Chapter 6

Altered states of awareness

Curriculum statement topic
Psychobiology of altered states of awareness

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Why do we need sleep? How does sleep deprivation affect our concentration? Why do we sometimes wake up and remember our dreams, but not always? What strategies can be taken to overcome insomnia? What effect does fatigue have on the road toll? How can we better cope with stress when facing exams? Does jet lag put sporting teams who have to travel at a disadvantage?

Our state of awareness is constantly changing and it affects our ability to function in different situations. It is affected by the amount of sleep we have, and our level of psychological and physiological arousal or stress.

As in previous chapters, you could use any of the four levels of explanation — socio-cultural, person, basic processes or biological — to examine altered states of awareness. For example if using a socio-cultural level of explanation, you might examine the influence of cultural factors such as having a siesta (a nap in the afternoon), which is traditional in countries such as Spain and Mexico and in South America. Alternatively, you might focus on how a busy modern lifestyle affects our levels of stress and our ability to sleep.

However, this chapter focuses on how a biological level of explanation can be used within the field of psychology to explain factors that affect our lives.

The SSABSA Stage 2 Curriculum Statement states that 'the biological level of explanation focuses on the biological and chemical processes underlying behaviour'. Within this chapter we are focusing on the biological and chemical processes within our brains and bodies that influence our levels of sleep and stress.

**CIRCADIAN RHYTHMS**

A circadian rhythm is a behavioural or physiological cycle that takes place over a 24-hour period. Examples of circadian rhythms include the sleep/wake cycle, body temperature, blood pressure, secretion of growth hormone and blood sugar levels. The body temperature circadian rhythm fluctuates about one degree centigrade each day. Generally, it peaks in the late afternoon and is at its lowest in the early morning. The drop in body temperature in the evening coincides with a drop in alertness. The growth hormone secretion circadian rhythm also links into this. The peak for the release of growth hormone is around midnight, which allows the body to rebuild and restore tissue and cells during the sleep phase when the body is least active, due to the sleep/wake cycle being in a period of low alertness.

**The sleep/wake cycle**

The sleep/wake cycle is a prime example of a circadian rhythm. The graph for this cycle is similar to that for the circadian rhythm for body temperature.

![Figure 6.1 Circadian rhythm graph of the sleep/wake cycle, body temperature and secretion of growth hormone](image-url)
In simplest terms, our levels of alertness are at their lowest in the early hours of the morning and they peak in the late afternoon. However, as will be discussed later, this peak in alertness can occur at different times in different people, depending upon factors such as whether they have a sleep debt, whether they do shift-work or their interest level in a particular task.

Circadian rhythms are controlled by areas in the brain. The sleep/wake circadian rhythm is controlled by the **SCN (suprachiasmatic nucleus)**. The SCN is a small cluster of nerve cells located in the hypothalamus in the brain. The SCN is a biological clock that keeps track of the time of day and hence regulates the timing of circadian rhythms within our body. Light is the external cue that synchronises this clock. There are receptors in the retina at the back of the eye that detect the level of light outside the body. The light is converted into an electrical impulse that then travels from the retina, through the optic nerve to the SCN, which responds to changes in light.

The SCN sends messages that make the brain and body adapt to whether it is day or night. Some of these adaptations include changes to our level of sleepiness, body temperature and blood sugar. The SCN controls the sleep/wake cycle by sending messages to the pineal gland to adjust melatonin levels, which plays a key role in adjusting our sleep circadian rhythm. It sends these messages by regulating levels of **hormones** and **neurotransmitters**. The SCN receives a message about whether it is light or dark outside the body and then tells the pineal gland to regulate the amount of the hormone **melatonin** accordingly. As light falls on the retina, it sends a signal via the optic nerve to the SCN, which then inhibits the secretion of melatonin from the pineal gland. Melatonin is the hormone that tells our body whether it should be awake or asleep. Our desire to sleep increases as melatonin levels rise and body temperature decreases. The reverse is also true; we wake up and alertness increases as our melatonin levels decrease and body temperature increases. Melatonin levels are at their highest at night and at their lowest during the day, therefore melatonin must be involved in helping us to sleep.

The release of melatonin is not a simple on/off switch. Melatonin is secreted during the sleeping phase of the circadian rhythm and prior to it. It signals and creates the onset of sleepiness. As melatonin is so critical for regulating the sleep/wake cycle, it has been used as a treatment for insomnia, to help synchronise the sleep/wake cycle in blind people and to help resynchronise the circadian rhythm in people who are travelling to a new time zone.

If patterns of external light and dark cues are altered, the circadian rhythm of melatonin release still remains the same for some time. Going to sleep in the dark and waking up in the light helps keep the sleep/wake circadian rhythm in phase.

In the United States, melatonin is available as an over-the-counter nutritional supplement. In countries such as Canada and Britain, there are restrictions placed on its availability (such as needing a prescription). Many countries are less liberal with the availability of melatonin as the potential long-term side effects are not known.

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**Figure 6.2** Information travels from the retina via the optic nerve to the SCN, which then alerts the pineal gland to increase, decrease or continue the release of melatonin.
Circadian rhythms can be desynchronised by things such travel across time zones, which leads to jet lag, and changing shifts at work. The desynchronisation happens because our body is awake when the outside cues says it should be asleep, or vice versa. Circadian rhythms are also affected by illness, stress, fatigue and genetic differences.

As well as the circadian rhythm, there are other factors that contribute to our level of awareness and sleepiness, such as interest level in an activity, the ‘post-lunch dip’ and how much sleep we had the night before. The post-lunch dip refers to a decrease in alertness and a rise in sleepiness that some people experience after lunch. There is much discussion as to why this occurs — one suggested reason is that it is a side-effect of eating a large, high-carbohydrate meal for lunch. Two possible ways to overcome this are to eat lunch in two smaller snack meals, or to do something energetic such as go for a walk immediately after eating lunch.

**Influence of jet lag on sporting performance**

Technically, jet lag occurs when new environmental time cues are different from the time that our biological clock and circadian rhythms believe that it should be. Jet lag results in reduced quality of sleep. It is most obvious when people travel through several time zones; however, many people will notice small differences to the time that they naturally begin to feel sleepy or wake up when they travel distances that make their circadian rhythm only 1 or 2 hours different from external cues. Jet lag results from travelling through different time zones to get to a destination. If a person travelled for several hours but remained in the one time zone, they may be tired from travelling but wouldn’t be suffering from jet lag.

Our bodies are slow to adjust to new time zones. The sleep/wake cycle can adapt to a five- to eight-hour time change in as little as two days but it may take as long as several weeks for some people. On average, it takes about one day of adjustment for every hour of time-zone change experienced. This can typically make people feel very sleepy during the day or be wide awake at night because their sleep/wake circadian rhythm hasn’t adjusted to the new time zone. Other symptoms of jet lag include increased fatigue, loss of concentration and increased irritability (Herxheimer & Waterhouse, 2003).

The body adjusts to changes more easily if bedtime is delayed than if it is brought forward. Essentially, it is easier to stay up later than to force yourself to go to sleep if you are not tired. You can adapt to westward travel, which lengthens the day, more easily than travelling eastward which shortens the day. Shortening the day means that the external cues are telling you that it is time to go to sleep, before the internal cues of the circadian rhythm recognise that it is.

People who travel long distances for work will commonly find that their circadian rhythm is ‘out of sync’ with the external cues of their new location. Sportspeople are one group who need to minimise the impact of jet lag on their performance.

Many sportspeople at the elite level are required to travel through a number of time zones to compete in their chosen sport. In some cases, they may have several weeks

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**LEARNING ACTIVITY 6.1**

**Review questions**

1. What is a circadian rhythm?
2. Describe one example of a circadian rhythm.
3. Draw a graph of a circadian rhythm of the sleep/wake cycle. The x-axis should be labelled ‘time’ and the y-axis should show the level of awareness.
4. Draw a flow chart to summarise how the sleep/wake circadian rhythm is regulated.
5. Explain why circadian rhythms fit into a biological level of explanation within the field of psychology.

**LEARNING ACTIVITY 6.2**

**Apply to a scenario**

Damien often has a different schedule for going to bed and waking up on weekends from the one he has during the week. He argues that it doesn’t matter if he stays up late to study or socialise on Friday or Saturday night because he can sleep in as late as he wants to the following day.

Use your knowledge of circadian rhythms to explain why it is important for Damien to maintain a regular going to bed and waking up time schedule, even on weekends.

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**Figure 6.4** Sportspeople need to be aware of how to minimise the effects of jet lag.
Jet lag and the World Cup qualifiers

Uruguay is sending an advance posse of six players and two coaches who will arrive in Australia today. The six include three players — defender Diego Lugano, and midfielders Omar Pouso and Gustavo Varela — who will miss the first leg of the playoff through suspension. Others include midfielder Martin Liguera and striker Sebastion Abreu. The group of six are traveling with assistant coach Eduardo del Capellanas as well as two officials from the Uruguayan Football Association and a team doctor. The advance group will be able to recover from jet lag and adjust their body clocks in time for next Wednesday night’s return leg against the Socceroos.

Herald Sun, 9 November 2005

Figure 6.3 The Socceroos were also likely to suffer from jet lag when they travelled to and from Uruguay.

for their body to become accustomed to a new time zone. However, very often, sportspeople have to compete only a short time (say 1–2 days) after travelling to a new time zone. During November 2005, Australia’s soccer team, the Socceroos, qualified for the 2006 Soccer World Cup. To do this they played Uruguay, with the first game played in Uruguay and the second in Sydney. This means that the players’ biological clocks would have been more than three hours different from the time zone in which they were playing.

On a more regular basis, sportspeople such as AFL, basketball, soccer and netball players fly around Australia each week during their season to play sport. Players and team personnel need to be aware of jet lag and must manage player’s daily schedules to minimise any effect of the change in time zone.

