

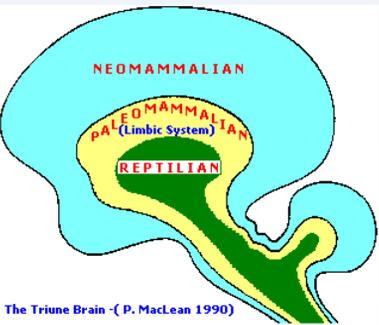
# How Religious Beliefs Can Directly Affect Brain Function and Mental Health: ETAS Theory

Kevin J. Flannelly, Ph.D.,<sup>1</sup> Kathleen Galek, Ph.D.,<sup>1</sup> Harold G. Koenig, M.D., M.H.S.,<sup>2</sup> Christopher G. Ellison, Ph.D.<sup>4</sup>  
<sup>1</sup>The HealthCare Chaplaincy, N.Y., <sup>2</sup>Duke University Medical Center, <sup>3</sup>University of Texas as Austin

## Introduction

This paper described a theoretical model that offers a plausible biological mechanism through which religious and other beliefs can directly affect mental health. The model, published by Flannelly, Koenig, Galek and Ellison (2007), draws on current thinking in psychiatry and cognitive psychotherapy about the evolutionary roots of psychiatric symptoms, integrating this with findings on the neural substrates of psychiatric disorders and brain evolution and function. In keeping with other theories in evolutionary psychiatry, ETAS theory proposes that various psychiatric symptoms are the by-products of brain functions that evolved to detect and assess potential animate and inanimate threats in the environment. The theory explains how threat assessments underlie certain psychiatric symptoms, and hypothesizes that three specific areas of the brain work together to varying degrees to form one or more Evolutionary Threat Assessment Systems (ETAS).

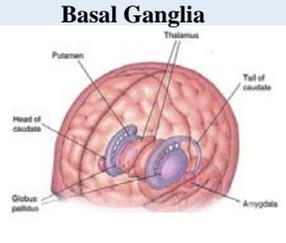
## MacLean's Triune Brain



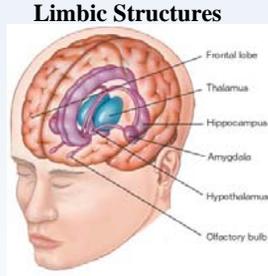
Paul MacLean was an early proponent of the idea that psychiatric disorders had evolutionary roots; that many psychiatric disorders represent the functioning of areas of the brain that evolved, in part, for self defense. MacLean thought the human brain should be considered to be three separate brains that interact with each other – a “triune brain.” He called the oldest part of the brain, the reptilian brain. It is mainly comprised of the basal ganglia, and it operates instinctively. He called the next most recently evolved portion of the brain, the paleomammalian brain, because it first appears in early mammals. This portion of the brain is comprised of the limbic system, which plays critical in emotions. The last part of the triune brain to evolve is the neomammalian brain, or neocortex. The area of the neocortex that is mainly associated with threat assessment and self-defense is the prefrontal cortex. All three brains are thought to be involved in detecting, assessing, and responding to environmental threats to some extent.

## Triune Brain Structures

The basal ganglia (shown in purple) lie deep within the center of the brain, underneath the neocortex, flanking the thalamus; globus pallidus, caudate nucleus, and putamen. The amygdala is part of the limbic system.

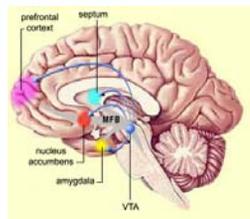
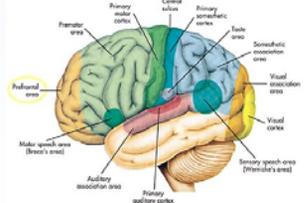


Definitions of the limbic system vary, but MacLean (1955) included amygdala, the hippocampus, and cingulate gyrus, which is the large unlabeled arch at the top of the illustration. The frontal lobe is not part of the system.



