

Sleep Deprivation and Cognitive Performance in Medical Students

Posted on July 24, 2022

Part 1

Psychology Research Hypothesis

The effect of sleep deprivation on cognitive abilities of medical college students of last year in the U.S.

Research Method

For my experimental research, I would select a control group and an experimental group of medical students. My first and foremost task would be to ask for their consent, that is, if they are willing to participate in my experimental research or not. After this, I would note down their demographic data, and with the help of weekly sleep logs, Pittsburgh sleep quality index (PSQI), and Continuous performance tests, participants' sleep schedule and cognitive abilities shall be assessed. The research design selected for my study would be a pretest-posttest control group design. As the participants selected for the study would be around 18 to 22 years of age, the one allotted to the experimental group could be requested to sleep well for 8 hours while the participants/students of the control group could be requested to sleep as normally as they want.

Main Hypothesis

Lack of sleep can lead to a decrease in cognitive abilities among last year's medical students.

Variables Of The Study

Independent variables: The total hours spent sleeping

Dependent variables: Cognitive abilities

Operational Definitions

Cognitive abilities: These are brain-based abilities that are required to perform any type of task, from

the simplest to the most complex one (What Are Cognitive Skills and Abilities? | SharpBrains, n.d.).

Sleep deprivation: It is also acknowledged as inadequate sleep or sleeplessness, which is the condition of not having sufficient sleep ("Sleep Deprivation," 2020).

The independent variable, which is the sleep duration, could be varied as the participants would be asked to complete the 8-hour sleep requirement during the night and note it down in their sleep logs. The dependent variable (cognitive abilities) shall then be measured using a continuous performance test (CPT) in the morning and after 24 hours of sleep deprivation.

Results

If the results come in favour of my hypothesis, then I would suggest to the medical students that in order to excel in their field and reach their goal of becoming good doctors in the future, they should continue to have at least 8 hours of sleep every night. Similarly, I would suggest that hospitals and medical colleges assist these students by decreasing their study load and arranging their college schedule so that their sleep is not compromised.

Part 2

Mechanism Of Action Of SsrIs

With the discovery of antidepressants such as SSRIs, the knowledge of depression has increased as well, and they are more selective in action as compared to the previously used TCAs. These medications have a selective mode of action when prescribed for depression, which is why they are preferred as compared to other anti-depressants. Serotonin, another name for which is 5-hydroxytryptamine, is an essential neurotransmitter that regulates mood and, thus, depression. Serotonin, or 5-HT, is synthesized with the help of a precursor called tryptophan. It is saved in synaptic vesicles and released into the synapse as a result of depolarizing stimuli and initiates many pre and post-synaptic responses by initializing many 5-HT receptors. Eventually, 5-HT is then vacuumed from the extracellular spaces by uptake transporter proteins that are situated in the plasma membranes of presynaptic terminals. These terminals are actually the target sites for SSRIs. As these medications cease the cascade of serotonin reuptake from the pre-synapse, the neurotransmitter stays longer in the extracellular spaces and thus can implement its effect for a longer time post-synaptically. Additionally, this effect is exerted more on the somatodendritic areas instead of the axonal terminals. Hence, with a higher concentration of 5-HT or serotonin in the synaptic cleft, there is an improvement in mood disorders, specifically depression. (Davis et al., 1999).

Neuroplasticity

Neuroplasticity is the capability of the brain to modify its connections or rewire them (Costandi, 2016). There are two types of neuroplasticity. One is structural neuroplasticity, in which the brain changes its neuronal connections. The second is functional neuroplasticity, in which the brain enhances its function in response to lost functions. Without the help of this biological process, no living creature would be able to evolve or recover itself from an injury to the brain. With the help of this process, the brain is able to cope with new environments and experiences. Each new event generates a new neuronal pathway in the brain or enhances a pre-existing one. For example, a child training for ballet dance. Another example of neuroplasticity is the enhancement of sensory sensations when a motor function is lost in a patient who has survived a stroke. As new neurons cannot be formulated, the pre-existing neurons are enhanced in their function to compensate for the loss of brain function (Cramer et al., 2011).

Part 3

Twin And Adoption Studies

These studies basically focus on how genetics and the environment collectively affect the behaviour of a human being. Genetics are the inherited traits that are passed on to children from their parents or ancestors, and these traits cannot be modified. At the same time, environmental factors are completely modifiable because they influence a person's behaviour at any stage of life. If we take the example of childhood obesity, we would realize how these two factors of genetics and environmental stressors can affect human behaviour and how they lead to variation in a child's BMI. Obesity, though, can be inherited from parents to their children, but at the same time, if a child is continuously fed fatty food and he sees that his family and his surrounding peers prefer fatty food from his childhood, he would too start to love the same kind of food leading to childhood obesity. When he grows up and his environment changes, including his family and friends, he changes his eating habits as well (Silventoinen et al., 2010). This shows how genetics and environmental factors play a combined role in crafting one's behaviour.

When we talk about nature vs nurture, we argue how a person's behaviour is affected either by his nature (genetics) or nurture (environment). An example of nature vs nurture would be my parents and my intelligence level. My parents could not afford a good schooling system when they were younger; hence, they could not succeed as much in life. On the other hand, I was schooled in a high-level environment; therefore, I was admitted to a reputed college, which led me to a reputable job. This is an indication of how nurturing human behaviour in a specific environment can lead to different subsequent behaviours, although nature plays its role side by side. Now that I know of this nature and nurture notion, this concept of twin and adoption studies can be used to train individuals in a highly specific environment in order to enhance their abilities and relative behaviour (Hahn, 2019). For

example, students who are not so intelligent by nature can be trained in controlled environments such as better-equipped schools, friends, and teachers to enhance their cognitive abilities and improve their behaviour towards education.

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