LEARNING ACTIVITY 6.3
Review questions

1. What is jet lag?
2. Think about sports in Australia that require teams to fly around the country. Are teams from Adelaide less or more likely to suffer from jet lag than teams from the Eastern states and from Western Australia?
3. Sanjiv is going to travel from his home city of Darwin to California in the United States to play in a golf tournament. He will be arriving less than 24 hours before the tournament begins. Describe the effect that jet lag could have on Sanjiv’s body and hence his sporting performance.

LEARNING ACTIVITY 6.4
Research and group discussion

Use the Internet or library resources to research how the managers and coaches of sporting teams try to minimise the effect of jet lag on the performance of their players. For some websites that you may find useful, visit www.jaconline.com.au/psychology/psych?? and click on the Managing jet lag weblinks.
SLEEP DEPRIVATION AND SLEEP NEEDS

It is clear that circadian rhythms affect our desire to sleep. However, there are also other factors that affect when we actually fall asleep. Sleep is a homeostatic process. This means that the longer a person is awake, the more their desire to sleep will increase. Figure 6.5 shows that this desire to sleep increases until we actually do sleep, which makes the desire reduce.

Our accumulated sleep debt affects our desire to fall asleep. On average, a person needs to sleep eight hours each night. If you sleep less than eight hours each night, you accumulate a sleep debt, which is the difference between the amount of sleep that you need to function at an optimal level and the amount that you actually had. For example, if you need eight hours of sleep but get only seven hours, you have a sleep debt of one hour. When we have a sleep debt, our body’s desire to sleep during the day to make up the lost hours of sleep is greater than if we had the optimal amount of sleep. It is important to understand that a sleep debt doesn’t continue to build up over a lifetime. For example, if you slept one hour less than you needed to for 30 days, this doesn’t mean that you need to sleep for 30 extra hours to function at an optimal level again. If the body was left to naturally go to sleep and naturally wake up without the external cues of an alarm, light or noise, it would sleep longer for the first night and possibly the second; however, the hours of sleep would then reduce back to the optimal amount of sleep required.

Other factors that affect our ability to get to sleep are whether caffeine or drugs have been taken, stress levels and social and environmental factors (Weiten, 2004).

LEARNING ACTIVITY 6.5
Whole class activity

Think of a day when you were sleep deprived. Maybe you were up late studying, at work, at a party or travelling long distances the night before. List the effects that sleep deprivation had on your mood and ability to function during that day. Compare notes with others in your class and come up with a class list of the changes that people experience as a result of sleep deprivation.

Figure 6.5 Our desire to sleep increases the longer we are awake.

Sleep deprivation

Sleep deprivation is a very common condition. It is when we don’t get the sleep we need to function at an optimal level. Sleep deprivation increases as our sleep debt increases. It is generally accepted that sleep deprivation has a negative effect on our body and its biological and chemical processes. Sleep deprivation reduces the effectiveness of our immune system. In the long term, it can lead to health problems, hallucinations and delusions. In society, it is most common for people to suffer from partial sleep deprivation. This means that they get some sleep each 24-hour period but not of the quality or quantity that is considered necessary for optimal daytime functioning. Common symptoms of partial sleep deprivation are increased daytime sleepiness, irritability, hand tremors, slower than normal reaction time, poorer memory, lapses in attention and microsleeps. Microsleeps are when a person enters a state of sleep for a very brief time, often for only a few seconds but sometimes for several minutes. The person may or may not close their eyes, stare blankly and stop paying attention to what they are doing. Microsleeps are particularly dangerous when someone is driving a car or operating machinery. They are common during monotonous tasks. The chance of a microsleep happening increases as our sleep debt, and hence our sleep deprivation, increases.

Some research into the effect of continuous sleep deprivation on the body has shown that on the second night of sleep deprivation, people fall asleep but deny it. On the third day they become tense, apathetic and irritable when disturbed, have mood swings, microsleeps and may experience illusions and hallucinations. By the fourth day people are paranoid. These negative effects raise many ethical issues about research into the effect of sleep deprivation (Sternberg, 1995).
Pilcher and Walters (1997) aimed to assess the effects of sleep deprivation on cognitive performance and mood. The participants were 44 volunteers with a mean age of 20.5 years (standard deviation = 4.37). The participants were given extra credit points as an incentive to participate.

The Watson-Glaser Critical Thinking Appraisal is a standardised test that was used to measure cognitive performance.

At 10 pm on a Friday night the participants reported to the sleep lab. Participants were asked to get out of bed between 7 am and 9 am on the Friday morning and not to nap during the day. Students were randomly assigned to either a sleep-deprived or a non-deprived group. They signed consent forms to participate in the research. The non-deprived group were then told to go home, go to bed between 11 pm and 1 am and get up again between 7 am and 9 am so that they slept for approximately 8 hours.

The sleep-deprived group spent the night in the sleep laboratory with two researchers. They watched movies, played video and board games or worked on personal projects. They were allowed to eat food and drink but were limited to two each of caffeine drinks and sugary snacks. At 10 am the next day all the participants were tested for cognitive performance. The sleep-deprived group scored lower than the non-sleep deprived group on the cognitive performance test, the Watson-Glaser Critical Thinking Appraisal (see figure 6.6).

The study also found that sleep-deprived participants reported feeling more fatigue, confusion and tension.

**LEARNING ACTIVITY 6.6**

**Summary of Pilcher and Walters (1997) research**

1. Discuss the ethical issues raised by the Pilcher and Walters (1997) study.
2. Explain which features of Pilcher and Walters’ research make it an experimental design.
3. An objective quantitative method of assessment was used. What advantages did this have over a subjective assessment of cognitive performance?
4. Based on the results of this study, what advice about sleep would you give a student who is approaching exams?

**LEARNING ACTIVITY 6.7**

**Ethics**

You are going to research the effects of continuous sleep deprivation on a group of Year 12 students. Previous research has shown that continuous sleep deprivation can eventually lead to microsleeps, illusions and hallucinations. In these states, people are unable to think logically or evaluate the effect the research is having on them.

In groups, discuss the ethical issues that might arise from completing this research. Report your ideas back to the class.

**Sleep needs**

As research generally shows that sleep deprivation has a negative effect on our bodies, it follows that one of the reasons that we need sleep is to stop these negative effects from occurring. Despite this, there isn’t one definitive explanation of why we need sleep. The amount of sleep needed varies from individual to individual and can depend on factors such as age: on average, we need 6 to 10 hours per night. Figure 6.7 shows that young children require about 12 to 16 hours of sleep, but as we get older we require less sleep. Researchers argue that there is a range of reasons why we need to sleep. These reasons include energy conservation, repair and restoration, and to consolidate memories.
When we sleep, we use less energy than when we are awake. One of the key reasons for this is that our metabolic rate is lower, and there could be an evolutionary basis for this. While walking around, or even while just sitting, humans use more energy than while they sleep. During prehistoric times, it was much harder for humans to get food than it is today. By sleeping for part of the day, humans could conserve some of the energy they gained from this scarce resource. The downside of this is that sleeping would have made our ancestors more vulnerable to predation. Berger and Phillips (1995) argue that sleep allows the body to conserve energy, which is evidenced by the fact that our temperature drops slightly when we sleep. The body isn’t required to work as hard when it has a slightly lower temperature. At the same time, though, our brains still use quite a lot of energy to process our thoughts, particularly during the REM stage of sleep.

Energy conservation

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Repair and restoration

Another theory about why we need sleep is that it aids repair and restoration. A lot of cell repair occurs during sleep, although relaxed and restful wakefulness also allows much cell repair to occur. During sleep, our body strengthens its immune system and eliminates waste products from muscles. Studies show that people who experience partial sleep deprivation over a period of time are more likely to suffer from a range of illnesses.

Memory consolidation

There is much research to support the idea that sleeping allows our brain to consolidate learning and, in particular, to make sense of our memories and store them in a logical and accessible order (Paller & Voss, 2004). Rauchs et al. (2005) concluded that different types of memories are consolidated in different stages of sleep. People who get plenty of deep NREM sleep in the first half of the night and REM sleep in the second half improve their ability to perform spatial tasks. This means that the quality of a person’s sleep is important. It is important for memory consolidation that the brain has an opportunity to spend time in each stage of sleep. (See pp. 000 for more about the stages of sleep.)
STAGES OF SLEEP

When we sleep, we pass through five stages. Stages 1 to 4 are also known collectively as NREM (non-REM) sleep. REM sleep is the fifth stage of sleep. As our brains move from a waking state through to deeper stages of sleep, our brainwaves become slower; or, in other words, our mental activity slows down. Through the use of an EEG (electroencephalograph), researchers have been able to study people who are sleeping to identify these five stages and to then identify what makes each stage distinct from the others. An EEG is a device that monitors the electrical activity in the brain. A researcher places electrodes on the scalp of the person. The EEG represents the activity in the brain by making tracings on paper. These tracings are known as brainwaves. Brainwaves can differ in amplitude and frequency. Amplitude is the height of the brainwave. Frequency is the number of cycles per second (cps). When we are in different states of consciousness, awake and asleep, the amplitude and frequency of the brainwaves differs. Brain waves are named after letters in the Greek alphabet: beta, alpha, theta and delta.

When we are awake, our brains are very active and on an EEG, activity can be seen by beta waves which have a high frequency of 13–24 cps. Just before entering stage 1 sleep, we experience deep relaxation and our brain activity begins to slow. An EEG will now show brain activity as alpha waves, which have a slower frequency of 8–12 cps.

Stage 1 sleep usually happens for only a few minutes and is the first stage of sleep that we fall into. People woken from stage 1 sleep will often deny that they have been asleep at all, as they may have been sub-consciously aware of noise in their surroundings. Theta waves can be seen on an EEG during this phase. Theta waves have a lower frequency than the alpha waves that occur red in the relaxed state just before stage 1 sleep. Theta waves have a frequency of 4–7 cps.

