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Impulsivity, arousal and attention

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Abstract

This study compared the utility of four theories of impulsivity that differ in whether they attribute impulsivity-related differences in performance to differences in arousal, differences in attentional processes or differences in nonattentional processes. Based on self-report, subjects were categorized as high or low in two forms of impulsivity, dysfunctional and functional, and two forms of arousal, tense and energetic. The four theories made differing predictions about the relationship between dysfunctional impulsivity, energetic arousal, and subjects' performance on a visual search task whose attentional demands were manipulated. It was found that higher levels of energetic arousal were associated with faster performance for high dysfunctional impulsives and slower performance for low dysfunctional impulsives only when the task was attention-demanding, supporting the theory that impulsivity-related differences in performance are due to differences in the mechanisms that allocate attention. Functional impulsivity showed complex interactions with both tense and energetic arousal; these were explained in terms of the effects of tense arousal on functional impulsives' levels of cautiousness, and the effects of energetic arousal on their ability to shift attention rapidly.

1. Impulsivity, arousal and attention

Individual differences in self-reported impulsivity have been found to be associated with differences in performance on a wide range of cognitive tasks (Eysenck & Levey, 1972; Loo, 1979; Revelle, Humphreys, Simon & Gilliland, 1980; Anderson & Revelle, 1983; Dickman, 1985; Brunas-Wagstaff, Bergquist & Wagstaff, 1994). One important source of disagreement

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between the different theories that have been offered to account for these findings has to do with the roles of arousal and attention in mediating the impulsivity–performance relationship.

Both Eysenck (1993) and Revelle (1987) have proposed that performance differences between high and low impulsives reflect differences in arousal. The disagreement between these theorists concerns the specific consequences that such arousal differences have on information processing.

Matthews (Matthews, 1987; Matthews, Davies & Lees, 1990) and Dickman (1993, 1996) have proposed theories in which the differences between high and low impulsives are primarily due to factors other than arousal differences. These two theorists disagree on whether the other factors are attentional or non-attentional (i.e. automatic) in nature. The present study was designed to explore further the roles of both arousal and attention in accounting for impulsivity-related differences in performance.

1.1. Time of day effects

It should be noted that two of the theories discussed here, those of Revelle and Matthews, hold that the factors producing the performance differences between high and low impulsives are affected by the time of day. The present study was concerned with determining the nature of those factors, rather than with determining whether they show circadian rhythms. Therefore the discussion here will focus on the predictions made by the different theories about performance during the daytime, when most research on impulsivity has been conducted.

1.2. Theories of impulsivity

1.2.1. The general arousal theory

Eysenck (1993), extending a theory he originally developed to account for extraversion-related differences in performance, has proposed that high impulsives are chronically lower in arousal than low impulsives. Eysenck notes that the relationship between arousal and performance is curvilinear in nature, taking the form of an inverted 'U' (Yerkes & Dodson, 1908). Therefore, according to Eysenck, increases in arousal tend to help the performance of high impulsives by shifting their level of arousal upwards towards the optimal level, and to hurt the performance of low impulsives by shifting their already high level of arousal beyond the optimal level.

1.2.2. The SIT/STM theory

Revelle (Revelle, Humphreys, Simon & Gilliland, 1980; Humphreys & Revelle, 1984) agrees with Eysenck that low impulsives are overaroused and high impulsives are underaroused (at least during the day). However, he proposes that the effects of increased arousal on these two groups will depend on the nature of the task. Specifically, he distinguishes between short-term information transfer (SIT) tasks and short-term memory (STM) tasks.

SIT tasks involve the processing of incoming sensory information with relatively little access to information stored in memory; such tasks are always helped by increases in arousal. Thus both high and low impulsives would be expected to be helped by arousal on such tasks, but