



Aggression and brain asymmetries: A theoretical review

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Received 4 September 2005; received in revised form 13 September 2005; accepted 14 September 2005
Available online 25 October 2005

Abstract

The relationship between aggression and brain asymmetries has not been studied enough. The association between both concepts can be approached from two different perspectives. One perspective points to brain asymmetries underlying the emotion of anger and consequently aggression in normal people. Another one is concerned with existence of brain asymmetries in aggressive people (e.g., in the case of suicides or psychopathies). Research on emotional processing points out the confusion between emotional valence (positive–negative) and motivational direction (approach–withdrawal). Because of this, it is not clear whether the frontal asymmetry reflects the valence of the emotion, the direction of the motivation, or a combination of valence and motivation. Appetitive motivations are not always associated with positive affects. Anger (a negative emotion) has been associated with approach motivation and with aggression. Relative left-prefrontal activity is associated with state anger and with aggression. This information would lead to the conclusion that the more violent a culture, the higher the relative proportion of the right-handers. On the other side, there is an exaggerated structural asymmetry in the anterior hippocampus (R>L) in unsuccessful psychopaths. In suicidal persons, the functional insufficiency of the right hemisphere produces a compensatory shift to left hemisphere information processing, showing a reversed asymmetry of typical traits for suicidal people. These findings, therefore, suggest the existence of a certain correlation between brain asymmetries and human aggression.

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Keywords: Brain asymmetry; Aggression; Violence; Anger; Emotion; Motivation

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1. Introduction

History shows that humanity has the ability to allocate resources on several levels for starting and supporting wars. At present, western societies are living a moment of important terrorist pressure. The Basque terrorism in our own country (Ramirez & Sullivan, 1987) and the international terrorism on the Twin Towers in New York in 2001 and, more recently, on trains in Madrid and London, are only a few unfortunate examples of this fact. On the other side, newspapers report too often about fighting on the streets or domestic violence. All these actions refer to an unchained aggression with which we must daily coexist. It is important to emphasize that aggression refers to a specific behavior, namely a reaction to a situation, stimuli or particular emotion. According to these life circumstances, it seems logical to suppose that aggression is present in human nature and, consequently, about a possible existence of relationships between human brain and aggression. Moreover, since the scientific literature indicates existence of brain asymmetries and laterality functioning (see: Fox, 1991), one could wonder whether there was any relation between these and aggression.

Our argument in favor of a possible relation between brain asymmetries and human aggression is based on three assumptions: a) Principles of neuroscience suggest a strong brain determinism on human behavior. b) According to the general theory of the cerebral function, there seems to exist unevenness on cortical activation; for example, introverted people show very high basic activation line and, because of this, they feel too much stimulation and tend to run away from social interaction, while extroverted people have low cortical activation and need more stimulation to avoid becoming boring (Carver & Scheier, 1997). These differences at the cortical activation level when talking about the dimension extroversion/introversion suggest that it could be possible to find similar differences among people with different levels of aggression display. c) According to Gray (e.g. 1987), all the behavior may be regulated by two cerebral systems: a behavioral approximation system (BAS), the activation of which moves the individual to approach a goal and to obtain rewards; and a behavioral inhibition system (BIS), which activates the individual to inhibit his movement to reach goals in order to avoid punishment. Gray's theory refers to behavior and emotional experience, attributing positive feelings to the first system and negative ones to the second one. Moreover, the tendency to feel negative affects (NAs) would be associated with a behavioral avoidance system partially localized at the right-prefrontal area, whereas the tendency to feel positive affects (PA) would be associated with a behavioral activation system partially localized at the left-prefrontal area. This conceptualization of behavior corresponding to two cerebral systems is referred as the *reinforcement sensitivity theory*. Later, Davidson (1992a, 1992b) showed the association of higher levels of rest at the right-prefrontal area with negative feelings, whereas, on the contrary, higher levels of rest at the left-prefrontal area indicate an association with positive feelings. This frontal asymmetry may be due to three different dimensions: a) to emotional valence (positivity/negativity), b) to motivational direction (approach/withdrawal), and c) to a combination of both, emotional valence and motivational direction (positive-approach/negative-withdrawal). In this way, Davidson (1998) attends only to the emotional experience, as evidence in favour of a brain asymmetry on emotional processing.

If there are brain asymmetries on emotional processing, there could also be possible brain asymmetries related to aggression. This eventual association between both concepts could be analyzed from two different perspectives. One perspective tries to explain existence of brain asymmetries underlying emotion processing and consequently aggression: brain asymmetries would modulate the emotion (anger) that produces aggression. Another one points out the existence of brain asymmetries in specific groups of people who can display an aggressive behavior as consequence of a mental illness (e.g., in the case of suicidal people). In this case, brain asymmetries would cause or, at least, correlate with aggression without mentioning emotion.

At a general level, aggression has to do with emotional processing, as far as it may constitute a reaction to a particular emotion, anger. But aggression has also to do with brain activity because it correlates with emotional processing. Finally, as we will see, the study of aggression may also have to do with cerebral asymmetries. The present review would try to revise the scientific literature in order to understand this eventual relationship.

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