SUBJECTIVE VISUAL VERTICAL MATURATION IN CHILDREN

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ABSTRACT

The attraction of the Subjective Visual Vertical (SVV) to the side of rod presentation has already been described in adults and is purportedly related to visual dependency. The aim of this study was to evaluate this phenomenon in children and to analyze the effect of age and sex on the SVV. In a previous study, we showed that SVV was attracted to the side of bar presentation and this effect varied progressively with iterations. In the present study, the influence of gender at early ages is unclear (Witkin et al., 1946). Although many studies suggest that children have also a lower capacity in these tasks due to the immaturity of their central nervous system, the influence of gender is not well defined. In the present study, we aimed to evaluate this phenomenon in children and to analyze the effect of sex and age.

INTRODUCTION

• Subjective visual vertical (SVV) is routinely used to assess the otolithic function (Vibert et al., 1999).
• SVV is determined by means of a visual balance test of the VVS paradigm and is considered as a sensitive and reliable tool for the assessment of the otolith function.
• The SVV measurement is performed by presenting a bar alternatively to the left and the right. The patient was asked to replace the bar vertically with a remote control.
• The 12 measures were completed in less than 5 minutes. Deviations of the rod from the vertical were measured by a linear regression test. The precision of the control was 0.1°. The patient remained in the dark between iterations.

OBJECTIVE

• The aim of this study was to evaluate in a large number of pediatric patients, the effect of sex on the visual attraction phenomenon in children before and after the age of puberty.

MATERIAL AND METHODS

Population

• The retrospective study included 411 consecutive children and teenagers (age ranging between 4.5 and 19 years) selected by a pediatric center for balance or oculomotor problems. The mean age of patients was 12 ± 4.3 years. All patients underwent a thorough clinical examination including audiometry, neuro-otological tests, balance tests, and visual acuity tests. Diagnostic criteria were based on patient’s history and the above tests.

Subjective Vertical Visual Measurements

• The SVV measurements consisted of presenting a red phosphorescent bar measuring 1.5 cm placed in front of a seated patient in complete darkness. The patient faced the wall and was instructed to replace the bar vertically with a remote control.
• The patient was asked to replace the bar vertically each time using a remote control. The remote control was held in the patient’s right hand and there was no alignment between the illumination and the red bar. The angle deviation from the vertical was measured by a linear regression test. The test was stopped when the patient stopped by tilting the bar toward the vertical and the test was stopped when the patient was unable to maintain the bar in the vertical position. The cumulative tilt was calculated as the difference between the cumulative SVV measurements (in degrees) and calculated by:

where n represents the iteration, the visual attraction index (VAI) was defined as the cumulative SVV at the last measure. A positive index indicates an average attraction toward the side of the rod presentation (left) and a negative value an inverted effect.

RESULTS

SVV measurements and population characteristics

• SVV values were within the normal limits described for adults, except a slight increase in younger children.
• SVV values did not vary with age in children considered as normal (p=0.22 for 97 years old, 0.5±0.03°; p=0.37 for 11-14 years old, 0.5±0.02°; p=0.14 for 15-19 years old, not significant) and adults (p=0.37 for 20-30 years old, 0.5±0.02°; p=0.25 for 31-40 years old, not significant). The normally observed was the same in all age groups. A significant increase in the number of slopes was observed. Only boys and girls in age group 8-10 years old, exhibited a significant increase in the number of slopes.

Figure 1- VSS measurement

Figure 2- Subjective Vertical Visual Values Measurements as function of iteration. SVV was measured to position the bar alternatively to the left (left bars) and to the right (right bars) for 10 iterations.

Figure 3- Cumulative SVV tilt as a function of iteration in different age groups. Cumulative SVV tilt is defined as the cumulative sum of slopes between 12 iterations.

Figure 4- Cumulative SVV tilt as a function of gender in the 4 age groups. Cumulative SVV tilt is defined as the cumulative sum of slopes between 12 iterations.

Figure 5- VSS measurement

CONCLUSIONS

• SVV was significantly different between boys and girls in visual attraction. While, VSS was significantly different between boys and girls in visual attraction. While, VSS was significantly different between boys and girls in visual attraction. While, VSS was significantly different between boys and girls in visual attraction. While, VSS was significantly different between boys and girls in visual attraction.

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