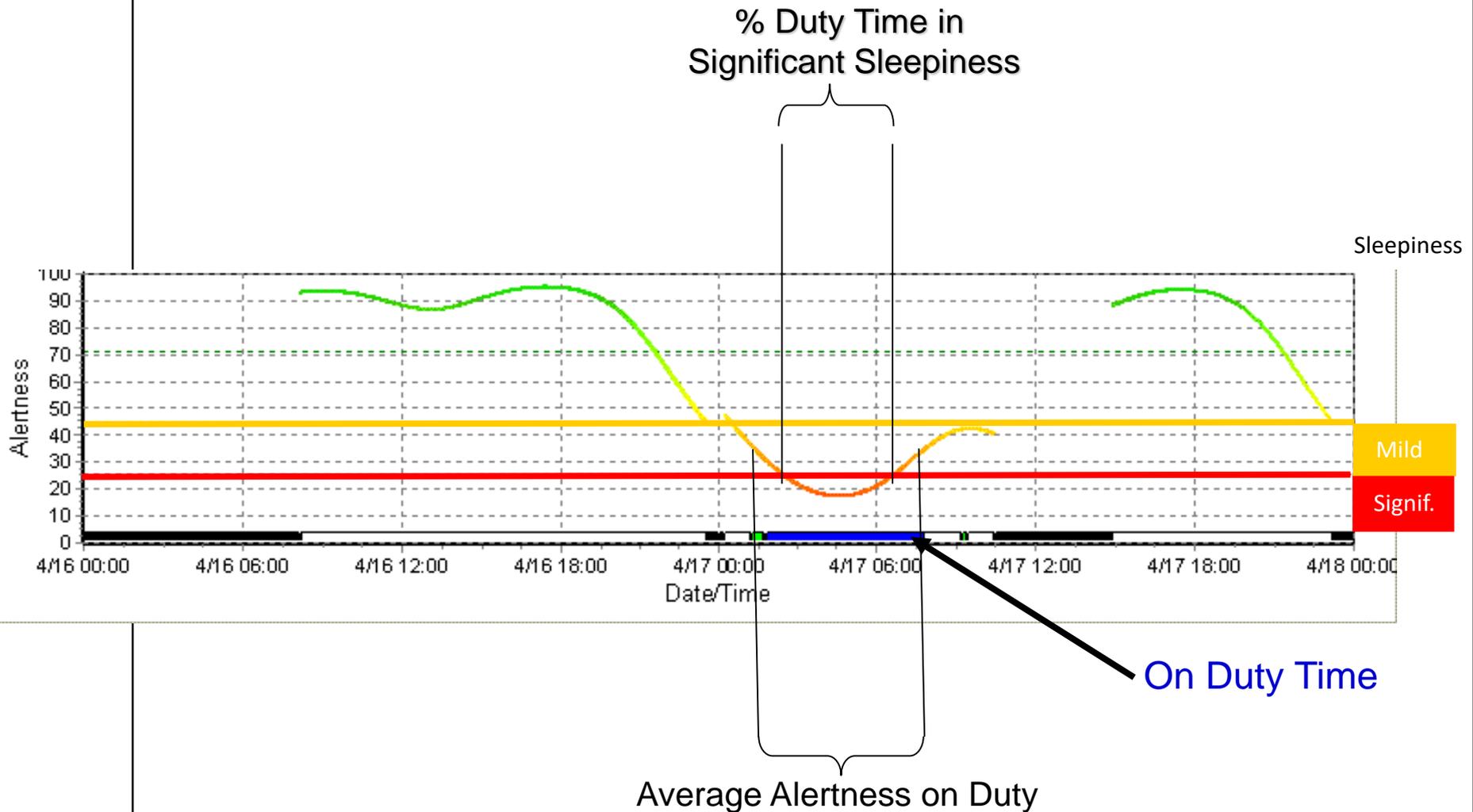
- derived from a very large body of scientific research literature
- Estimates the **duration, timing and quality of sleep** for each sleep opportunity before, during and after any given duty-rest schedule

