

A selective impairment of Insomnia Disorder patients performing a visual search task discussed in the light of the Sternberg's (1966) model

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Objectives

Although several studies have demonstrated that Insomnia Disorder (ID) is frequently associated with the presence of cognitive daytime impairments, little is known about the impact of this sleep disorder on specific perceptual processes. In this study we aim at evaluating the effects of ID on visual processing by means of a visual search paradigm.

Materials

Stimuli consisted in matrices of distractor letters (characters Os, Xs, or Ls) containing a target (character T) in half of the cases. Target's salience (inversely proportional to the similarity between target and distractors: Os vs. T; Xs vs. T; Ls vs. T) and distractors' numerosity (15, 30, 60) were manipulated.

Methods

23 ID patients and 20 healthy age- and sex-matched control subjects participated in the study. ID patients performed the visual search task after a PSG recording night. In each trial, the stimuli were showed on a computer screen after the presentation of a fixation point. The observers had to detect as soon as possible the presence/absence of the target. After the observer's answer, the stimulus was replaced by a masking matrix for 2000 ms. Accuracy and reaction times (RT) were recorded as dependent variables.

Results

Results mainly confirmed the typical effects of a visual search task: RT decreased with target's salience and increased with distractors' numerosity. Furthermore, an overall delay was found for stimuli in which the target was absent. No difference between the two groups with regard to accuracy was found, but ID patients generally performed the task with higher RT. However, distinguishing RT to stimuli containing the target from RT to stimuli in which the target was absent, the clinical group differed from controls solely in the condition of target absent.

Surprisingly, the performance (RT) of the subjects correlated with age in the control group, whereas no correlation between RT and age, disease duration and quality of sleep was found in ID patients.

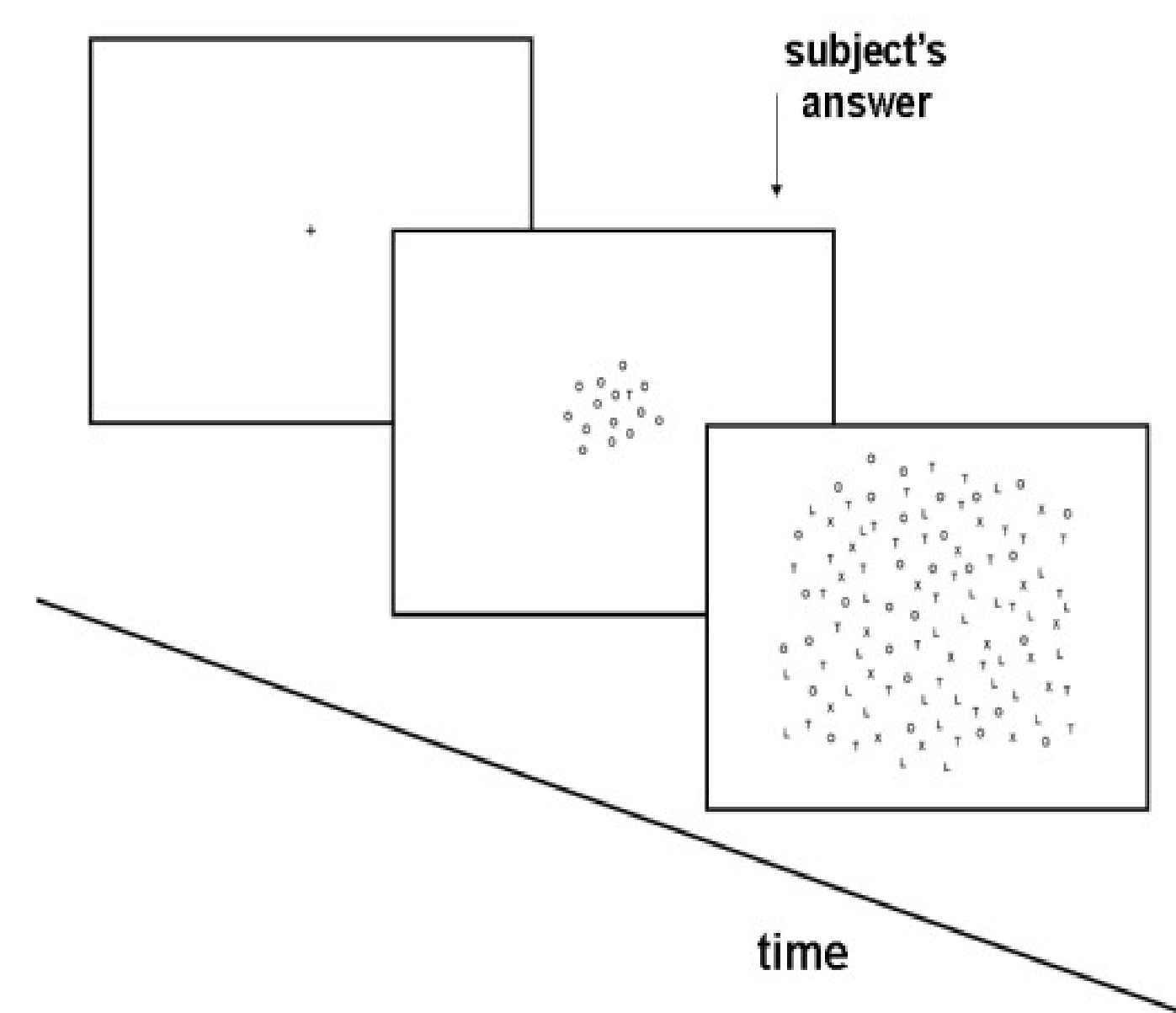
Discussion

The general effect of delayed RT for stimuli without target with respect to RT for stimuli containing the target supports the idea of a "self-terminating" analysis of patterns comprehending relevant visual information. This effect is emphasised in the clinical group, indicating a selective impairment of ID patients in stopping visual scanning when target is absent. The dissociation found in visual search experimentally demonstrates the presence of a selective perceptual impairment occurring in ID patients.