The next two figures show lateral and medial views of the neocortex with the prefrontal cortex located on the left.

## Prefrontal Cortex



## Threat Assessment

The clinical psychologist and evolutionary theorist Paul Gilbert said: “humans, like other animals, have to make one essential judgment about nearly all situations, ... the degree to which they indicate a threat or are safe” (2002, p. 275). It is believed that the basal ganglia, the limbic system, and the prefrontal cortex all evolved, in part, to assess potential threats of harm (Flannelly et al., 2007). The basal ganglia instinctively assesses threats and the limbic makes emotional assessments of threats. The prefrontal cortex is involved in making rationale assessments of potential threats and integrates information from the sub-cortical structures. Together, these brain structures form one or more ETAS for assessing possible threats from various animate and inanimate sources of harm.

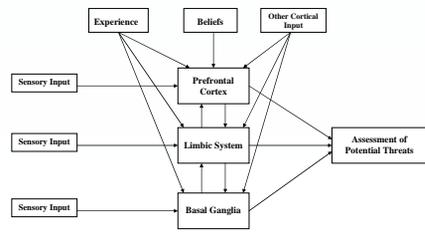
## Threat Assessment and Psychiatric Symptomology

It has been suggested that threat assessment systems can cause psychiatric symptomology for at least four reasons: (1) the threat assessments made by cognitive and emotional/innate assessments may conflict in some way, (2) the functioning of the systems is no longer effective in the modern world, or their operation is (3) improperly activated or (4) improperly prolonged (Flannelly et al., 2007; Gilbert, 2002). Paranoia, for example, is thought to reflect an improper assessment of the threat of harm posed by other people (Schlager, 1995).

Cognitive psychotherapists, such as Gilbert (1984), Beck (e.g., Beck, Emery & Greenberg, 1985) and others (e.g., Clark 1999) have long argued that psychiatric disorders result from distorted beliefs about the threat posed by certain situations. These beliefs can be quite general, such as “Any strange situation should be regarded as dangerous;” or “It is always best to assume the worst” (Beck et al., 1985, p. 63). If beliefs can cause psychiatric symptoms, presumably they can also ameliorate them.

But what would be the mechanism of action? Miller and Cohen (2001) suggest that beliefs affect various parts of the brain through the prefrontal cortex.

## Simple Model of an ETAS



## Explanation of ETAS Model

As indicated in the model, the three brain areas comprising an ETAS all use sensory input and past experience to make their threat assessments. Cortical areas other than the prefrontal cortex may also provide input.

Beliefs influence the assessment of threats by moderating the sensitivity or threshold of the system. Note that no direct connections are shown between beliefs and the basal ganglia or the limbic system. Since these sub-cortical structures evolved before language, beliefs must be translated to them in some way for them to have an effect.

## How Beliefs Work

Miller and Cohen (2001) give an example of an American tourist in England who, before crossing the street, is “reminded” by his prefrontal cortex “you are in England” – the implication being that he must look to the left to see if it is safe to cross. To a tourist crossing a street or walking past a dark alley in New York City, the prefrontal cortex might say “you are in New York City,” so judge the safety of the situation accordingly.

We think the simple belief that “the world is a dangerous place to live” increases the sensitivity of ETAS, so they are more likely to assess situations as being threatening. This, in turn, increases the psychiatric symptoms the assessments produce: e.g., general anxiety, agoraphobia, etc.

Beliefs about human nature will also influence psychiatric symptoms, especially those related to social threats. For example, the belief that “human nature is basically evil” should increase paranoia, social anxiety, etc., whereas the belief that “human nature is basically good,” should decrease such symptoms.

In the same way, belief in a close and caring God, should reduce threat assessments, and thereby certain types of psychiatric symptoms. Belief in guardian angels should do the same. Other religious beliefs could have positive or negative effects, and some may interact with each other, to the degree they are related to threat assessment.

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