



Affective modulation of the startle reflex and the Reinforcement Sensitivity Theory of personality: The role of sensitivity to reward



Anton Aluja*, Angel Blanch, Eduardo Blanco, Ferran Balada

Department of Psychology, University of Lleida, Catalonia, Spain
Institute of Biomedical Research (IRB Lleida), Catalonia, Spain

HIGHLIGHTS

- An assessment of the Lang paradigm about the differences in startle reflex
- Unpleasant pictures provided higher startle reflex than the neutral and pleasant.
- The pleasant pictures obtained a significant smaller startle reflex.
- Subjects higher in SR obtained higher startle reflex in pleasant pictures.

ARTICLE INFO

Article history:

Received 17 December 2013

Accepted 29 September 2014

Available online 20 October 2014

Keywords:

Startle reflex

IAPS

Reinforcement Sensitivity Theory of personality

Sensitivity to Reward

Sensitivity to Punishment

ABSTRACT

This study evaluated differences in the amplitude of startle reflex and Sensitivity to Reward (SR) and Sensitivity to Punishment (SP) personality variables of the Reinforcement Sensitivity Theory (RST). We hypothesized that subjects with higher scores in SR would obtain a higher startle reflex when exposed to pleasant pictures than lower scores, while higher scores in SP would obtain a higher startle reflex when exposed to unpleasant pictures than subjects with lower scores in this dimension. The sample consisted of 112 healthy female undergraduate psychology students. Personality was assessed using the short version of the Sensitivity to Punishment and Sensitivity Reward Questionnaire (SPSRQ). Laboratory anxiety was controlled by the State Anxiety Inventory. The startle blink reflex was recorded electromyographically (EMG) from the right *orbicularis oculi* muscle as a response to the International Affective Picture System (IAPS) pleasant, neutral and unpleasant pictures. Subjects higher in SR obtained a significant higher startle reflex response in pleasant pictures than lower scorers (48.48 vs 46.28, $p < 0.012$). Subjects with higher scores in SP showed a light tendency of higher startle responses in unpleasant pictures in a non-parametric local regression graphical analysis (LOESS). The findings shed light on the relationships among the impulsive–disinhibited personality, including sensitivity to reward and emotions evoked through pictures of emotional content.

© 2014 Elsevier Inc. All rights reserved.

1. Introduction

1.1. Personality and startle reflex modulation

The association of personality differences with emotions has been addressed by combining the biological factor models of personality such as Eysenck's and Gray's theories, and the startle reflex modulation paradigm [1–8]. Lang, Bradley and Cuthbert [9] and Lang, Bradley, Cuthbert and Patrick [10] developed a framework to study the neuro-physiological components of human emotion through the startle reflex,

a non-voluntary response in an electromyography signal recorded from the orbicularis oculi muscle. Lang [11] suggests an emotional system subdivided into aversive and appetitive motivational systems. The former facilitates defensive behaviour such as avoidance, escape or defence, whereas the latter facilitates approaching behaviours such as mating, food taking or exploration. In this respect, Lang, Bradley and Cuthbert [12] view valence and arousal/activation as the fundamental dimensions of emotions: valence determines the direction, and arousal the intensity of activation. Startle reflex modulation represents an interesting paradigm for the study of individual differences in emotionality and hence for the comparison of theories about the biological basis of personality, which is particularly pertinent to the first formulation of Gray's Reinforcement Sensitivity Theory (RST) of personality [13–16].

* Corresponding author at: Institute of Biomedical Research of Lleida, University of Lleida, Avd. Estudi General, 4, 25001 Lleida, Catalonia, Spain.
E-mail address: aluja@pip.udl.cat (A. Aluja).

Subjects scoring high in Eysenck's neuroticism have generally shown reduced startle reflex to disgust-inducing film-clips, but enhanced startle responses to fear-inducing film-clips [8]. Subjects with higher scores in extraversion, sensation seeking, impulsiveness, risk-taking and nonconformity have shown faster, more rapid startle habituation [7]. Gray carried out a reformulation of Eysenck's theory of human personality based on a shift in the concepts of extraversion and neuroticism. Higher levels of anxiety would be found in neurotic-introverted individuals, and lower levels of anxiety in emotionally balanced-extroverted people. Therefore, the theory suggested three neuropsychological systems: The Behavioral Approach System (BAS; appetitive system) activates behaviour in response to signals of reward and non-punishment. The Behavioral Inhibition System (BIS; aversive system) inhibits behaviour in response to signals of punishment, non-reward and novelty. The Fight-Flight System (FFS) mediates reactions of rage and panic, flight versus fight, and is sensitive to unconditioned aversive stimuli. FFS is often referred to as the threat system [17]. The BIS normally functions as a comparator, taking control of behaviour in response to signals of punishment, frustrated non-reward and novelty stimuli. The BAS is responsible for approaching behaviour in response to incentive (signals of reward or punishment). The BIS is related to the trait-anxiety and the BAS is related to impulsivity.

1.2. Measure of the Reinforcement Sensitivity Theory of personality (SPSRQ)

The BAS and BIS constructs can be assessed with several psychometric measures. One of the best-known instruments is the Sensitivity to Punishment and Sensitivity to Reward Questionnaire (SPSRQ) [18,19]. The Sensitivity to Reward (SR) scale was created to assess differences in Gray's impulsivity dimension. The items in it cover topics such as money, sex partners, social events, power and sensation seeking. The Sensitivity to Punishment (SP) scale includes items about behavioural inhibition, passive avoidance, worry and cognitive processes related by the threat of punishment or failure [19]. In this framework, introverts would condition better than extraverts in situations of major cortical arousal, whereas people more prone to neuroticism would be more sensitive to punishment than to reward. Likewise, higher levels of extraversion together with higher levels of neuroticism would result in lower SP levels and higher SR levels [20].