A number of physiological changes also happen as we enter stage 1 sleep. Eye movements, breathing and heart rate slow down, muscles relax and blood pressure drops. Stage 1 is a light stage of sleep. Brief muscular contractions called hypnic jerks can also happen during stage 1 sleep.

During stage 2 sleep, theta waves continue. However, the start of stage 2 sleep is signified by the onset of sleep spindles (waves of lower amplitude but higher frequency than theta waves) and K-complexes (slow, high amplitude waves). Both of these can be seen on an EEG reading. During this stage, sleep continues to deepen; however, stage 1 and stage 2 are the lightest stages of sleep. Respiratory rate, heart rate, muscle tension and body temperature continue to decline. This stage typically lasts about 10 to 25 minutes.

On an EEG, stage 3 sleep begins as delta waves commence. These are high-amplitude, low-frequency, rhythmic brainwaves. Muscles continue to become more relaxed and sleep becomes deeper. During stage 3 sleep, delta waves make up less than 50 per cent of brain activity.

Stage 4 sleep begins when delta waves make up more than 50 per cent of brain activity. This is the deepest stage of sleep. The muscles are relaxed, there is a decreased rate of respiration and a slightly lower body temperature. Stage 3 and 4 sleep are sometimes known as delta sleep or SWS (slow wave sleep). As people sleep more deeply during these stages than the others, they are the stages during which it is hardest to awaken someone. If someone is woken during this stage, they are often confused and disorientated. People woken during this stage will also not typically remember the dreams they have experienced in their sleep. After stage 4 sleep, a person cycles back through stages 3 and 2; however, they then enter REM sleep rather than stage 1 sleep.

Figure 6.8  The stages of sleep as shown by an EEG reading
REM sleep has some very distinct characteristics, which is why the other stages are sometimes grouped together as non-REM sleep. REM stands for Rapid Eye Movement. During this stage, the eyes rapidly move left to right and up and down. If you closely watch someone in the REM stage of sleep, you can see the eye moving under the eyelid. However, in a sleep lab, researchers use an electro-oculograph to monitor rapid eye movements. In the body, pulse rate and blood pressure quicken, respiration is faster and irregular, and muscles relax. This is also the stage when the most dreaming occurs. People who are awoken during this stage often report dreaming. While dreaming does occur during the other stages, it is less common and the dreams during other stages are also considered to be simpler. Dreams during REM sleep seem to be more complicated, abstract and emotional. If a person wakes up during the night, they re-enter sleep at stage 1 sleep again. During REM sleep, an EEG records high frequency beta waves. This means that during REM sleep, brain activity is similar to that of a person who is awake. This means that the brain is just as active during REM sleep as it is during wakefulness. You need to look at indicators other than just EEG readings to determine if someone is awake or in REM sleep, namely muscle activity and rapid eye movement. During REM sleep, recordings of eye movements will show great activity, and muscle movement will be almost non-existent compared to wakefulness.

A cycle of REM and NREM sleep lasts about 90 minutes. As the night progresses, we spend more of the 90 minutes in REM sleep and less in the other stages. On average, people will cycle through stages 1 to 4 and then REM sleep about four times during the night. Age alters our sleep phases. Babies sleep much more than elderly people do.

### Learning Activity 6.10

#### Review questions

1. Draw a table to summarise the characteristics of the five stages of sleep.
2. Which stage of sleep is a person most likely in if:
   - they are awoken and report elaborate dreams?
   - an EEG shows signs of theta waves, sleep spindles and K-complexes?
   - they report being confused and disoriented when awoken?
   - delta waves make up less than 50 per cent of their brain activity?
   - they have slow eye movements, their muscles begin to relax and their blood pressure drops?
   - they experience rapid eye movements?
   - delta waves make up more than 50 per cent of their brain activity?
   - they have just fallen asleep?
3. What characteristics make REM sleep different to stage 1 sleep?
4. What characteristics make stage 3 and stage 4 sleep similar and different?
5. What characteristics make stage 1 and stage 2 sleep similar and different?
6. What characteristics make REM sleep and wakefulness similar and different?
7. Use the information in figure 6.9 to complete the following activities.
   - How many cycles of NREM and REM sleep does the average person go through each night?
   - How does REM sleep change through the night?
   - When do people enter stage 1 sleep?
   - Does the cycle of NREM and REM sleep stay the same throughout the night? Explain your answer.

### Learning Activity 6.11

#### Astronauts’ state of awareness

Visit [www.jaconline.com.au/psychology/psych](http://www.jaconline.com.au/psychology/psych) and click on the Astronaut Study weblink. The activities at this website will test your knowledge of the stages of sleep.
COMMON SLEEP DISORDERS

Sleep disorders are more common than many people think. The International Classification of Sleep Disorders lists almost 70 clinically diagnosable sleep disorders. Sleep disorders also cause greater problems, both for sufferers and the wider community, than you might think, as they contribute to other health conditions and accidents. Sleep disorders generally leave individuals with some degree of daytime sleepiness and, hence, reduced daytime functioning. Three common sleep disorders are sleep apnoea, insomnia and narcolepsy.

Off the air

Last night 500 000 men stopped breathing in their sleep. Were you one of them?

By Reece Doyle

While he was sleeping last night, Paul Russell*, a 49-year-old senior civil servant, stopped breathing 22 times. ‘I thought I’d slept well but at one stage I didn’t breathe for 55 seconds. This has been happening for years and I didn’t have a clue,’ he says, looking at the results of an overnight stay at a sleep disorder clinic.

Russell is one of hundreds of thousands of Australian men who have sleep apnoea — a condition where you stop breathing while asleep. It not only exhausts you; as more is becoming known about it, it’s being blamed for everything from depression to fatal car accidents and increased rates of heart attack.

‘We’ve only really known about it for the past 20 years, but it is a hugely under recognised problem,’ says Professor John Wheatley, director of Sleep and Respiratory Medicine at Westmead Hospital, NSW. ‘Between 80 to 90 per cent of men [with it] don’t know they have it.’

Unlike snoring — where the fleshy tissue at the back of your throat vibrates loudly — that tissue completely closes the airway, stopping you breathing for up to two minutes at a time. It’s only when the lack of air in your system becomes so critical that the brain arouses the sleeper to wake long enough to suck in air and start breathing — and usually they’re not awake long enough to remember the next day. ‘This stops people from getting a good slumber, leaving them with not enough sleep, a lack of energy, poor memory and chronic tiredness,’ says Wheatley.

The land of nod

‘Men tend to get it more than women. Especially men over 40 with extra weight. Around two thirds of the cases I see have weight as a factor,’ he adds.

Access Economics, a leading economics consultancy, estimates that sleep disorders (of which apnoea counts for two-thirds of all conditions) cost the economy $10.3 billion in 2004 — more than the cost of that spent individually on drug abuse, dentistry, skin cancer and HIV/AIDS.

The implications for sufferers are more far-reaching than chronic tiredness though. Dr Ral Antic, director of Thoracic Medicine at the Royal Adelaide Hospital, says that years of sleep apnoea jolting the body is now being linked to increased rates of heart disease, stroke and even depression. ‘It’s amazing that it isn’t considered a major public health priority,’ he says. And motoring body Austroads has concluded that sleep apnoea sufferers are up to seven times more likely to have motor vehicle accidents because of chronic fatigue.

It was falling asleep at the wheel that helped Russell decide he should see a doctor about possible sleep problems. ‘There were lots of other signs too. For years I was always tired in the afternoon, had trouble staying awake in meetings and was told I was a really loud snorer,’ he says.

‘The biggest problem,’ says Wheatley, ‘is that the symptoms happen when you’re asleep and you often can’t remember a thing. Most come in because their partner has told them they stop breathing and wake up gasping.’

The good news is that most diagnosed cases can be successfully tackled, says Wheatley. Treatments can be as simple as losing weight or using an oxygen mask that forces airways open during sleep. ‘One thing’s for sure, people will be hearing a lot more about sleep apnoea in the future,’ concludes Wheatley.

Are you breathing?

Sleep apnoea can affect anyone but if you’re over 40 and have a neck size bigger than 42 cm, you’re a prime candidate, especially if you:

• get plenty of sleep but still feel fatigued
• are told you snore loudly
• have high blood pressure
• are overweight
• wake up with headaches in the morning
• drink heavily, particularly late at night.

If you have three or more of these conditions, see your GP.

*Name changed.

Sleep apnoea

Sleep apnoea is when a person’s breathing stops periodically for a few moments while they are asleep. The breathing may stop hundreds of times a night. In a chronic case, it leads to such disruption of sleep that it can cause high blood pressure and an irregular heartbeat. Sleep apnoea causes a blockage of air passages, as the brain doesn’t control respiration correctly. As sleep is disrupted, sufferers often feel very tired upon waking. It most commonly affects overweight men over 40 years of age. However, it also affects younger people, those who aren’t overweight and women. Weight loss may help to reduce the condition. Sleep apnoea puts pressure on internal organs. The word ‘apnoea’ literally means ‘with no breath’.

The word ‘apnoea’ literally means ‘with no breath’.
Narcolepsy

Narcolepsy is irresistible and unpredictable daytime attacks of sleepiness, lasting 5 to 30 minutes. People have an uncontrollable urge to fall asleep and experience a loss of muscle tension. It tends to run in families and medication can help with the disorder. Essentially, this is a waking disorder as much as a sleep disorder. You might think that it would be most commonly a problem at night when people are relaxed and beginning to feel sleepy; however, it commonly occurs at times when people are in a heightened state of alertness such as when they are laughing, angry or driving. This makes narcolepsy a particularly dangerous sleep disorder because if someone falls asleep while driving or operating machinery there is a high chance of them having an accident. The term ‘narcolepsy’ comes from the Greek words narcosis, meaning ‘numbness’, and epilepsia, meaning ‘seizure’. When people fall asleep during the day due to a narcolepsy episode, they go into REM sleep almost immediately. Its causes aren’t well known but it is thought that some people have a genetic predisposition to the condition.

