Startle potentiation in humans – an indicator of fear and anxiety

Paul Pauli*†[1]

[1]Department of Psychology, University of Würzburg – Marcusstr. 9-11 D-97070 Würzburg, Germany

Abstract

Seminal animal studies (e.g. by M. Davis) demonstrated that startle response potentiation by fear-conditioned stimuli is mediated by the amygdala. In humans, startle responses include an eye-blink which can be reliably measured with orbicularis oculi EMG. Human studies revealed potentiation of startle responses by fear-conditioned or negatively valenced stimuli, and neuropsychological and imaging studies indicated the amygdala's importance. Our studies on healthy subjects revealed that startle potentiation is modulated by darkness, movement of stimuli, context, and a genetic polymorphism affecting dopaminergic efficiency (DRD4 receptor polymorphism). Importantly, we found evidence that CS – UCS timing can reverse startle potentiation effects, although explicit emotional responses are unaffected. Since phobias presumably are based on fear-conditioning, we expected and found potentiated startle responses in phobic patients, yet stronger effects in spider phobics than in flight phobics presumably indicating biological preparedness. However, our studies with virtual reality indicate that cognitions modulate fear responses triggered be fear-specific stimuli. Unlike phobic patients, patients with an attention deficit/hyperactivity disorder generally exhibited normal startle potentiation but deficits in startle attenuation indicating normal fear but deficient reward processing. In sum, startle potentiation seems to be a valuable indicator of fear and of psychopathology of the emotional-motivational system.

*Speaker

†Corresponding author: pauli@psychololgie.uni-wuerzburg.de