

A relationship between Idiopathic Adolescent Scoliosis and motion sickness

Advances the understanding of this disease?

Adolescent idiopathic scoliosis is a three-dimensional deformity of the spine observed in 2 % of the adolescent population aged 10–16 years (Fig 1A). It is a serious medical condition, susceptible of causing difficulties in adult life: chronic pain, respiratory and cardiac complications. Treatments are sometimes heavy: rigid brace, corrective surgery.

Visual, somatosensory and vestibular information, to standing position.

Studies show that adolescents with scoliosis have difficulties to stabilize standing position. In humans, maintain a stable standing position is essential to explore the environment (walking, manipulating objects). For this, we must constantly refer to Earth's gravity and to the surface on which we stand. To analyze these data, we use 3 types of corroborating sensory information: visual (resulting from retinal sensors), somatosensory (from muscle and joint sensors, and also located in the feet and in some organs) and vestibular (from inner ear sensors). This information are transported to the brain, and then analyzed.

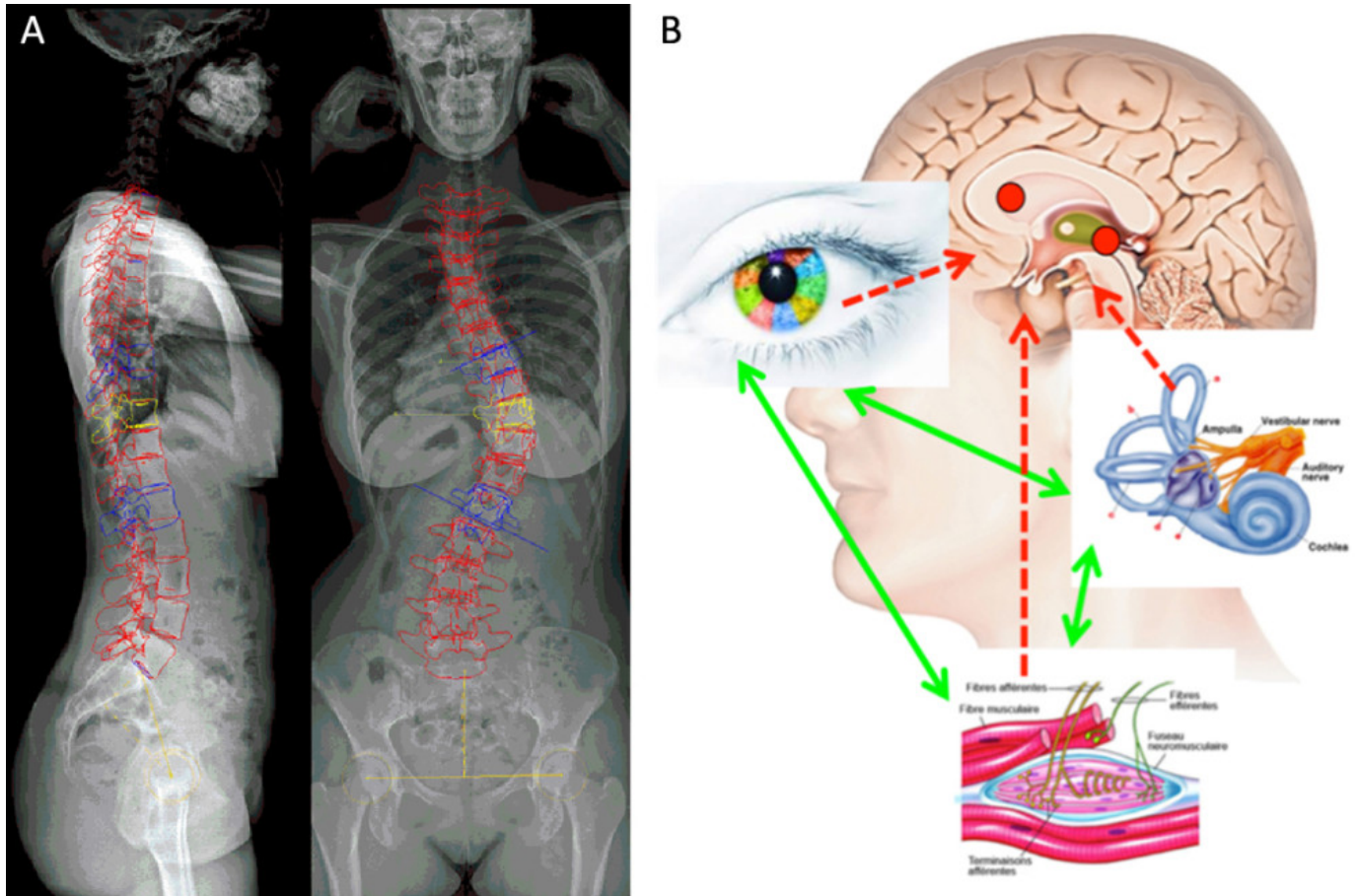


Fig. 1. A. Frontal and profile radiographic views of idiopathic scoliosis. B. Vestibular, visual and somatosensory information, are analyzed in the brain, to stabilize our upright posture.

Mismanagement of sensory conflict situations

Adolescent scoliosis have disturbance of this process. This is verified especially in sensory conflict situations, when sensory information is not consistent. In most cases, the brain "sorts" out these conflicting signals, and we do not realize that. Sometimes, the sensory conflict is lived as special experience! You have probably experienced this phenomenon: you are sitting quietly, in a stopped train, at a station. You are looking, through the window, another stopped train. This train fills your field of vision. Your colleague, traveling with you, detrained to purchase a newspaper. The stopped train, next to your, starts. You feel strongly that your train moves! You rush to call your colleague, when you understand that your train is always stopped and that the neighboring train is gone. This is a "vection": it is an illusory perception of self-motion that can occur when visual motion fills the majority of your visual field. This is a classic example of sensory conflict: your sensors in the retina tell you "you move!" while the somatosensory sensors tell you "you're still. "

A clinical study

We conducted a clinical study, to assess whether scoliotic adolescents have mismanagement of sensory conflict situations. We chose a sensory conflict situation well known to the public: motion sickness. Frequently, motion sickness is generated by sensory conflict between visual and vestibular information. For example, in a car, when the rear-seating passenger reading, its vestibular sensors (inner ear) detect head acceleration ("I move"). But its retinal visual sensors detect no movement, because his eyes are fixed on a book ("I do not move"). To estimate motion sickness in idiopathic scoliosis, we used a simple, validated and fast test: the Motion Sickness Susceptibility Questionnaire.

A relationship between scoliosis and motion sickness

Our study was performed in 65 scoliotic adolescents, versus 71 non scoliotic adolescents. In the two groups, subjects have comparable age, girl/boy ratios and body measurements. Statistical analysis shows that scoliotic adolescents are more susceptible to motion sickness than non-scoliotic subjects, with a significant difference. Adolescents with idiopathic scoliosis have 9 times more sickness than subjects without scoliosis. This result supports mismanagement of sensory conflict situations in adolescent idiopathic scoliosis. Our research continues. We want to verify whether scoliotic adolescents with more susceptibility to motion sickness have more severe and progressive scoliosis. If this hypothesis is confirmed, we will develop specific rehabilitation techniques, to limit aggravation of risky scoliosis.

Publication

[Evaluation of motion sickness susceptibility by motion sickness susceptibility questionnaire in adolescents with idiopathic scoliosis: a case-control study.](#)

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