Insomnia

Insomnia is a sleeping disorder that causes a reduction in quality and amount of sleep, making a person unable to function as they wish to during the day. Symptoms include fatigue and impaired concentration. Most adults suffer from poor sleep and these symptoms at some stage in their lives.

Young people most commonly suffer from insomnia that involves not being able to fall asleep at night, although some people may have difficulty staying asleep and others may regularly wake early in the morning. Some insomnia sufferers experience a combination of two or three of these (Weiten, 2004).

LEARNING ACTIVITY 6.12

Sleep apnoea

Read the article ‘Off the air’.
1. What is sleep apnoea?
2. What causes sleep apnoea?
3. Why does sleep apnoea lead to daytime sleepiness?
4. Which group in the community is most at risk of sleep apnoea?
5. Besides daytime sleepiness, what problems can sleep apnoea cause?
6. What can be done to help to reduce the impact of the condition?

Box 6.2

Causes of insomnia

There are a number of different factors that can cause insomnia. These include psychological, lifestyle and environmental factors.

- Psychological factors such as persistent stress, excessive anxiety and tension can prevent relaxation. Stress can also cause worrying, which leads to a heightened state of psychological arousal that, in turn, makes it difficult for someone to sleep.
- Lifestyle factors such as drinking caffeine or smoking cigarettes may make it difficult to fall asleep, as both of these drugs are stimulants. Working shift work can make it difficult for people to establish a sleep routine, just as someone who has a very inactive lifestyle may find it hard to sleep at night.
- Environmental factors such as noise and light can make it difficult to sleep.

Illness and secondary factors can also contribute to insomnia. People who suffer from headaches, arthritis, depression, back pain, ulcers and asthma can find that their conditions make it more difficult for them to go to sleep.

LEARNING ACTIVITY 6.13

Sleep disorders

1. Summarise three key points about narcolepsy, sleep apnoea and insomnia.
2. Read the following scenarios and decide which of the sleep disorders mentioned in this chapter the person might suffer from.
   a. Tran has been experiencing an uncontrol- lable urge to fall asleep during the day, but he usually falls asleep for only 5 to 10 minutes.
   b. For the past two months, Alexis has been having trouble falling asleep and staying asleep at night. This is making it difficult for her to work at her best during the day. She usually feels fatigued and can’t concentrate.
   c. Neil is tired during the day because he wakes up briefly several times during the night even though he isn’t aware of this. His wife has told him that it is worrying when he stops breathing for a few seconds, then appears to wake up before going back to sleep again. She has told him that this happens several times a night.
3. Choose one of the three sleep disorders described and explain how it disrupts the chemical and biological process of the circadian rhythm.
There are a number of psychological interventions that can be used in the treatment of insomnia. These include stimulus control therapy and sleep restriction therapy. 

Stimulus control therapy is based on the assumption that where a person sleeps becomes associated with factors to do with staying awake. Many insomnia sufferers say that they can fall asleep in their lounge room but not in their bed. They may have had trouble sleeping in the past, due to stress from work and therefore learnt to associate bed with lying awake. To remove this conditioned pattern of association, insomnia sufferers are given rules to follow that encourage only sleep-promoting behaviour in the bedroom. These rules are:
1. Lie down in bed to go to sleep only when you feel sleepy.
2. Don’t use the bed to do things such as read, watch television, eat or worry.
3. If you lie down in bed but can’t sleep, get up and go into another room. Don’t stay in bed more than 10 minutes. Repeat this step as many times as you need to during the night.
4. Get up at the same time every morning, irrespective of how much sleep you had during the night.
5. Do not nap during the day.

These rules aim to help people to associate bed with going to sleep. By not napping during the day, a person should be more tired the next night and so should fall asleep more easily when they go to bed.

Sleep restriction therapy works on the theory that limiting the amount of time spent in bed will lead to more effective sleep. It acknowledges that spending a lot of time in bed can lead to the development of insomnia. Limiting the amount of time someone can be in bed, and hence sleep, makes them more sleep deprived, which leads to an increase in sleep debt. The sleep debt makes the person more tired, so they will fall asleep more easily the next night. This process helps to keep a person’s circadian rhythm in sync with outside cues. In some aspects it is similar to stimulus control therapy. Stimulus restriction therapy follows this process:
1. Person records their estimated amount of sleep time each night in a sleep diary for two weeks.
2. The diary is used to work out their average number of hours sleep per night.
3. The person is then allowed to stay in bed for the average number of hours slept plus 15 minutes, but the total amount of time is never less than four and a half hours.
4. Get up at the same time each day.
5. No naps allowed during the day.
6. Once a person sleeps for 75 per cent of the time that they are allowed to spend in bed for five days, they are allowed to go to bed 15 minutes earlier.
7. Repeat procedure until the person can sleep for eight hours or the amount of time desired.


LEARNING ACTIVITY 6.14
Insomnia therapy

1. What are the key differences and similarities between stimulus control therapy and sleep restriction therapy?
2. Explain why stimulus control therapy and sleep restriction therapy can be effective treatments for insomnia, but not for narcolepsy or sleep apnoea.

LEARNING ACTIVITY 6.15
Class discussion

Which of the sleep disorders is most likely to increase in incidence in the future? Justify your reasons.

Box 6.4

Sleep disorders in Australia

A report released in 2005 discussed the prevalence and costs of sleep disorders in Australia. Up to 90 per cent of the population suffer from poor sleep at some point in their lives. This is due to factors such as shiftwork, a busy lifestyle and stress.

The report estimated that 1.2 million Australians, or about 6 per cent of the population, experience a primary sleep disorder at any given time. This is a sleep disorder that isn’t due to another medical condition (see table 6.1). The percentages would be higher if those suffering secondary sleep disorders were included in the statistics. Secondary sleep disorders are considered to have developed due to symptoms and side effects of another disorder. Many sufferers of sleep disorders have never had the disorder diagnosed by a physician.

(continued)
Shiftwork and Workplace Accidents

Shiftwork is a common example of something that can affect people’s sleep/wake circadian rhythm. People who work night shift all the time are affected, but those who regularly have to swap between day and night shifts are affected most. These people live out of cue with environmental situations. Shift-workers typically suffer from poorer sleep quality and reduced night alertness, and have more accidents than non-shiftworkers.

Shiftwork has a negative effect on health. Adjusting to a new shift at work can lead to the circadian rhythm being desynchronised. People find themselves feeling tired and irritable, suffering sleep disturbances and digestive complaints, and are more likely to have accidents. They also suffer from a higher rate of sleep disorders, gastrointestinal disease and cardiovascular disease (Rajaratnam & Arendt, 2001).

Adjusting to shiftwork is difficult because, as with jet lag, the external cues of light and dark conflict with the internal cues of melatonin and body temperature. From 2 am to 6 am, it is very difficult to stay awake. As with adapting to jet lag, when you change a work schedule it takes an average of one full day to adjust to every hour of schedule change.

Night workers who need to sleep during the day tend to have less sleep as melatonin is secreted at night. Our desire to sleep begins as melatonin levels rise and body temperature decreases. The reverse is also true: we wake up and alertness increases as our melatonin levels decrease and body temperature increases. Light reaching the retina is the outside cue for this. People who do night work need to sleep during daylight hours, hence they sleep less. People who do permanent night work are likely to have a shifted circadian rhythm, with melatonin peaking in the day, although there is usually a smaller amplitude of this than in people who are day workers.

If night workers fall asleep before the sun rises, they can stay asleep during the day more easily. If they don’t go to sleep until mid-morning, and have therefore been exposed to more light, the body becomes ‘confused’: it feels tired but the external cues are saying to wake up. This means that the person often can’t sleep as long, and their sleep quality isn’t as good, unless they are exhausted. The sleep deprivation that is often experienced by shiftworkers affects their ability to perform tasks safely and efficiently. As a person’s level of alertness decreases, so does their performance. This not only leads to a loss in profits at work, but also increases the risk of workplace accidents.

It is believed that sleepiness and fatigue associated with shiftwork contributed to some major accidents, including the Three Mile Island and Chernobyl nuclear power plant disasters. These disasters both occurred during the night shift.
At 1.23 am on 26 April 1986, there was an explosion at a nuclear power plant in Chernobyl, USSR. Thirty people died immediately. There were high levels of radiation released into the air. While there were a number of factors that contributed to the disaster, Akerstadt et al. (date???) identified fatigue of night shiftworkers as one of the major factors.

The high levels of radiation in the air were seen to cause increases in many physiological and psychological conditions in the surrounding population during the years after the explosion. There was a significant increase in thyroid cancer among children from birth to 14 years of age, although the survival rate among these children has been very good. There was also an increased incidence of anxiety and depression as a result of health, economic and social issues following the explosion. This led to further debate about the dangers of nuclear energy.

It is harder to stay awake when you are sleep deprived. Sleep loss leads to slower physical and mental reaction times, increased errors and impaired memory. Lamberg (2004) cited evidence from Folkard and colleagues, who concluded that people who work night shift have a 30 per cent higher risk of injury than people who work the day shift. They also concluded that the risk of being injured on night shift increases the longer it has been since the person had time off. This is because night shiftworkers carry a greater sleep debt the more days in a row they work. The challenge for workers, employers and government bodies is to find ways to minimise the negative impact of shiftwork on sleepiness and health.