References

Sternberg S (1966) High-speed scanning in human memory. Science 153:652-654

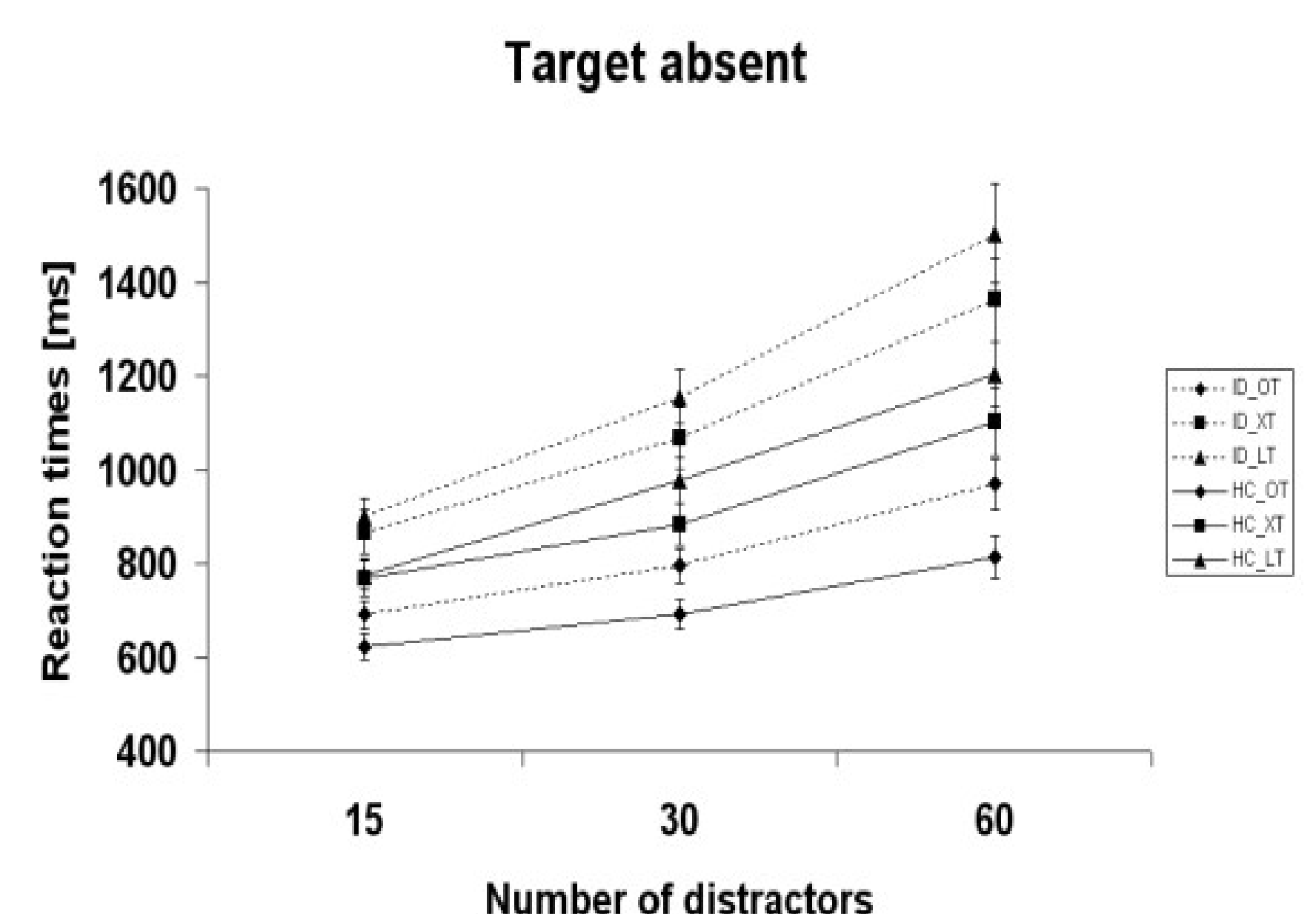
Experimental procedure



(A) A fixation point was presented to keep the observer's attention (500 ms).

(B) A stimulus matrix was shown. The stimulus consisted in a matrix of letters (Os, Xs, Ls) which could contain or not the target letter (T). The subject had to respond as soon as possible about the presence/absence of the target. The stimulus was displayed until the subject's response.

(C) Then, a masking matrix was presented (2000 ms) after stimulus to avoid interference between trials.



RT for trials with target absent are represented in function of three levels of numerosity (15, 30, 60), for three conditions of target's salience (diamonds for OT, squares for XT, and triangles for LT condition, respectively), for ID patients and HC (dotted and continuous lines, respectively).

PSG recordings	PI recordings Mean \pm SD (N=23)
TST (min)	415.17 \pm 63.43
SL (min)	18.57 \pm 17.70
WASO (min)	46.43 \pm 38.20
SE (%)	86.69 \pm 8.56
Nr. AWK	7.30 \pm 3.14
S1 (%)	6.86 \pm 2.49
S2 (%)	53.50 \pm 8.27
SWS (%)	19.70 \pm 10.12
REM (%)	19.96 \pm 4.80
SL REM (min)	91.52 \pm 39.64
PLMs index	6.04 \pm 5.57

Table 1: Mean PSG results \pm standard deviation of the ID group.