**Supplementary materials**

Investigating racing thoughts via ocular temporal windows: deficits in the control of automatic perceptual processes

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**S1: Neuropsychological evaluation**

The Trail Making Task was used to assess processing speed (TMT-A, a condition where subjects had to connect a series of numbers in order, i.e. 1-2-3…) and attention switching (TMT-B, a condition where subjects had to connect targets by alternating between numbers and letters, i.e. 1-A-2-B…). The difference between the two scores (‘time B’ - ‘time A’) reflects attentional switching costs (TMT-B) by subtracting the general psychomotor slowing (TMT-A).

 Further assessments included the Hayling test (Burgess & Shallice, 1997) assessing semantic inhibition, the Vocabulary Subtest of the Wechsler Adult Intelligence Scale-Third Edition (WAIS-III) (Strauss, Sherman, & Spreen, 2006) assessing lexico-semantic abilities and vocabulary size and the French National Adult Reading Test (Mackinnon & Mulligan, 2005) measuring premorbid intelligence levels (see Table 2 in the main manuscript).

**S2: Figure S1. Distribution of the RCTQ scores and composition of the racing thoughts groups.**

RCTQ score thresholds used to establish racing thoughts groups are indicated with dashed lines.

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**S3: Equipment and stimuli**

The study was conducted in a quiet and dimly lit room. Visual stimuli were generated by a Hewlett-Packard Compaq 8100 Elite 2 computer using programs written on MATLAB software (2007) by MathWorks and PsychToolbox (Brainard, 1997) and presented on a 21’’ Sony Triton CRT screen.

Throughout the experimental conditions the Necker cube was presented on the screen for 60 seconds (Fig. 1). Each side had a length of 12° of visual angle, consisting of black lines (0.008 cd/m² and 0.18° thickness) on a white background (41.5 cd/m²).

An EyeLink CL 1000 (SR Research) infra-red video-based eye tracking system (sampling-frequency of 1000 Hz and a spatial resolution of 1024 x 768 pixels) was used to measure right eye movements throughout the experiment. Before each experimental condition the eye tracker was calibrated with a fixation dot that appeared repeatedly in different locations following a 9-point grid. Participants had to fixate the dot until stable eye coordinates could be measured. Head movements were minimized using a chinrest at a fixed distance of 70 cm from the computer screen. The number and duration of ocular fixations were registered and analyzed. Fixations were defined by stable eye position coordinates for a minimum of 90 ms and a maximum of 1000 ms. The processing of eye tracking data was carried out using programs written on MATLAB, and data was analyzed with Statistica® software 13.0. by Statsoft.

**Statistical analyses:** In the ANOVAs, within-group variables were the experimental condition (Spontaneous vs. Focus vs. Switch) and, for some analyses, the rank of the conditions (‘Second session’ vs. ‘Third session’). Between-group variables were the Racing thoughts group (‘No’ vs. ‘Low’ vs. ‘High racing thoughts group’) and, for some analyses, the order group (‘Focus then Switch’ vs. ‘Switch then Focus’). We added the partial eta-squared (𝜂2) as a measure of effect size.

**S4: Validation of the cluster analysis in the racing thoughts groups**

The validity of our cluster analysis was verified by comparing the spatial coordinates of ocular fixation clusters in the control condition (where two non-ambiguous versions of the Necker cube were presented alternately on the screen) and in the other three conditions (where the ambiguous figure was presented continuously). In our preceding study, it was found that left and right cluster coordinates were similar when the figure is ambiguous and when it changes physically between two non-ambiguous versions, except when the instruction was to switch between perceptions. The similarity of coordinates between the ‘Spontaneous’, ‘Focus’ and ‘Control’ conditions means that the positions of left/right ocular fixations during viewing of the ambiguous Necker cube correspond to perceptual representations of the two interpretations (left/right orientations) of the figure.

 Repeated measure ANOVAs were conducted in all three racing thoughts groups separately, with the abscissa of the ocular fixation clusters (left and right location) and condition (Spontaneous, Focus, Switch and Control) as within-group variables. A main effect of the abscissa in all three Racing thoughts groups indicated that the left and right fixation clusters had systematically different x coordinates in each condition (for details on statistics see Table S3).

