HYPNOTIZABILITY AND POSTURAL EFFECTS OF SENSORY ALTERATION

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INTRODUCTION
Hypnotizability is a psychological trait evaluated by scales and is largely based on peculiar cognitive abilities related to the functional characteristics of the supervisory attentional system [1]. The main reason why body sway might be less vulnerable to sensory alteration in subjects with high hypnotic susceptibility (Highs) than in low hypnotizable individuals (Lows) is based on the role of attention in both hypnotizability and postural control. This is an “attention consuming” function modulated by concomitant cognitive activities and by higher cognitive processes, and its attentional cost of balance is increased by sensory alteration. Greater availability of attentional resources in Highs might account for the observation that body sway is modified in Lows, but not in Highs, during guided imagery and mental computation and might also lead to lower vulnerability of the body sway to sensory alteration in Highs [2]. Aim of the study was to investigate the postural effects of the suppression of visual input (eye closure) and alteration of leg proprioceptive input (unstable support) in Highs and Lows, as well as the mechanisms involved.

METHODS
Ten healthy Highs and 12 Lows (SHSS, C) stood barefoot on a stabilometric platform during 2 conditions (firm: stable support; foam: unstable support due to an 8 cm thick piece of foam) each consisting of 3 Trials (I, II, III) including 2 periods: open (OE, 1 min) and closed eyes (CE, 1 min) [3]. At the end of each trial, they were interviewed about their perception of sway during OE and CE (range: 1 min-10 max). Variables analyzed: scores of sway perception, area of the ellipse (Area) described by the movement of the centre of pressure (CoP), CoP mean velocity (Velocity) and the ratio between the length of the CoP trajectory and Area (length for surface, LFS). In addition, stabilogram diffusion analysis (SDA) was performed [4]. This method considers the CoP trajectories as a random-walk and assumes that the short-term control of CoP movement is due to central mechanisms (open loop control, within 2.5 sec), while the long-term control is modulated by peripheral afferences (closed loop control, later than 2.5 sec). The variables provided by SDA (Fig. 1) are: 1) the abscissa and the ordinate of the point (critical point) “where and when” the control of the CoP movement shifts from an open to a closed control loop, 2) the slopes of the regression lines of the diffusion coefficients for the short- and long term control period in both frontal and sagittal planes. Diffusion coefficients are the squared values of the difference between consecutive CoP positions.

RESULTS AND DISCUSSION
Sway perception: Both Groups perceived larger sway at eyes closure and on the unstable support, without differences between Highs and Lows.
Stabilometric variables: 1) suppression of visual input increased the CoP mean Velocity in Highs more than in Lows, while alteration of leg proprioceptive input increased it similarly in the two groups (Fig. 2); 2) suppression of visual input increased Area in the two groups, while alteration of leg proprioceptive input increased it more in Highs than in Lows (Fig. 3); 3) suppression of visual input increased LFS similarly in the two groups, while alteration of leg proprioceptive input induced different postural strategies increasing LFS only in Lows (Fig.4)
SDA variables:

1) Critical point coordinates. In both groups and planes, hypnotizability did not affect the abscissa of the critical point. In the frontal plane, the ordinate of the critical point was higher in foam than in firm in both groups and its value was higher in Highs than in Lows. Higher values during CE than during OE were observed in both groups, but, during CE, the ordinate increased more in Highs than in Lows. In the sagittal plane the ordinate was larger in Highs than in Lows and it increased more in Highs than in Lows during CE and in foam. It was larger in Highs than in Lows only during CE in firm and during both OE and CE in foam. Higher values during CE than during OE were observed in both groups, but, during CE, the ordinate increased more in Highs than in Lows. In the sagittal plane, the ordinate was larger in Highs than in Lows and it increased more in Highs than in Lows during CE and in foam. It was larger in Highs than in Lows only during CE in firm and during both OE and CE in foam.

2) Slopes of the diffusion coefficients regression lines. In the frontal plane, the regression line slope for the short-term control period was generally higher in Highs than in Lows. It increased significantly in both groups at eye closure and on the unstable support, but was significantly higher in Highs than in Lows during CE independently of the firm/foam condition. In addition, the regression line slope was quasi-significantly higher in Highs than in Lows during OE. In the long-term control period, both groups increased their regression line slope in foam and decreased it during CE. However, the decrease during CE was significant only in Highs and significantly higher slopes in Highs than in Lows were only observed during OE. In the sagittal plane, the slopes of the short-term regression lines were higher in Highs than in Lows, but this difference was significant only during CE. The slopes of the long-term regression lines were not affected by eye closure and increased significantly in foam in Highs only, leading to a Group difference in this condition. In summary, the higher critical point ordinate and higher slopes of the short-term diffusion coefficient regression lines in Highs indicate that their CoP can assume a wider range of positions with respect to Lows before the occurrence of feedback control mechanisms. Therefore, the set point for balance control seems to be different in the two groups. Differences between Highs and Lows concern proprioceptive alteration mainly.

The results support the hypothesis that hypnotizability modulates the postural effects of visual and proprioceptive alteration and that Highs and Lows exhibit different postural control. The changes induced in the stabilometric variables by sensory alteration do not confirm the hypothesis of greater stability of Highs. However, the stabilogram diffusion analysis suggests that Highs have a wider range of stable positions and that different internal reference systems might account for the similar subjective perception of sway associated with different actual sway in Highs and Lows. From this point of view, the greater changes in the stabilometric variables, and the less accurate postural adjustments shown by SDA indicate that Highs have a lower need for body sway corrections, likely due to a pre-eminent centrally-driven control instead of a less effective postural control.

REFERENCES