At the Sleep Research Centre at Queen Elizabeth Hospital in Adelaide, Lamond et al. (2003) undertook a study to investigate how simulated night shiftwork affected the amount of sleep someone got. The researchers were also interested to discover whether night shifts had an impact on circadian rhythm and performance. Their study showed that the simulated shiftwork didn’t have as great a negative effect on sleep and performance as other studies had shown.

The study found that people’s performance was poor on the first night but improved over the seven-day period. Lamond et al. concluded that performance suffered on the first night because the participants had been awake all day and then awake all night, hence their time of wakefulness was longer than on the other days.

Other studies have shown that people’s performance doesn’t significantly improve the longer they do shiftwork. Lamond et al. concluded that their results differed because in the simulated environment the participants had very dark and quiet sleeping spaces and didn’t have social and domestic interruptions (such as traffic noise, telephones and people knocking at the door). This allowed sleep to be the main focus when they finished their shiftwork.

From these results, Lamond et al. drew several conclusions about how to minimise the negative effect of shiftwork on health.

- Obtain adequate sleep quality and quantity during the day to minimise accumulated sleep debt and hence maximise night-time performance.
- Educate night workers about how factors such as light, noise and social factors such as friends and family minimise the sleep they get and the need to organise these factors.
- Wear dark glasses if returning home from work in daylight to minimise exposure to light.
LEARNING ACTIVITY 6.17

Summary of Lamond et al. (2003) study

1. What reason did Lamond et al. give to explain why their study didn’t show such a negative effect of shiftwork on sleep and performance as other studies?
2. Why do researchers need to be wary of concluding that results obtained in simulated environments in laboratories apply to the general population?
3. What advantages do you believe that Lamond et al. gained by completing their research in a simulated environment rather than a real world environment?
4. What might be some ethical issues that would need to be considered in this kind of study?

Overall, there are a number of things that can be done to minimise the negative impact of shiftwork.

- Change shifts as infrequently as possible. This allows time for the circadian rhythm of melatonin secretion to become more synchronised to sleep.
- The use of bright lights to ‘reset’ the biological clock in the SCN can help shiftworkers adjust to a new time schedule more quickly. However, studies are still being done on the timing, intensity and duration of the light required.
- If returning home to sleep once the sun has risen, wear dark glasses to limit the amount of light that can be registered by the SCN.
- Taking melatonin supplements may help. These are commonly available in the United States from health food stores. In Australia, Canada and Britain you can obtain melatonin only with a prescription. Given that it is a relatively new treatment and the long-term effects of taking it are not yet known, it is not generally recommended.
- Taking short naps is valuable to maintain alertness as awake time progresses.
- Drink caffeinated beverages while at work. However, the effect of caffeine reduces if it is drunk regularly.
- Education programs in managing sleepiness can be helpful.
- During the day, sleep in a dark, quiet environment.
- If changing shifts, rotate them forwards rather than backwards as laboratory studies show that people can adapt to forward shift rotation more rapidly than backward rotation.

LEARNING ACTIVITY 6.18

Night shifts

1. Why are fatigue and sleepiness a greater problem for night shift compared to day shift workers?
2. Why might it be difficult to measure the impact of fatigue on accidents at work and loss of production?
3. What are some of the negative effects of shiftwork on health?
4. Explain why taking melatonin can help to reduce the negative effects often experienced by shiftworkers.
5. Explain why wearing dark glasses when leaving work after a night shift can help a person to improve their sleep quality and quantity during the day.

LEARNING ACTIVITY 6.19

Application task

Kathleen has just finished studying to become a nurse. While she loves helping and supporting patients, she is concerned about how fatigued she could become once she begins working night shift and changing shifts.

Give Kathleen some advice about strategies she could adopt to reduce the negative effect of shiftwork on her health and levels of fatigue.

FATIGUE AND THE ROAD TOLL

Many factors contribute to accidents and fatalities on our roads, including speed, blood alcohol level and driver inattentiveness. Luckily, we have ways to measure or observe these three things. We can measure if someone is driving at a speed that is dangerous or if they have a blood alcohol level that is considered too high, and we can observe someone using a mobile phone or being otherwise distracted.

Fatigue is another factor that increases the road toll, but how do we accurately measure fatigue? How much fatigue makes us dangerous on the road? What can governments and we as individuals do to reduce the impact of fatigue on the road toll?

Fatigue basically means that someone is drowsy, more likely to fall asleep and has impaired performance such as slower reaction time.
Fatigue could lead to an accident if someone actually falls asleep, or it could simply increase reaction time and make the driver less attentive so that they are unable to avoid an accident as they would normally. Reports show that fatigue contributes to between 10 and 30 per cent of fatal crashes. This statistic does differ in various reports because fatigue is so hard to measure.

Driver fatigue often occurs for people who are driving long distances such as commercial truck drivers. However, the fatigue could also occur because of the timing in someone’s circadian rhythm, if it has been a long time since they last slept and they have accumulated large sleep debt, if they are sleep deprived because of the fast pace of modern life or if they have a sleep disorder. Some studies have attempted to show how great an impact fatigue has on the road toll by comparing the effect of sleep deprivation on performance with the effect of alcohol consumption on performance.

The effect of fatigue on the road toll is most likely to be seen at times when people are most sleepy or fatigued. Typically, these times are late at night, in the early hours of the morning or during the mid-afternoon hours of approximately 1 pm to 4 pm. Note that this time also corresponds with the ‘post-lunch dip’ (see p. 000).

There are a number of things that can be done to reduce the impact of fatigue on the road toll. Prior to a long trip, having 7 to 8 hours of uninterrupted sleep and planning your travel so that you are not travelling for more than 8 to 10 hours each day can help. So can arranging overnight accommodation in advance to avoid the temptation to just keep driving into the night. Finally, before and during your trip, avoid alcohol and any prescription medicines that may cause drowsiness.

**Spotting signs of fatigue**

One of the biggest problems with fatigue is that it can increase slowly. This means that people have to be alert to the warning signs so that they can take a break before they have an accident. Signs of fatigue can include any combination of the following things:

- you keep yawning
- you have difficulty keeping your head up or your eyes open
- your eyes feel sore or heavy
- your vision starts to blur or dim
- you start ‘seeing things’
- you find you are daydreaming, thinking of everything else but your driving
- you have difficulty in maintaining a conversation
- you become impatient and make rash decisions
- you feel hungry or thirsty

- your hands feel sweaty
- your reactions seem slow
- you feel stiff or cramped
- your driving speed creeps up or down
- you start making poor gear changes
- you wander over the centre-line, or into another lane or onto the road edge
- you hear a droning or humming in your ears
- you do not notice a vehicle until it suddenly overtakes you
- you miss exits or turns
- you do not remember driving the last few kilometres.


**LEARNING ACTIVITY 6.20 Driving tired**

1. What is fatigue?
2. What contributes to fatigue?
3. List five signs of fatigue to look for in yourself when you are driving.
4. What ethical issues would Dawson and Reid have needed to consider during their research?
5. Why are Dawson and Reid’s findings important for the community?

**LEARNING ACTIVITY 6.21 Group and class discussion**

Read the article ‘Deadly hours on our roads’. In small groups, discuss the following questions and then report your ideas back to the class.

1. Why might twice as many fatalities have occurred between 3 pm and 5 pm than between 8 am and 10 am on Australian roads between 2000 and 2003?
2. According to the article, the worst single time for fatalities on South Australian roads is from late Friday night to the early hours of Saturday morning. What factors might contribute to this?
3. What could be done to reduce the number of road accidents and fatalities that happen due to fatigue?
Deadly hours on our roads

Paul Weston
Matt Clemow

Researchers have pinpointed the killer time on our roads — and it starts at 3 pm.

They say fatigued drivers are causing twice as many fatalities between 3 pm and 5 pm than during the morning peak hour.

An analysis of four years of data provided by the Australian Transport Safety Board challenges the common view that Australians die alone late at night driving country roads.

Holden Performance Driving Centre general manager Russell White has provided his findings to a driver-fatigue inquiry currently being conducted in Queensland.

‘The most dangerous hours of the day to be on the road are between 3 pm and 5 pm when I believe a more subtle form of fatigue is at work.’ Mr White said.

Mr White, who has taught safety to drivers for more than a decade, admits his analysis of the data surprised him.

Fatalities between 3 pm and 5 pm on Australian roads from 2000 to 2003 were more than double those between 8 am and 10 am.

The number of fatal crashes peaked at 106 (in both 2000 and 2001) for the hour after 3 pm, which compares to an average of 48 in the morning peak hour.

‘People on the roads at the danger times, whether they be tradesmen coming home from work, mothers picking up their children from school or office workers finishing for the day, are distracted and somewhat fatigued — even if there is plenty of daylight left,’ he said.

‘Fatigue is not just lack of sleep. It’s going through the regular tasks on autopilot, thinking about the kids, the job, the shopping, the night ahead.’

Mr White’s submission urges the all-party committee to consider education initiatives and improving driver reviver stops.

RAA figures show most South Australian accidents happen between 3 pm and 7 pm on weekdays.

‘There is an increase in vehicle traffic at those times,’ RAA spokesman Adam Thomson said.

‘We find it particularly bad on Thursdays and Fridays but most days of the week are hazardous.’

The worst single time for fatalities on South Australian roads is from late Friday night to the early hours of Saturday morning.


Comparing effects of fatigue and alcohol consumption on performance

In Adelaide in 1997, Drew Dawson and Kathryn Reid completed research comparing the effect of fatigue on performance with the effect of alcohol intoxication on performance.

Forty participants took part in two experiments. In the first experiment, the participants were kept awake for 28 hours from 8:00 am until 12:00 midday the next day. In the second experiment, they were required to consume 10–15 g of alcohol at 30-minute intervals from 8:00 am until their mean blood alcohol concentration reached 0.10 per cent.

To assess performance, Dawson and Reid measured cognitive psychomotor performance at half-hourly intervals. To do this, they used a computer-administered test of hand–eye coordination.

