

Relationship between biological factors and behavior



**ASSIGN
BUSTER**

The methods used to study the brain have evolved significantly over the past century. Brain imaging technologies are used to investigate the relationship between behavior and brain structures. They can be used to diagnose a patient with Alzheimer's, epilepsy or tumors as well as to research into brain localization, causes of behavior and the impact of the environment on the brain. In the early to mid-1900's, psychologists and scientists used methods including postmortem dissection, connecting wires and electrodes to the brain, animal studies as well as case studies on damaged patients who have had strokes and accidents in order to observe the relationship between behavior and brain structures. Although these methods allowed psychologists to attain sufficient data, they were imprecise, unethical and sometimes difficult to apply to humans thus making it hard to form accurate conclusions about the relationship between the brain and behavior.

From the 1960s and onwards, the invention and development of brain imaging technologies such as the CAT (computerized axial tomography), PET (positron emission tomography) and MRI (magnetic resonance imaging) scan has made it possible to directly study living brains as various tasks are performed on human patients. In addition, it has allowed psychologists and scientists to link specific areas of brain damage to changes in a person's personality and mental abilities.

One study in particular which demonstrates the use of recent brain imaging technologies in investigating the connection between specific areas of the brain and mental cognitive abilities is the Maguire study (conducted in 2000). Maguire wanted to explore whether or not there was any correlation between morphological changes in the healthy human brain and extensive <https://assignbuster.com/relationship-between-biological-factors-and-behavior/>

experience of spatial navigation. Her prediction was that the hippocampus would be the region in the brain to most likely show changes. In order to carry out her experiment, Maguire scanned the brains of 16 healthy male London black-cab drivers who had spent an average of three to four years on the job. The data was collected using structural magnetic resonance imaging (MRI) which works by collecting data on the structure and anatomy of the brain. The MRI scanner operates by exposing the participant's brain to a strong magnetic field and radio waves to produce detailed pictures of the brain. Computer software then converts the information into a 3D image of the brain. In this study, the analysis calculated the amount of grey matter in the hippocampus. The findings of the research were that the posterior hippocampi of taxi drivers were significantly larger relative to those of the control subjects (taxi drivers who lacked such extensive navigation exposure). Thus, this demonstrated that behavioral factors such as learning and navigating one's way around the streets of London could have direct effects on one's physical structure of the brain. On a broader note, this illustrated that the brain behaves like a muscle in the sense that the repetition of a behavior can cause certain regions to grow.

Another study, which also used brain imaging technologies to observe the relationship between biological factors and behavior, is Jim Fallon's study on psychopathic behavior and its relationship with the lack of activity in the orbital cortex. The orbital cortex was analyzed, as this is the area scientists believe is involved with ethical behavior and moral decision-making. Fallon used positron emission tomography (PET) scans, which are scans that produce colored maps of brain activity by detecting the metabolism level of

injected substances such as glucose made mildly radioactive to show which parts of the brain are most active, in order to observe the brains of already classified psychopaths compared to the PET scans of healthy people.

Through his observations, Fallon was able to verify the belief that psychopaths did in fact have noticeable differences in their orbital cortex compared to healthy brains. This was because the PET scans showed that all of the psychopath's brains that were analyzed had dark patches in their orbital cortexes whereas healthy brains did not.

Although such groundbreaking information has been discovered, the brain imaging technologies used to collect the data for Maguire and Fallon's experiments can be criticized. Even though brain imaging technologies (such as the MRI and the PET scans) is a promising field in the investigation of a possible relationship between biological factors and behavior, so far scanning can merely register structures and activity in the brain. It is not possible to determine cause-effect relationships at this point in science since there are many other contributing factors as to why a person may act a certain way. In addition to this, other disadvantages of using MRI and PET technology include the fact that these scans are conducted in unnatural environments.

Consequently, the combination of being put in an enclosed space and the loud noises that are made by the scans can make some people feel claustrophobic thus affecting the data. Finally PET and MRI scanners are very expensive, meaning that the number of scanners is limited. Therefore, for non-urgent studies, there may be a wait to use the scanners thus becoming time consuming.

However, despite the few disadvantages of using brain imaging technologies, there are many advantages of using it, which make them worthwhile in the end. For instance, although PET and MRI scans can be time consuming and costly, compared to the past when none of this technology existed and scientists had to resort to post mortem dissection, this technology is much more efficient. Having to wait for patients to die before being able to observe the brain could take years. In addition, the observation of dead brains could have also influenced the results hence why brain imaging technologies are more accurate as scans can gain information about the brain structure and function of conscious patients, some even while they are performing psychological tasks. Lastly, the invention of brain imaging technologies is more ethical compared to the methods used in the past. In the past when scientists wanted to conduct experiments in order to observe the relationship between human behavior and the brain, they would resort to using animals. This method is unethical and imprecise as animals and humans have very different psychological structures. Therefore, the findings from these experiments are hard to apply to humans thus making them pointless. Overall, although brain imaging technologies may have its disadvantages, it has allowed scientists to broaden their research methods thus allowing for a more reliable way to observe the relationship between behavior and biological factors.