Relationship between dysfunction of the prefrontal cortex

The prefrontal cortex (PFC) is an essential aspect of the frontal lobes in the brain. Executive function is carried out by the prefrontal cortex: where abilities to differentiate among conflicting thoughts and to determine what is good or bad operate. The PFC is connected very compactly with the rest of the brain which allows the PFC to be responsible for guiding features such as memory, emotion, decision-making, planning actions, and attention. If the PFC is damaged and the activity in it is minimal then this affects many things. The PFC could be damaged by lesions or even due to the misuse of drugs or alcohol (Rogers et al., 2010). In turn the damage to the PFC can lead the brain to make irrational decisions; have loss of behavioural control or even have a complete personality change: all of which explain why people may perform antisocial behaviour (ASB).

Lesions in the prefrontal cortex have massive effects on decision making. (Manes et al., 2001). ASB stems from the fact that a human being has taken the decision as to whether they should act in a way that is not seen as appropriate in society: therefore, the damage to the PFC may have led them to this decision. Manes (2001) carried out a study to examine this theory. Manes found that out of several different groups he had with lesions in different parts of the brain – the group with large frontal lesions was the only group to exhibit risky decision making.

This contradicts most other studies: including studies by Benjamin Libet and colleagues which showed that brain activity associated with deliberate decisions can be detected shortly before we are conscious of making the decision. (Libet, 1983) Participants were asked to note when they first felt the intention of making a movement by noting the position of a dot on a

computer screen. The participants were first aware of their intentions about 200 milliseconds before actually acting. This is much later than the onset of readiness potential: meaning that the decision to act in a particular way in this study was risky. This experiment was heavily criticised for its accuracy. However, recent research has proven that if anything the actual onset of conscious intention is later. (Lau, 2006).

The PFC can not only change the way somebody makes decisions -many studies have proven that lesions in the PFC can cause a complete personality change, where a good mannered personality can be changed instantly to an unpleasant one. (Chow, 2000)

This was substantially displayed in the accident of Phineas Gage, (Harlow, 1848) where he survived a horrific accident after a large iron rod went completely through his head, destroying much of his brain's left frontal lobe. This accident resulted in a vast personality change of Gage, which raised one of the first discussions as to whether damage to the prefrontal cortex can change a person's behaviour. This then led to even more studies into this issue which resulted in one of the largest studies of patients with brain damage.

Grafman (1996) found that the patients that showed an increase in aggression were most strongly associated with PFC lesions in a sample of 279 veterans of the Vietnam War. However, the higher scores were mostly associated with verbal aggression rather than physical. This, yet again, supported Harlow's observation of Gage. (Grafman, 1996)

The PFC is essential for behavioural control; therefore, this is why PFC lesions lead to ASB. Anti-social behaviour can be described as behaviour that is “ likely to cause harassment, alarm or distress to [others].” (Riley, 2007). Many studies have demonstrated the direct effect that the PFC has on determining ASB.

Violent behaviour is connected with structural and functional shortages in the prefrontal cortex according to many brain imaging studies. A meta-analysis of these studies was carried out by Yang et al (2009), where 43 structural and functional imaging studies were looked at. Results showed an 11% reduction in PFC grey matter in patients with anti-social personality disorder (APD). From all of these studies it was concluded that there is reduced prefrontal structure and function in antisocial individuals.

Anderson (1999) also investigated this – he examined the long term consequences of PFC lesions before 16 months in two adults. It resulted in the two adults having severely impaired social behaviour despite basic cognitive abilities and also insensitivity to consequences of decisions. The two patients suffered from defective social and moral reasoning; showing attainment of complex social and moral rules had been impaired. This study explained that early prefrontal damage syndrome leads to syndrome resembling psychopathy.

A great deal of empirical research demonstrates that mental illness is higher in incarcerated populations and estimates that as many as 25% of defendants evaluated for capability are medically and legally incompetent to stand trial. (Golding, 1984). With this fact in mind, many people argue that “

minds are simply what brains do” (Minsky, 1948) If this is the case then people are controlled by their brain, therefore have little personal choice as to how they behave.

It is clear that the PFC has a huge effect on behaviour of human beings. It can have such an effect that it changes a person’s entire personality from positive to negative. Anything that minimises the activity in the PFC can lead to negative consequences. It can make somebody less effective at decision making; make people violent and entirely change somebody as a person. All of these things in turn lead to antisocial behaviour which raises huge debate as to whether people who are antisocial due to minimal activity in the PFC are criminals or are innocently mentally ill human beings. It is certain how important the PFC is to the brain and the research that has been carried out shows that we should not abuse the PFC (alcohol, drugs) as it is very significant to enable us to behaviour in a responsible manner.