The results showed that participants’ performance decreased significantly in both conditions. After 17 hours of continuously being awake, cognitive psychomotor performance decreased to a level equivalent to the performance of people with a blood alcohol concentration of 0.05 per cent.

Driving with a blood alcohol level of 0.05 per cent or above is illegal in Australia and, under new laws introduced at the end of 2005, if you are caught driving with a blood alcohol level of 0.05 per cent or more in South Australia, you will lose your licence.

After 24 hours of being awake, participants’ performance level decreased to a level that was equivalent to the performance of people with a blood alcohol concentration of about 0.10 per cent. This is well above the legal blood alcohol level for driving.

Dawson and Reid concluded that their results provided policy makers and the community with a comparison to help understand how fatigue can impair performance.

Figure 6.11 Scatterplot graphs show the relationship between hours of wakefulness and blood alcohol concentration and performance.
Once you are on the road, you should take 15-minute breaks every two hours. On the breaks it is good to get out of the car and do some brief exercise. Eat healthy meals and avoid fatty foods, as they can make you feel sleepy.

Government bodies and the wider community also take measures to reduce the accidents caused by fatigue. Rumble or alert strips along the edge of the road make noise and vibrations when driven on. This can alert a drowsy driver or even wake one who is already sleeping. They don’t reduce fatigue but could warn a tired driver that they need to pull over. Rest areas along country roads and the ‘driver reviver’ programs advertised at holiday times encourage drivers to rest, take a break and eat. The television advertisements about microsleeps spoken by Dr Karl Kruszelnicki, and the related series of billboard advertisements, aim to make people aware of the dangers of driver fatigue.

**Myths and facts about how driver fatigue can be reduced**

There are many myths about driver fatigue. A few of them are shown below.

**Myth:** I will be safer if I make the trip overnight because I will avoid the daytime traffic.

**Fact:** Your body has a normal 24-hour rhythm pattern built into it. If you are driving when you would normally be sleeping, you will be fighting yourself to stay awake. The chances of falling asleep at the wheel after your normal bedtime, especially in the early hours of the morning, are very high.

**Myth:** It is a good idea to start the trip after work.

**Fact:** This is the worst time to begin your trip. You have been using your mental and physical energies all day and you will be tired already, even though you do not realise it. The safest thing to do is to get a good night’s sleep and start your journey the next morning.

**Myth:** Loud music will keep me awake.

**Fact:** This might help for a while but it will not help for long. Loud music might also distract you from the driving task or even send you to sleep!

**Myth:** A flask of coffee or a caffeine drink will keep me awake.

**Fact:** Caffeine is only a short-term solution and will have less and less effect the more often you use it. It might make you feel more alert, but it will not keep you going for long. The long-term solution is to get some sleep.

**Myth:** Plenty of fresh air through the window will keep me awake.

**Fact:** This might give you a boost and help for a while, as might turning the air-conditioning on to cold. But if you are tired, sleep is the only solution.

**SLEEP HYGIENE**

Sleep hygiene relates to behavioural factors in your control that can help optimise sleep quality and quantity. There are a number of things that can make it more difficult for you to get to sleep at night. These things include:

- exercising late in the day, close to bedtime
- eating a meal after 8 pm
- doing intense mental activity late at night
- consuming excessive amounts of caffeine
- a bedroom that is too light, noisy, hot or cold
- spending too much time in bed or napping
- constantly varying sleep schedules.

The following is a list of things that can help you achieve better sleep hygiene.

1. Stick to a consistent wake-up time and bedtime every day of the week.
2. Have a quiet and comfortable sleep environment. A low constant sound of a fan, air-conditioner or waterfall can help you to sleep as it blocks out other sudden sounds that grab attention.
3. Don’t consume caffeine within four hours of bedtime.
4. If having trouble sleeping at night, avoid taking naps during the day.
5. Resolve problems from your day — make a ‘worry’ list. Write down the problems and one way that you could solve each of them. This helps you to feel closure and worry less so that you can sleep.
6. Establish a bedtime routine such as TV off at 9 pm, shower, read a book, lights off at 10 pm.

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**LEARNING ACTIVITY 6.24**

**Sleep hygiene**

1. What is sleep hygiene?
2. What could you do to improve your own sleep hygiene?
3. For the following two scenarios, outline strategies for Sarah and Tyson to improve their sleep hygiene.

(a) Sarah is an events planner with a particular focus on planning weddings. She spends a lot of time during the day in meetings with future brides and with various suppliers of goods and equipment. It is not uncommon for Sarah’s mind to continue to think of better ways to plan and present events even after she goes home. She often skips lunch and instead grabs a cup of coffee. Sarah believes that her cup of coffee before going to bed allows her to relax. Sarah often finds that she has trouble getting to sleep and she lies there worrying about how to make her clients’ weddings the best they can be.

(b) Tyson is in his first year at university. From Monday to Wednesday, he has lectures at 9.00 am. On Thursday and Friday, his lectures start later in the day. Tyson hates getting up early but does so in order to get to his lectures on time. When his lectures don’t start until the afternoon, he stays up late the night before. This has led to Tyson sometimes having trouble getting to sleep and then waking up even more tired. To try to overcome this, Tyson has a nap in the afternoons that he doesn’t have a lecture.

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**LEARNING ACTIVITY 6.25**

**Roleplay**

In groups, develop a short roleplay that could be shown to the class to demonstrate some of the key concepts you have learnt about sleep. It would be good if each group had a slightly different focus. Here are some possible topics:

- Managing the impact of jet lag on sporting performance
- How sleep disorders affect everyday life
- How to manage sleep disorders
- The effects of sleep deprivation on school children
- How to reduce the impact of fatigue on the road toll
- How to reduce the impact of fatigue on workplace accidents.

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**PSYCHOLOGICAL AND PHYSIOLOGICAL AROUSAL**

Stress is a state of high arousal. It includes both physiological and psychological aspects. When our bodies become stressed, the flight-or-fight response is triggered. This activates the endocrine and sympathetic nervous systems. When aroused or stressed, the body diverts resources away from everyday maintenance in order to better fight or flee the threat or emergency. This heightens our awareness to face challenges.

Our body’s response to stressors (factors in our environment which contribute to a stress response) is controlled by the **autonomic nervous system**. The autonomic nervous system transfers information
between the brain and body to control basic life functions such as heartbeat, digestion, respiration and response to stress.

The autonomic nervous system has two parts: the **sympathetic nervous system** and the **parasympathetic nervous system**. The sympathetic nervous system activates the body in response to a threat. It is activating the flight-or-fight response. However, the body doesn’t need to be in this state all the time; in fact, it is not healthy for the body to be in this state for long periods. After a threat has passed, the parasympathetic system is responsible for calming the body down, maintaining energy levels and supporting everyday needs such as regulating blood sugar levels, secreting saliva, regulating heart rate and blood pressure, and eliminating wastes.

**Fight-or-flight response**

Walter Cannon researched stress in 1932 and described the fight-or-flight response. This response happens when we experience a shock, surprise or something that we perceive as a threat. In essence, the response that happens in our body prepares it to either fight or run from (flee) a threat.

In the fight-or-flight response, the sympathetic nervous system and endocrine system are activated. The endocrine system secretes chemicals called hormones into the blood; in particular, the hormones adrenaline and cortisol are released from the adrenal glands, located above the kidneys. The release of adrenaline and cortisol leads to several changes, which result in physiological and psychological arousal.

**Physiological arousal**

When a person becomes physiologically aroused, the fight-or-flight response causes an increase in respiration to supply the body with more oxygen. Heart rate and blood pressure increase, allowing more oxygen and blood sugar to power the muscles. Blood is diverted from the skin to the muscles to reduce blood loss if the skin is damaged and to increase the supply of oxygen and sugar to the muscles. Our temperature will rise, due to the extra activity in the muscles and then we sweat more, which helps to cool the skin and the muscles beneath it. Blood is diverted from the digestive tract to parts of the body needed in an emergency response, and digestion slows or stops. Muscles become tense and there is an increase in energy consumption.

**Psychological arousal**

The fight-or-flight response also causes changes that make us more irritable, anxious, excitable and psychologically alert to a threat.

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**LEARNING ACTIVITY 6.26**

**Fight or flight?**

1. What is the fight-or-flight response?
2. Draw a flow chart to summarise the fight-or-flight response.
3. Akram was startled when an animal ran in front of his car as he was driving home from work at night. He was able to brake suddenly and swerve so that he missed the animal. Describe the physiological and psychological changes that would have happened to Akram as a result of his heightened state of arousal.

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**Arousal and task performance**

Research has shown that there is an optimal level of arousal for an individual to achieve optimal performance in a task. If a person’s arousal is too low or too high, then they will not achieve optimal performance. A common example is sitting an exam. If your arousal level is low and you are tired, yawning and bored then it is probable that your performance won’t be the best it can be. Likewise, if your arousal level is too high, and you are overly anxious and worried and can’t focus, then it is probable that this too will prevent you from working at an optimal level. Researchers believe that the ideal level of arousal is a moderate one.

However, it isn’t always as simple as this. The optimal level of arousal is different for different people.

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**LEARNING ACTIVITY 6.27**

**Arousal and task performance**

1. Describe the relationship between task performance and arousal.
2. What advice would you give the following people on how to manage their level of arousal for optimal performance? You must justify your advice.
   (a) A boxer
   (b) A student sitting an exam
   (c) A chess player
**Task difficulty and familiarity**

It has been found that the optimum level of arousal varies according to the difficulty or complexity of the task or activity in which the person is engaged. As shown in figure 6.13, for simple tasks, a high level of arousal may be optimal and for complex tasks a low level of arousal may be better. For example, in one of the first studies on arousal and task difficulty, Hebb (1955) found that when attempting a simple task such as adding numbers, a high level of arousal was necessary for optimal performance. In contrast, for a complex task such as solving geometry problems, a low level of arousal was necessary to achieve the optimum performance. Task difficulty has also been found to be a relevant factor in performing physical tasks. For example, with sports that are not very complex and involve a lot of physical contact, such as boxing and rugby, high levels of arousal are usually best (but over-arousal can be detrimental). Consider the trainer ‘psyching up’ the boxer, or the coach of a team giving a stirring pre-match address. In contrast, a concert pianist or a chess ‘master’ might prefer quiet and solitude prior to performing because the task is so complex that a low level of arousal is desirable (see figure 6.13).

