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Impulsivity and time estimation: Casting a net to catch a fish

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Abstract

We employed a series of time-estimation tasks, chosen such that impulsivity could be revealed in deviant performance both within and between tasks. Trait impulsivity was assessed using a number of measures; cognitive impulsivity was measured using a number of neuropsychological tests (e.g., Trail Making, Circle Tracing). Time estimation was evaluated using reproduction tasks (both remote and immediate) within a prospective paradigm. The structure underlying the data is four-dimensional: Factor 1 (F1) has contributions from both venturesomeness and the indices of immediate time reproduction, implicating sensation seeking; F2 is uniquely identified with performance on remote time reproduction; F3 implicates a component of trait impulsivity; F4 implicates a component of cognitive-motor impulsivity.

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1. Introduction

The construct of impulsivity is multi-faceted (Kindlon, Mezzacappa, & Earls, 1995; White et al., 1994), and is assessed using trait measures, such as those associated with Barratt (1993) and with both Eysenck (1993a) and Eysenck (1993b), and cognitive (or behavioural) tasks, such

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as Circle Tracing (Bachorowski & Newman, 1985) and time estimation (Wingrove & Bond, 1997). While the tests of impulsivity are positively correlated within each domain (Carrillo-de-la-Peña, Otero, & Romero, 1993), between-domain correlations are negligible (Wingrove & Bond, 1997).

In our research, we have employed a series of tasks of time estimation, chosen such that impulsivity could be revealed in deviant performance both within and between tasks. Consider a non-impulsive individual who is required to produce intervals of 4, 8, 16 and 32 s (Glicksohn, 1996). Assume that the intervals produced are 2, 4, 8 and 16 s, respectively. Clearly, while these are all underestimations, there is a lawful relationship between produced and target durations. If both produced and target durations are log-transformed (to base 2), then the target durations will conform to a linear scale ranging between 2 and 5, and the produced intervals will range between 1 and 4. The relationship between the two will be linear, having a slope which is equivalent to the exponent of the psychophysical power function relating produced to target time (Eisler, 1976): In this case, the slope will be 1, and the intercept will be -1 . Now consider an impulsive individual, whose cognitive timer is working at a faster rate—the working hypothesis underlying the present research. Let us assume that the intervals now produced are 1, 2, 4, and 8 s. While the slope will be the same as before (1), the intercept will be -2 . Thus, impulsivity should be negatively correlated with the *intercept*, if the working hypothesis is essentially correct, and the task is that of time production. If it is the intercept which is implicated, then one may further deduce that impulsivity is related to time estimation via arousal and/or attention (see Glicksohn, 2001, for an extensive discussion). On the other hand, if it is the *slope* which is implicated (e.g., Barratt, 1981), then one may deduce that impulsivity is related to time estimation solely via the construct of arousal (Glicksohn, 2001).

In the present research, we were interested in seeing whether trait impulsivity would be correlated with such performance measures using the method of time reproduction. We employ a further distinction in designing the study, that between *immediate* and *remote* time reproduction (Zakay & Fallach, 1984). In immediate time reproduction, the participant provides an estimation of elapsed duration with practically no delay from offset of the interval; in remote time reproduction, one has to wait a certain interval before providing this time estimation. Conceivably, impulsivity will be more easily apparent using remote time reproduction, because of the infringement on the focus on the immediate “here-and-now” (Damasio’s, 1994, “myopia for the future”).

Given that impulsivity is a multi-faceted construct, it would be best to employ our tasks of time reproduction together with other measures of impulsivity. Of course, we shall be concerned with the degree of convergence of these measures—assessed by means of exploratory factor analysis.

2. Method

2.1. Design and participants

We ran two independent studies, the second serving as a constructive replication of the first. Here we shall pool the data—thereby enabling a more focused presentation. We employed a homogeneous female sample, drawn from an undergraduate pool, numbering 96. Their age ranged between 18 and 26.

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