CAS has been **progressively optimised** for over 20 years using large populations of equipment operators where sleep and alertness on duty has been simultaneously measured

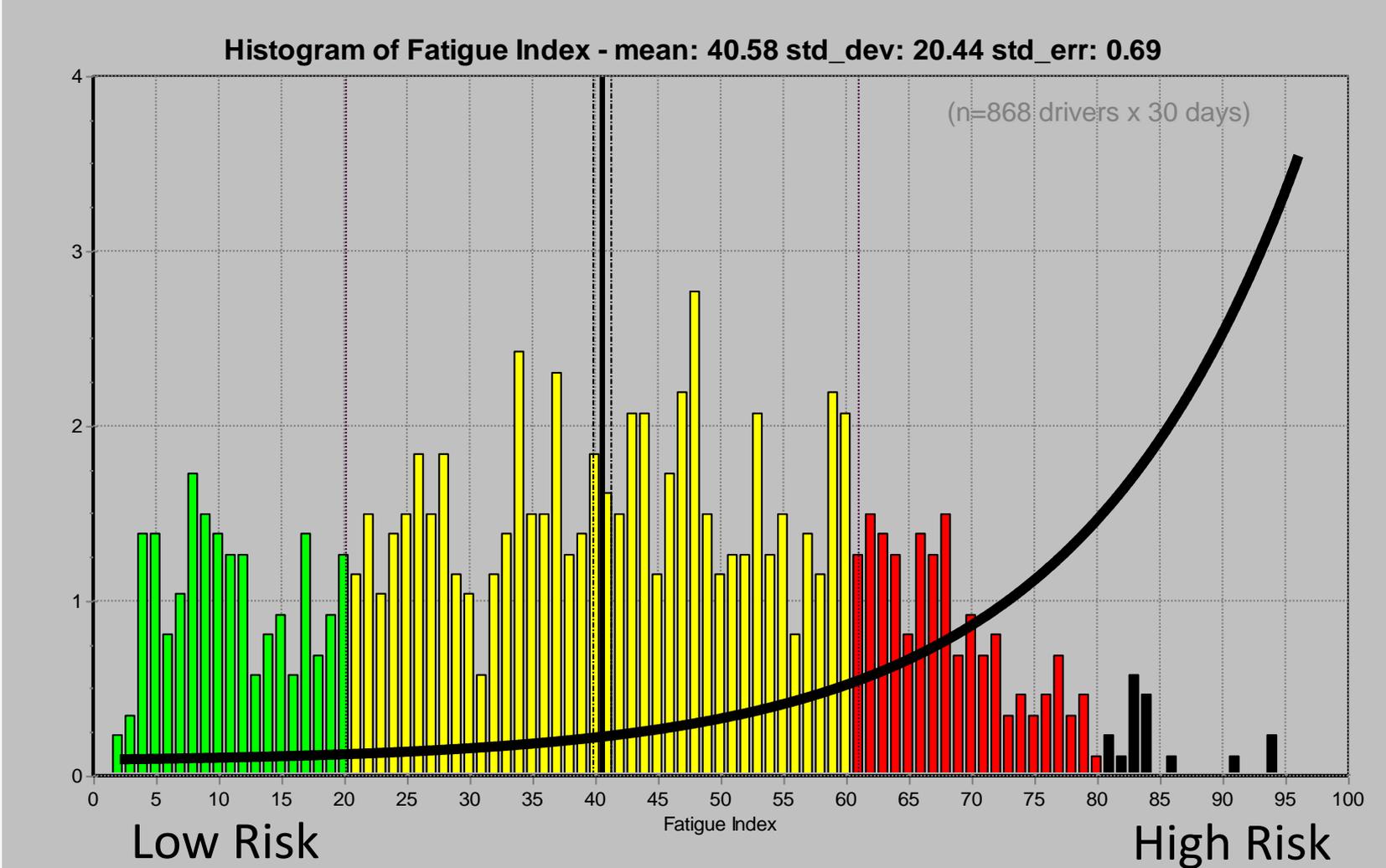
	Fatigue index (0-100)	Mean Alertness Level On Duty (0-100)	Maximum Alertness Level On Duty (0-100)	Minimum Alertness Level On Duty (0-100)	Minimum Alertness Not On Duty (0-100)	Time 'Actively Fighting' Sleep On Duty
EXISTING SCHEDULE	43.52	49.23	88.07	4.21	3.90	25.9%
PROPOSED SCHEDULE	39.24	51.97	89.38	5.94	3.97	21.2%