Another factor that appears to influence the relationship between arousal and performance is familiarity, or experience, with a task. Hebb (1955) found that the extent to which a task is previously known by a person plays an important role in establishing an optimal performance level. If the task is very familiar, a higher level of arousal will be required to reach optimal performance than if the task is new. Also, practising a complex task until the task becomes familiar will shift the level of arousal for optimal performance from low to high.

**Stress and its effect on health**

Stress is something that we all feel at some time. Stressors are things that lead to stress. They can be uncommon or everyday things. They can be both negative and positive. For example, a death of a family member would be negative, while getting married would be positive. Change is very often what causes stress in our lives. Selye (1976) showed how stressful events can negatively affect health. He coined the term **general adaptation syndrome** to describe how the body deals with stress over an extended period.

![Selye's general adaptation syndrome](image)

**General adaptation syndrome**

Selye explained that there are three phases that occur with long-term stress: alarm, resistance and exhaustion.

**Alarm**

The alarm phase is signified by the release of adrenaline — essentially it is Cannon’s fight-or-flight response. Selye, however, observed that stress could continue longer than just this initial response.
**Resistance**

In the resistance phase, the parasympathetic nervous system conserves body reserves. Physiological stress responses decline but remain slightly elevated as the stress continues. Respiration and heart rate return to normal; however, blood glucose levels remain high for energy. Hormones, including adrenaline and cortisol, are released at elevated levels. The body has higher than normal energy and arousal levels but has adapted slightly to the new conditions.

**Exhaustion**

In the exhaustion phase, the body can no longer sustain the level of arousal. During this time, the ability to repair tissue and resist infections is reduced. People become prone to illness and disease.

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**LEARNING ACTIVITY 6.29**

**Stress and your health**

1. Describe the biological and chemical processes involved in stress.
2. Why can stress lead to health problems?
3. Explain why a sudden loud noise might trigger a fight-or-flight response, while continuous low-level noise can contribute to ill health.
5. Evaluate the ethical considerations relevant to these two investigations.

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**BOX 6.11**

**Noise**

Noise on its own doesn’t have a negative effect on health. If you hear a loud noise, it may startle you and the fight-or-flight response may begin, with increased heart rate. However, noise that is constant, day after day, can lead to stress. Studies of children who live or go to school near airports show them to have impaired reading ability. Cohen et al. (1980) found that children who went to school in a noisy area had higher levels of stress hormones, higher blood pressure and were more distractible than children who learnt in quieter environments. Another study showed that people who were exposed to low-level office noise for a three-hour period, compared to those in a quiet environment, were less likely to make adjustments to ergonomic work furniture to ensure optimal health conditions for their body (Evans and Johnson, 2000).

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**BOX 6.12**

**Psychological stress and illness**

At the Medical Research Council’s Common Cold Unit in Salisbury, England, researchers Cohen, Tyrrell and Smith (1991) performed a study using 394 healthy volunteers. The participants were given a thorough medical examination prior to the research. They then completed questionnaires that assessed stressful life events, perceived stress and the negative effect of stress. Each of the participants was then exposed to a low infectious dose of one of five respiratory viruses using nasal drops. These five viruses were strains of a common cold virus.

Each participant was quarantined for two days before and seven days after being exposed to the virus. They were quarantined either alone or with one or two other people.

The participants who reported higher levels of stress showed greater rates of infection for all five viruses.

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Figure 6.15 Participants’ blood was assessed for the presence of infection with each of the five viruses. Those who reported higher levels of stress showed higher rates of infection.
PSYCHOLOGICAL INTERVENTIONS FOR COPING WITH STRESS

Not everybody who is stressed becomes sick. Largely, this is because many of us have coping strategies that we use to reduce the stress we experience. There are many different types of coping strategies, some of which are discussed below.

Psychological interventions can be used to cope with stress and can include both problem-focused strategies and emotion-focused strategies. Problem-focused strategies aim to change the thing or situation that is causing the stress. Emotion-focused strategies aim to change the negative thoughts about the situation and the negative emotional consequences of the stress (Westen et al., 2005). Emotion-focused strategies are useful when you can’t change the stressor or when stress levels are so high that changing the stressor seems impossible.

Cognitive therapy is a psychological intervention that assumes that a person’s thoughts are causing them psychological problems. This is an emotion-focused strategy. Psychologists use various techniques to help people change negative thoughts and develop more positive ways of thinking. In this way, people gain self-understanding about their negative thinking. Two examples are Ellis’ rational–emotive behaviour therapy and Beck’s cognitive therapy.

- In Ellis’s rational–emotive behaviour therapy, the aim is for people to maximise rational and minimise irrational thoughts. The therapist brings irrational thoughts to the attention of the patient and then shows alternative logical and rational thoughts.
- In Beck’s cognitive therapy, patients keep a journal to record thoughts and moods. The therapist then questions these thoughts and moods and the patient’s justifications for them.

Cognitive behaviour therapy (CBT) combines cognitive therapy, which involves changing thoughts, with behaviour therapy, which involves changing behaviour. The change in behaviour can help a person to develop skills and strategies to deal with stress. CBT could equip people with problem-solving strategies so that they can better deal with stressful situations. Psychologists begin by analysing behaviours and then create a plan to overcome these behaviours and cognitions.

One common use is in the treatment of panic attacks. Panic attacks involve high levels of physiological arousal, including a racing heart and a feeling of suffocation. As part of the cognitive behaviour therapy, a therapist may use breathing exercises to deal with the breathlessness and rational analysis of the beliefs that led to the panic attacks.

Improving your own stress management

In addition to psychological therapies, there are a lot of things that can be done to help manage stress. Improving your stress management is important for keeping psychological and physiological arousal at healthy levels. One of the key things that you need to do is establish what causes stress in your life. This may not initially be obvious because small things over time can cause stress, even though we appear to become used to them.

Some ways to help you manage your stress levels:
- develop problem-solving strategies
- plan ways to resolve the situation
- seek advice about how to change the situation
- avoid stressors by planning ahead.

Social support studies have shown that the support of a friend can help to reduce levels of stress and lower heart rates. Support groups are also valuable places to gain social support. However, not all social relationships are positive. Sometimes negative family relationships and friendships can be the cause of someone’s stress.

Physical strategies are also useful for reducing stress. Exercise is important, as physically fit people don’t become ill as often when they are stressed. Massage lowers stress hormones and reduces depression, pain and anxiety. Good nutrition and adequate sleep are also important.

Relaxation techniques help reduce physiological arousal, slow respiration and heart rate, and reduce blood pressure. Do an activity that you find calming and relaxing, such as listening to relaxing music, writing in a journal, cooking or making a model (Wade & Tavris, 2005).

LEARNING ACTIVITY 6.30

How stressed are you?

1. What strategies do you currently use to manage your own stress?
2. What causes you stress?
3. How could you improve your stress management techniques?
INVESTIGATION METHODS

Both objective and subjective measures can be used to investigate levels of sleep and stress.

Sleep and fatigue

Objective measure
To study sleep, researchers can use an EEG (electroencephalogram). Electrodes are attached to the scalp that measure the wave patterns in the brain. An EEG is commonly used to measure sleep and awareness. The EEG machine translates brain activity into a visual record of what the brain is doing. Different EEG waves are seen for different stages of sleep (see pp. XX–XX).

Subjective measures
Two common subjective measures used within the assessment of sleep are the Epworth sleepiness scale and the Stanford Sleepiness Scale. They are most commonly used over a period of at least several days to gather an average level of sleepiness.

<table>
<thead>
<tr>
<th>Situation</th>
<th>Chance of dozing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sitting and reading</td>
<td></td>
</tr>
<tr>
<td>Watching TV</td>
<td></td>
</tr>
<tr>
<td>Sitting, inactive in a public place (e.g. a theatre or a meeting)</td>
<td></td>
</tr>
<tr>
<td>As a passenger in a car for one hour without a break</td>
<td></td>
</tr>
<tr>
<td>Lying down to rest in the afternoon when circumstances permit</td>
<td></td>
</tr>
<tr>
<td>Sitting and talking to someone</td>
<td></td>
</tr>
<tr>
<td>Sitting quietly after lunch</td>
<td></td>
</tr>
<tr>
<td>In a car, while stopped for a few minutes in the traffic</td>
<td></td>
</tr>
</tbody>
</table>

Scoring key
The Epworth Sleepiness Scale scores range from 0 to 24. Scores greater than 16 indicate a high level of daytime sleepiness.

Methods of assessment for levels of stress and arousal

Objective quantitative method

Measuring physiological arousal: the polygraph

Psychologists may use a variety of equipment to measure physiological changes associated with arousal. One of these devices is the polygraph. The polygraph measures heart rate, blood pressure, breathing rate and galvanic skin response (GSR). Although the polygraph is often called a 'lie detector', it does not actually detect lies. The polygraph monitors certain physiological indicators of arousal, some of which are not detectable by other means. Polygraph lie-detection tests have been used mainly in the United States for testing suspected criminals, by security agencies, and by businesses to screen potential employees for honesty, or to uncover employee theft, although they have occasionally been used in Australia.