1.3. Sensitivity to Punishment (anxiety) and startle reflex modulation

Bearing out Gray's RST, Caseras et al. [2] found a significant interaction between an SP group (high vs low) and emotional content stimuli. Comparing startle response between unpleasant and pleasant pictures, low SP participants did not show increments in the magnitude of the startle response, whereas high SP participants did. Both groups displayed potentiated startle during blood-disgust pictures. The selected blood-disgust pictures produced modulation in anxious groups. Some of the studies reporting that anxious subjects showed higher potentiation in startle reflex when exposed to unpleasant stimuli used fear and phobic pictures [2]. Phobic subjects also show potentiated startle reflexes to feared pictures [21]. Nevertheless, Wilson et al. [8] found that subjects higher in neuroticism showed greater startle reactions than subjects lower in neuroticism under fearful conditions, even though subjects low in neuroticism showed greater startle when disgust was evoked.

It has been hypothesized that anxious subjects highly sensitive to punishment would display a higher increment of the startle reflex when exposed to aversive pictures [9,10], whereas being more impulsive and sensitive to reward should be related to greater modulation of startle reflex when exposed to pleasant pictures [4,22]. The results of this study were, however, only consistent for the first hypothesis. Highly anxious subjects with high scores in Cloninger's Harm Avoidance (HA) scale reacted to unpleasant pictures, but impulsive subjects did

not react to pleasant pictures (high psychoticism, extraversion and neuroticism in Eysenck's system, or novelty seeking, as measured by the Temperament Personality Questionnaire; TPQ) [23]. Moreover, Kumari et al. [6] did not find any relationships between Eysenck's and Cloninger's dimensions and affective modulation in subjects viewing pleasant, neutral and unpleasant films. Later, Wilson et al. [8] reanalyzed the Kumari et al. [6] data and found that subjects higher in Eysenck's neuroticism scale showed minor startle reflex responses to disgust-inducing film-clips, but exhibited major startle reflexes to fear-inducing film-clips. In general, results have demonstrated differences between the startle reflex response and some personality dimensions. Introverts have smaller response latencies to the startle probe at higher stimulus intensity level [1], while extraverts and stable subjects obtain a linear pattern of modulated startle, with subjects higher in HA showing a modulation to unpleasant pictures [3,4]. Subjects higher in psychoticism show longer latencies to eye blink onset when probed during viewing of pleasant film-clips [6].

1.4. Sensitivity to Reward (impulsiveness) and startle reflex modulation

The current study assessed the Lang paradigm about the differences in the startle reflex response to pleasant, neutral and unpleasant pictures, with the basic premise that higher responses in startle reflex should be expected for unpleasant pictures, and lower responses for pleasant pictures. In addition, we analysed the relationships among extreme scores in the dimensions of SP and SR with the startle reflex response for pleasant, neutral and unpleasant pictures. According to the biological basis of Gray's RST, exposure to a novel unpleasant picture should be associated with sustained cardiac deceleration, facial muscle action, and potentiation of startle probe reflexes. Reward-seeking behaviour is controlled by neural circuits that include the medial prefrontal cortex, and the nucleus accumbens which functions as an interface with motor areas [24]. Gray suggested that impulsivity is caused by reward motivation, regulated by the BAS. Activation of the BAS by reward is thought to produce an output to the motor cortex and an increase in arousal, enabling the individual to approach the source of reward. BAS-Impulsive individuals are thought to be more reactive to and more strongly motivated by positive incentive stimuli. Dickman's functional impulsivity reflects Gray's notion of reward-reactivity and could therefore be related with RST. Results on startle reflex response and SP and SR personality dimensions have supported a positive relation between higher SP scores and higher startle reflex potentiation after exposure to unpleasant pictures. However, the possible relationships between SR and higher startle reflex response have not been considered. Impulsive, sensation seeking and extraverted subjects possess lower basal levels of cortical arousal resulting from lower activity of the reticular system [25]. Sensation seekers tend to seek sensation and exciting stimuli which increase the activity of catecholamine systems in the brain. The sensation seeking trait has been related to low levels of platelet monoamine oxidase (MAO), and a low MAO concentration in the neural synapses is related to higher levels of catecholamine [26–28]. Gorenstein and Newman [29] claimed that dysfunctional reward reactivity is the common diathesis underlying disinhibited behaviour (e.g. psychopathy, early onset alcoholism, childhood hyperactivity and non-pathological impulsivity). It is likely that the appetitive pictures portraying risk behaviours provoke a higher startle response, because high SR subjects can feel especially motivated and aroused by these topics. In addition, extraverted and impulsive-disinhibited people have lower levels of cortical arousal, which could explain their higher startle reflex response when viewing pictures of risk behaviours. If both rapid habituation to startle elicitation in extraverts and sensation seekers and SR correlate with sensation seeking and extraversion, we can hypothesize that pleasant pictures can potentiate the startle reflex response in impulsive subjects with higher scores in SR [7].

Download English Version:

<https://daneshyari.com/en/article/2844231>

Download Persian Version:

<https://daneshyari.com/article/2844231>

[Daneshyari.com](https://daneshyari.com)