FATIGUE RISK DETERMINATION

Percent Duty Time with Significant Sleepiness



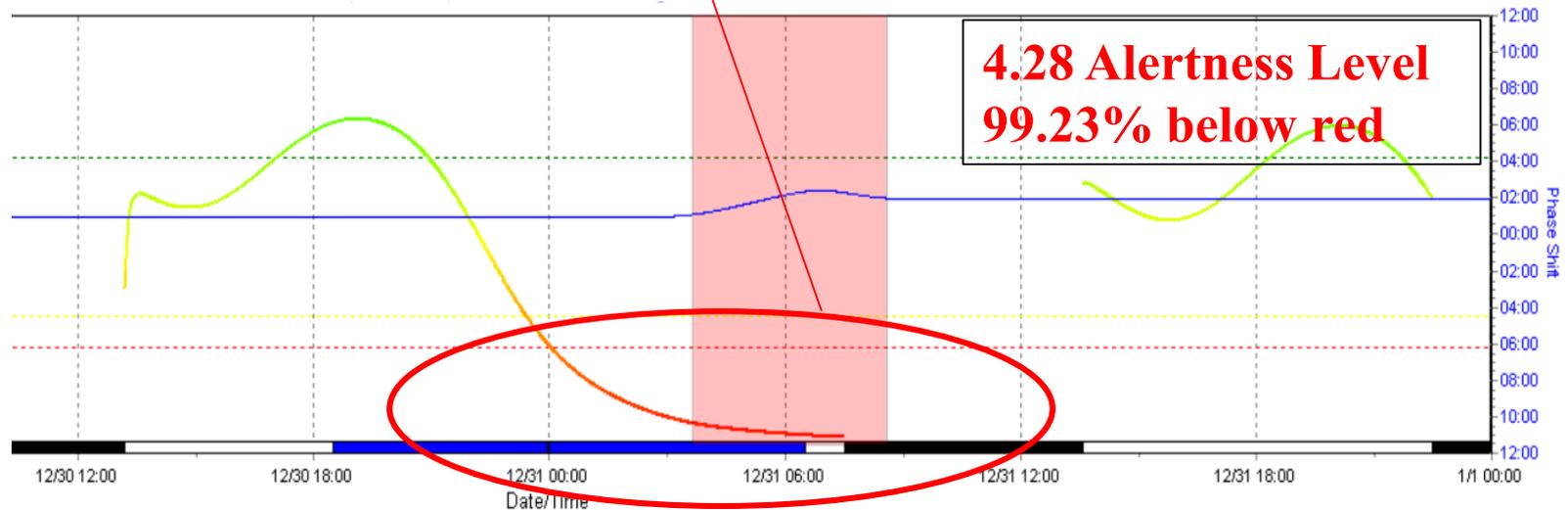
CAS FATIGUE SCORE VS. ACCIDENT RISK



FATIGUE 'PINCH' POINTS



Week	Mon	Tue	Wed	Thu	Fri	Sat	Sun
1	M	M	N	-	-	M	M
2	A	A	A	-	-	M	M
3	M	M	M	-	-	-	M
4	M	M	A	A	A	-	M