Limitations of the polygraph

A polygraph is able to detect physiological changes associated with psychological arousal. However, when assessing stress levels, a polygraph has a disadvantage compared to other methods. It can be expensive and it is specialist equipment that requires training to use.

Subjective measures

Like sleep assessment, there are subjective measures of stress. A commonly used assessment of stress is the Social Readjustment Rating Scale (SRRS) by Holmes and Rahe (1967). Many researchers have used it since it was developed. Unlike the polygraph, which measures biological and chemical factors, the SRRS examines the social environment. In particular, it measures the degree of social adjustment to stressors required to live a relatively normal life. Items requiring greater adjustment are considered more stressful and hence are worth more points.
The Social Readjustment Rating Scale

<table>
<thead>
<tr>
<th>Rank</th>
<th>Life event</th>
<th>Mean value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Death of a spouse</td>
<td>100</td>
</tr>
<tr>
<td>2</td>
<td>Divorce</td>
<td>73</td>
</tr>
<tr>
<td>3</td>
<td>Marital separation</td>
<td>65</td>
</tr>
<tr>
<td>4</td>
<td>Detention in jail or other institution</td>
<td>63</td>
</tr>
<tr>
<td>5</td>
<td>Death of a close family member</td>
<td>63</td>
</tr>
<tr>
<td>6</td>
<td>Major personal injury or illness</td>
<td>53</td>
</tr>
<tr>
<td>7</td>
<td>Marriage</td>
<td>50</td>
</tr>
<tr>
<td>8</td>
<td>Being fired from work</td>
<td>47</td>
</tr>
<tr>
<td>9</td>
<td>Marital reconciliation</td>
<td>45</td>
</tr>
<tr>
<td>10</td>
<td>Retirement</td>
<td>45</td>
</tr>
<tr>
<td>11</td>
<td>Major change in the health of a family member</td>
<td>44</td>
</tr>
<tr>
<td>12</td>
<td>Pregnancy</td>
<td>40</td>
</tr>
<tr>
<td>13</td>
<td>Sexual difficulties</td>
<td>39</td>
</tr>
<tr>
<td>14</td>
<td>Gaining a new family member</td>
<td>39</td>
</tr>
<tr>
<td>15</td>
<td>Major business readjustment</td>
<td>39</td>
</tr>
<tr>
<td>16</td>
<td>Major change in financial state</td>
<td>38</td>
</tr>
<tr>
<td>17</td>
<td>Death of a close friend</td>
<td>37</td>
</tr>
<tr>
<td>18</td>
<td>Changing to a different line of work</td>
<td>36</td>
</tr>
<tr>
<td>19</td>
<td>Major change in the number of arguments with spouse</td>
<td>35</td>
</tr>
<tr>
<td>20</td>
<td>Taking out a mortgage or loan for a major purchase (e.g. for a home or business)</td>
<td>31</td>
</tr>
<tr>
<td>21</td>
<td>Foreclosure on a mortgage or loan</td>
<td>30</td>
</tr>
<tr>
<td>22</td>
<td>Major changes in responsibilities at work</td>
<td>29</td>
</tr>
<tr>
<td>23</td>
<td>Son or daughter leaving home</td>
<td>29</td>
</tr>
<tr>
<td>24</td>
<td>Trouble with in-laws</td>
<td>29</td>
</tr>
<tr>
<td>25</td>
<td>Outstanding personal achievements</td>
<td>28</td>
</tr>
<tr>
<td>26</td>
<td>Wife beginning or ceasing work outside the home</td>
<td>26</td>
</tr>
<tr>
<td>27</td>
<td>Beginning or ending formal schooling</td>
<td>26</td>
</tr>
<tr>
<td>28</td>
<td>Major change in living conditions (e.g. building a new house)</td>
<td>25</td>
</tr>
<tr>
<td>29</td>
<td>Revision of personal habits</td>
<td>24</td>
</tr>
<tr>
<td>30</td>
<td>Trouble with the boss</td>
<td>20</td>
</tr>
<tr>
<td>31</td>
<td>Major change in working hours or conditions</td>
<td>20</td>
</tr>
<tr>
<td>32</td>
<td>Change in residence</td>
<td>20</td>
</tr>
<tr>
<td>33</td>
<td>Change of school</td>
<td>20</td>
</tr>
<tr>
<td>34</td>
<td>Major change in usual type and/or amount of recreation</td>
<td>19</td>
</tr>
<tr>
<td>35</td>
<td>Major change in religious activities</td>
<td>19</td>
</tr>
<tr>
<td>36</td>
<td>Major change in social activities</td>
<td>18</td>
</tr>
<tr>
<td>37</td>
<td>Taking out a mortgage or loan for a lesser purpose (e.g. for a car, TV, freezer)</td>
<td>17</td>
</tr>
<tr>
<td>38</td>
<td>Major changes in sleeping habits</td>
<td>16</td>
</tr>
<tr>
<td>39</td>
<td>Major change in number of family get-togethers</td>
<td>15</td>
</tr>
<tr>
<td>40</td>
<td>Major change in eating habits</td>
<td>15</td>
</tr>
<tr>
<td>41</td>
<td>Vacation</td>
<td>13</td>
</tr>
<tr>
<td>42</td>
<td>Holidays</td>
<td>12</td>
</tr>
<tr>
<td>43</td>
<td>Minor violations of the law (e.g. traffic tickets)</td>
<td>11</td>
</tr>
</tbody>
</table>

Figure 6.18 Social Readjustment Rating Scale (Holmes & Rahe, 1967)
LEARNING ACTIVITY 6.32
SRRS

1. What types of factors might cause stress that aren’t included on the list? What does this mean about them as a measure of stress?
2. What might need to be adapted in the SRRS to more accurately assess a teenager’s stress level?

The SRRS measures key life events and assumes that it is these that cause the most stress. Some research since this time has criticised the Holmes and Rahe scale because it doesn’t allow for everyday challenges and hassles to be considered as stress. There is much research to support that everyday stressors can cause just as much stress as a major life-changing event. In 1981, Kanner et al. developed the Daily Hassles Scale to assess the impact of daily events on stress levels. The scale includes a list of daily hassles and a list of uplifting events. Participants indicate how often each hassle or uplift on the scales has occurred and rate how intensely they have experienced them. They rate the intensity as either ‘somewhat’, ‘moderate’ or ‘extreme’.

LEARNING ACTIVITY 6.33
Review questions

1. Why are the polygraph and EEG considered objective measures?
2. Why is the Epworth Sleepiness Scale a subjective measure?
3. What are the strengths and weaknesses of using the methods of assessment mentioned in this section?

There are advantages to using these two subjective measures. They are cheaper than a polygraph test and you don’t need any specialist equipment to gather results. However, one of their limitations is that they are less objective than a polygraph. People could falsify results very easily and subjects could interpret some of the statements differently, for example the SRRS uses the term ‘close family member’. What is ‘close’ for some people, may not be for others.

Qualitative methods for assessing stress

Focus groups and the Delphi technique can be used to assess factors related to both stress and sleep. (See chapter 2 for more details on these methods.)

Ethical issues

The same ethical principles discussed in chapter 1 apply to the research of stress and sleep. It is important for a psychologist to be aware that people who have sleep disorders or are stressed need to be treated as potentially vulnerable groups. Research shows that people who are sleep deprived or stressed don’t think issues through fully, and it is important for both psychologists and researchers to consider this when gaining informed consent and voluntary participation from participants. Due to the vulnerability of participants, it is particularly important for researchers to minimise harm and remain alert to any distress that participants may experience.

LEARNING ACTIVITY 6.34
Evaluate this investigation design

A researcher intends to study the effect of long-term stress on health. He wants to use an experimental laboratory design to do the investigation. The aim is to establish a control group who are not exposed to any deliberate stressors. The experimental group would then be exposed to constant noise, intended to increase stress levels. Participants’ stress levels would be assessed using both a galvanic skin response measurement (an objective measure) and the Daily Hassles Scale (a subjective measure).

1. What problems might arise from using an experimental design rather than a quantitative observational design?
2. Describe how a quantitative observational design could be used instead.
3. Describe any ethical issues relevant to this scenario.
Short answer questions

1. What is a circadian rhythm?
2. Draw the sleep/wake cycle circadian rhythm.
3. What effects does sleep deprivation have on humans?
4. Describe two theories about why humans need sleep.
5. Compare stage 1 and REM sleep.
6. Describe how an EEG recording changes as a person moves through the five stages of sleep.
7. What causes sleep apnoea?
8. Explain why it is particularly dangerous for people with narcolepsy to drive a vehicle.
9. Summarise one psychological intervention that can be used as a therapy for insomnia.
10. Describe the relationship between arousal and task performance.
11. What physiological changes happen when a person increases their level of psychological arousal?
12. Outline the fight-or-flight response.
13. Explain how the general adaptation syndrome is different from the fight-or-flight response.
14. Describe two strategies that can be used to help you cope with stress.

Extended response questions

1. Circadian rhythms can be easily disrupted by environmental factors and everyday life experiences, such as jet lag and shiftwork.
   a. Explain what a circadian rhythm is.
   b. Choose an everyday experience and explain how it can disrupt the circadian sleep/wake cycle.
   c. Explain what can be done to re-set the circadian rhythm.

2. Class debate

   In many countries it is common to have a siesta in the afternoon. This is often done to avoid the extreme heat conditions late in the day. In Australia, this mid-afternoon time is when we are at a greater risk of accidents due to the post-lunch dip. The hours of 2 to 4 pm are the most dangerous time on our roads.

   Australian society should introduce a siesta during the afternoon to help minimise the number of road and workplace accidents during this time.

   Discuss the advantages and disadvantages of this idea.

3. Pamphlet

   Stress is something that teenagers often hear spoken about in a negative way. Create a pamphlet for teenagers so that they can:
   • develop a more informed understanding of the positives and negatives of stress
   • understand how they can improve their own stress management.