

Consequences of disrupting biological rhythms



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Critically consider the consequences of disrupting biological rhythms (24) A rhythm is something that is regularly repeated. All living organisms experience rhythmic changes which tend to coincide with seasonal or daily environmental changes. Most organisms have an internal biological clock called endogenous pacemakers, which are influenced by external environmental factors called exogenous zeitgebers, these control periodic changes. The sleep wake cycle is a circadian rhythm that repeats itself every 24 hours. However these can become desynchronised, resulting in a disruption of your biological rhythm.

It can be disrupted by many factors, including Jet lag and shift work. Jetlag occurs when flying east to west or vice versa, it does not occur when flying north to south or south to north because you do not pass through any differing time zones. Places to the east are ahead of the time, and places to the west are behind. Klein, Wegman and Hunt suggested that adjustments in sleep were faster for westbound flights compared to eastbound, as when you go eastbound readjustment takes approximately a day for every time zone you have crossed.

This is because when travelling west you are 'chasing the sun' and the day is lengthened (phase delay)- the body prefers this. But when you travel east the day is shortened (phase advance) this shortens the body for what is already a shortened day, making you try to sleep when you are not tired. The disruption of the biological rhythms are thought to be caused by melatonin release being out of step with the new environmental conditions, this can cause drowsiness during the day, and insomnia during the night.

Research evidence by Schwartz et al supports this theory. They studied the results of baseball games involving teams on the west and east coast of America, the time difference was 3 hours. They found that the east coast teams travelling west won significantly more games than the west coast teams travelling east, due to the day being lengthened for the east to west team, and shortened for the west to east team. However this study states that the only reason the east coast team won is because they suffer less jetlag than the west coast team.

But what the study does not take into consideration is the fact that the east coast team could just be genuinely better than the west coast team, and that is the reason they win, and not because of jetlag and the direction they travel. But this study does have ecological validity due to them being real teams, and it not being in laboratory conditions, making the results more valid and generalizable outside of the study. It also supports Klein, Wegman and Hunts findings that westbound flights are easier to adjust to.

However Chlo (2001) found a reduction in temporal lobe size and memory function in air crew who regularly flew over seven different time zones. This looks at a more biological approach as it challenges the views that jetlag is psychological as it shows organic structural changes and cognitive reduction. Stewart et al found that rats who have been emotionally stressed are not as good at resetting their innate clocks using light as the zeitgeber, as rats that have not been emotionally stressed.

This shows that stress can make the SCN less responsive to light. This could explain why some people experience jetlag and others do not, as those who do may find flying stressful. However this study lacks validity as rats have a

different physiological makeup to humans, meaning the results found from rats cannot be generalised to humans and how they behave. Moreover it is reductionist as it is stating that rats and humans SCN and brain is of the same complexity which is not the case.

Jetlag can be reduced. Research has shown that melatonin if taken prior to bedtime in the new time zone can be effective in allowing sufferers of jetlag to get to sleep sooner than their body clock would normally allow. Also research from Fuller has showed that a period of fasting before travel, followed by eating at times relevant to the new time zone can reduce Jetlag as food can act as a way of altering biological rhythms. Shift work is another factor that can disrupt your biological clock.

20 percent of workers working in industry work in shift work patterns, this can lead to fatigue, sleep disturbance, digestive problems, lack of concentration, memory loss and mood swings. Shift work is often seen to be worse than jetlag as it involves a prolonged conflict between internal clocks and external stimuli. This means that during the day when your metabolism is highest you're expected to sleep, and during the night when your body temperature is at its lowest you're expected to work.

This can be compounded by firstly if the person reverts to a normal sleep wake cycle at the weekend or if shifts alter every few days as this can mean your bio rhythms are in a permanent state of desynchronisation. This can lead to reduced productivity and employee moral. This has caused extreme consequences, for example the Chernobyl disaster occurred in the early hours and was attributed to tiredness. Czeisler et al found that rotating shifts

clockwise instead of anticlockwise is better for employees, as phase delay (staying up later) needs less adjustment.

He tested this in a chemical plant where workers reported increased productivity and fewer errors. However this study had a small sample, it was only one factory in one area than the world, meaning the results cannot be generalised to all factories in all countries, which affects the validity of the study. Also Czeisler's study relied on self report in order to gather results, making it subjective as participants' experiences of shiftwork are not precise and measurable, it could also have demand characteristics, where participants gave the answer they think the researcher is looking for.

However the study does have face validity as it does make sense that phase delay, making yourself stay up later, is easier than phase advance, making yourself go to sleep. Therefore a clockwise shift rotation makes more sense than an anticlockwise one. Monk and Folkard identified two major types of shift work, rapid rotation where workers change shift times every third shift, or slow rotation where workers change shift times every few weeks. Monk and Folkard concluded that rapid rotation is better as the body can maintain a fairly constant slow rotation.

However with both shift work at jetlag individual differences is a major criticism, as some people can easily adjust to shift work hours, with clockwise or anti clockwise shifts, or with rapid or slow rotated shifts, showing that the results do not correspond as far as everyone. As Stewart et al found rats who were more stressed found it harder to reset their biological clocks, showing that humans who are more stressed might as well, whereas not all humans would find flying a stressful experience.