THE ACTIGRAPHY TECHNOLOGY REAL-TIME & PREDICTIVE ALERTNESS



CONTROL ROOM DASHBOARD ALERTNESS VISIBILITY



9am 10am **Now** 12pm 1pm 2pm 3pm 4pm 5pm 6pm 7pm 8pm 9pm 10pm 11pm 12am 1am 2am 3am 4am

77% = 0.05
BAC

DASHBOARD OF YOUR RESPONDERS REAL-TIME & PREDICTIVE ALERTNESS UP TO 18 HOURS AHEAD

Intervene before

9:00 am



9:00 am



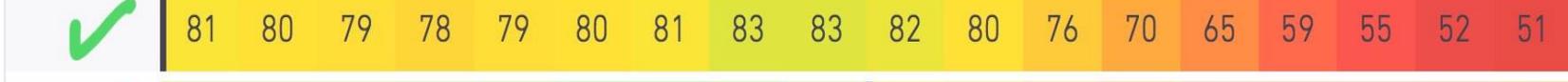
9:00 am



9:00 am



11:15 am



8:15 pm



9:30 pm



DESIGN APPROPRIATE SCHEDULES



- Unlimited number of working patterns
- Some core schedules are more commonly used than others
- Key is to narrow choice down to a few that:
 - Meet business needs
 - Fit with features preferred by the employees
 - Minimise fatigue/sleeping/health & safety problems
- Allow employees to select the schedule (as long as it meets pre-established business parameters)

DESIGN CONSIDERATIONS

SITE SPECIFIC CRITERIA



	MON	TUE	WED	THU	FRI	SAT	SUN
1	D	D	D	D	-	-	-
2	E	E	E	E	-	-	-
3	N	N	N	N	-	-	D
4	D	D	D	-	-	-	E
5	E	E	E	-	-	-	N
6	N	N	N	-	-	D	D
7	D	D	-	-	-	E	E
8	E	E	-	-	-	N	N
9	N	N	-	-	D	D	D
10	D	-	-	-	E	E	E

