Outline & evaluate research into circadian rhythms

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Circadian rhythms refer to innate biological rhythms that occur regularly on a 24-hour basis such as the sleep-wake cycle and core-body temperature. These are influenced by endogenous pacemakers – innate biological clocks such as the pineal gland and its secretion of melatonin, and exogenous zeitgebers – external environmental factors such as light that have an impact on the regularity of biological rhythms.

One piece of research into circadian rhythms would be that of Michel Siffre (1972), who spent a period of two months submerged in a cave in order to study the effects on his own biological rhythms and whether his free-running biological clocks (e.g. suprachiasmatic nucleus, pineal gland & melatonin) would alter in any way. Upon resurfacing, Siffre believed it to be a month earlier (mid-August) than it actually was (mid-September). Siffre repeated this study for an even longer period of time (6 months) a decade later in a Texan cave, and in each instance, it was found that his free-running biological clocks eventually settled down to just beyond the usual 24 hours to ~25 hours though he did continue to fall asleep and wake up on a regular sleep-wake schedule.

A strength of Siffre's cave studies would be that they are well supported by empirical research from the likes of Aschoff & Wever and Folkard, who both conducted bunker studies with a small group of participants, observing the effects of exogenous zeitgebers such as light and meal times on the regularity of the sleep-wake cycle. In Aschoff & Wever's study, it was found that after 4 weeks in a WWII bunker deprived of natural light, all but one of the participants displayed a circadian rhythm of 24-25 hours, thus it was concluded that the sleep-wake cycle was naturally around 24-25 hours but that is entrained by exogenous zeitgebers. In Folkard's study, it was found that after the '24-hour day' was shortened 22 hours, only one of the participants was able to comfortably adjust to their new circadian rhythms.

However, these studies can all be criticised because of the fact that they are case studies and are therefore idiographic, meaning that the research is subjective and unable to be applied to the general population as it fails to take into account that there is a lack of universality as to what constitutes a 'normal' sleep-wake cycle and the fact that exogenous zeitgebers such as light affect different people in different ways – individual differences play a role in what constitutes a 'regular circadian rhythm'. For example, these studies fail to take into account those who have exposure to light less regularly, such as those in the Arctic circle who are exposed to six months of light in the Summer and six months of darkness in the Winter yet still maintain a constant sleep-cycle of 7 hours per night on average.

Although, it can be said that research into circadian rhythms is not completely negative – it does have some positive implications as research such as Siffre's has led to the development of melatonin treatments that work to increase the secretion of melatonin from the pineal gland in order to induce sleep in people who have problems with sleep, and circadian rhythm research has also had an impact on how to combat jet lag by embracing local social cues such as bed times and meal times.

Another piece of research into circadian rhythms would be that of DeCoursey et al. (2000), who destroyed the suprachiasmatic nucleus of 30 chipmunks who were then returned to their natural habitats and observed for 80 days in order to study the effects of endogenous pacemakers on our sleep-wake cycles. At the end of the study, it was found that the sleep-wake cycle of the chipmunks had disappeared, they were awake when they were naturally supposed to be asleep, and as a

consequence a significant proportion of the chipmunks in the study died because they were eaten by predators.

An advantage of this piece of research would be that because of the methodology and extremely scientific focus of the experimental hypothesis, it is extremely scientifically falsifiable and therefore very high in reliability because standardised procedures can be followed and similar or identical results can be collected after each replication of the study.

Further, DeCoursey's (2000) research can also be praised because of the fact that there is empirical research in Martin Ralph's (2009) research to support the role of endogenous pacemakers in the regulation of circadian rhythms such as the sleep-wake cycle. At the end of this study – where Ralph bred 'mutant hamsters' with a 20-hour sleep-wake cycle and transplanted suprachiasmatic nuclei cells into the brains of normal hamsters – it was found that the sleep-wake cycle of the second group of hamsters had defaulted to 20-hours in line with their mutant suprachiasmatic nuclei cells.

However, these studies can be criticised because there are extrapolation issues with the application of animal research to humans – just because something happens in one way in one mammal doesn't mean that it will happen in the same way in other mammals such as humans.