Table S3.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Racing thoughts group | Left coordinate (pixels) | Right coordinate (pixels) | F | P | 𝜂2 |
| No | 608 | 683 | 129.83 | <0.00001 | 0.87 |
| Low | 635 | 710 | 167.03 | <0.00001 | 0.86 |
| High | 612 | 698 | 91.28 | <0.00001 | 0.80 |

 An interaction between the abscissa of fixation clusters and condition was found only in the “No racing thoughts group” ([F(3, 60)=6.06, p<0.005, 𝜂2=0.23]. A sub-analysis on the distance between left and right cluster coordinates (Right coordinate-Left coordinate) was conducted in this group in order to understand the origin of this interaction. Like in our preceding study, an effect of the condition indicated that the distance between left and right fixation clusters varied significantly throughout the conditions [F(3, 60)=6.06, p<0.005, 𝜂2=0.23], and Tukey’s post hoc analysis showed that this distance was larger in the Switch condition (110 pix.) compared to the Spontaneous (51 pix., p<0.005) and the Focus conditions (63 pix., p<0.05). The distance between left and right fixation clusters in the Control condition (74 pix.) did not differ from the distance in the other conditions where the ambiguous version of the Necker cube was presented. In the other two racing thoughts groups no interaction was found indicating similar fixation cluster coordinates throughout the conditions. These results are consistent with the fact that the perception of the Necker cube is less influenced by attentional conditions in subjects with racing thoughts compared to the ‘No racing thoughts’ group.

We additionally compared the Racing thoughts groups on the number of temporal windows produced in the ‘Control’ condition with similar ANOVAs as described in the main text (Racing thoughts group as between-group variable). There was no effect of group in the ‘Control’ condition on the number of manual [F(2, 80)=1.02, p=0.37, partial η²=0.02] or ocular windows [F(2, 71)=1.34, p=0.27, partial η²=0.04].

**S5: Results of the statistical analyses with age and level of education as covariates (ANCOVAs)**

**Number of manual windows**

The conditions of application of an Analysis of Covariance were not met for the manual windows data (Age negatively correlated with the number of manual windows in the ‘Spontaneous’ [r=-0,36; p<0.005] and the ‘Switch’ conditions [r=-0,32; p<0.005]).

**Number of ocular windows**

For ocular windows, which represented the main results of the study, we verified whether the statistics involving a comparison between groups changed or not when age and level of education were taken as covariates.

The interaction between the racing thoughts group and the condition remained significant for the number of ocular windows [F(2, 156)=2.65, **p<0.05**, partial η²=0.06].

**Effect of task order**

As for the analyses on the effect of task order, the 3rd level interaction between rank, order and racing thoughts group remained significant when age and level of education were taken as covariates [F(1, 75)=3.33, **p<0.05**, partial η²=0.08].

The other interactions likewise remained unchanged when age and level of education were taken as covariates:

* In the group that performed the conditions in the ‘Focus then Switch’ order the interaction between rank and racing thoughts group was still significant [F(2, 35)=4.28, **p<0.05**, partial η²=0.20].
* In the analysis in the (first) ‘Focus’ condition, the effect of racing thoughts group was significant like for the original analysis [F(2, 35)=4.99, **p<0.05**, partial η²=0.22], with the “High racing thoughts” group presenting a higher number of ocular windows compared to the “Low racing thoughts” group [F(1, 21)=9.02, **p<0.01**, partial η²=0.22].

Similar to the original result, no between-group difference was found in the (second) ‘Switch’ condition [F(2, 35)=1.76, p=0.19, partial η²=0.09].

In the group that performed the conditions in the ‘Switch then Focus’ order, the interaction between rank and racing thoughts group remained non-significant [F(2, 38)=1.06, p=0.36, partial η²=0.05].

**Control condition**

For the analyses in the Control condition, the effect of group remained non-significant for both manual [F(2, 78)=2.13, p=0.13, partial η²=0.05] and ocular data [F(2, 69)=0.86, p=0.43, partial η²=0.02].