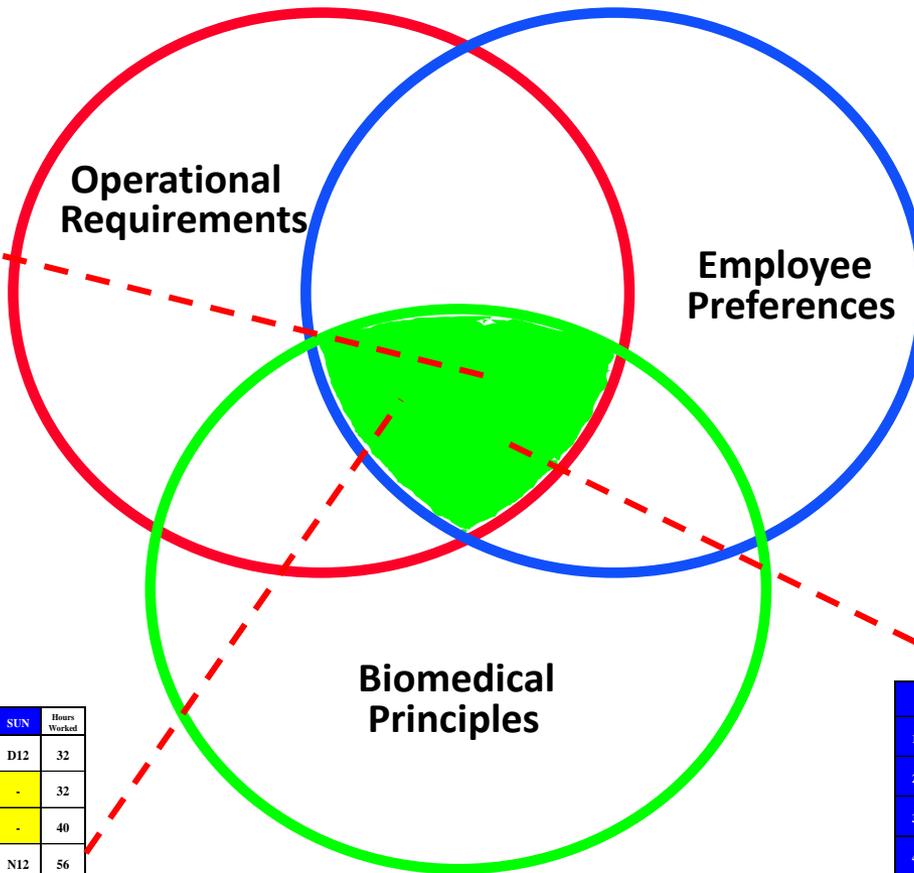
4-3,4-3,4-2

	MON	TUE	WED	THU	FRI	SAT	SUN	Hours Worked
1	-	-	-	-	D	D12	D12	32
2	D	D	D	D	-	-	-	32
3	E	E	E	E	E	-	-	40
4	-	N	N	N	N	N12	N12	56
5	N	-	-	-	-	-	-	8
Total Hours Worked								168
Avg. Hours Per Week								33.6

7-3, 5-3, 7-10

	MON	TUE	WED	THU	FRI	SAT	SUN
1	D	D	D	D	-	-	-
2	-	-	-	-	N	N	N
3	N	-	-	-	D	D	D
4	-	N	N	N	-	-	-

4-7,4-3,3-1,3-3



WHY IS SLEEP IMPORTANT?



Allows us to perform at our optimum, both physically and mentally:

Physically:

- Recuperate and restore energy
- Enables the body to repair itself
- Helps immune system to work at its best
- Flush neuro-garbage (Amyloid protein, Tau proteins, stress molecules etc.)

Mentally:

- Essential to our mental well-being – pre-frontal cortex (decision making) gets some rest
- Sleep deprivation can lead to anxiety and depression
- Crucial in our memory retention and the learning of new motor skills

Keep in mind:

- Most people experience some kind of difficulty with sleep at some time
- The best way to stay alert, productive, and feeling good is to get better sleep (at home)

THE BENEFITS OF NAPPING



The Benefits of Napping:

- 10- to 15-minute naps provide an alertness boost lasting up to several hours.
- A 90-minute nap before the night shift can improve alertness and performance by about 30%.

Benefits depend upon:

- How often you nap
- Length of the nap
- Type of sleep obtained during the nap
- Total amount of sleep debt prior to the nap
- What you have to do when the nap is completed



SLEEP DISORDERS



- International Classification of Sleep Disorders (ICSD) – 3rd Edition 2014
- 63 different sleep disorder categories with over a 100 specific types
- The main categories are:
 - Problems initiating and maintaining sleep and disorders of excessive sleepiness
 - Physical events that occur or become worse during sleep (i.e. sleepwalking)
 - Sleep problems associated with mental, neurological or other medical problems (Parkinson, alcoholism, etc.)
- 25-30% population have sleep disorder (*NIH, US*)
- 95% of sleep disorders are undiagnosed (*National Commission of Sleep Disorders Research*)

If you feel you may have a sleep disorder, visit your doctor right away!

 pepdays



SLEEP HYGIENE



- Light
- Noise
- Temperature
- Bedding
- Feedback
- Caffeine
- Nutrition



CAFFEINE: THE PROS AND CONS



- ✓ Can increase alertness
- ✓ Can improve reaction time
- ✓ Can improve performance
- ✓ Can improve overall energy
- ✓ Works quickly (in about 30 minutes)
- ✓ The effects last for 3-5 hours in most people
- ✗ Can cause gastrointestinal problems
- ✗ Stays in the body for several hours
- ✗ Caffeine is addictive
- ✗ May worsen some sleep disorders
- ✗ High levels promote stress, anxiety and irritation
- ✗ Coffee is a mild diuretic
- ✗ Cutting back can cause withdrawal symptoms

