

one third of them are repeated fallers. Falls are the most serious and frequent home accidents. They result in 9000 deaths per year in France. Falls represent around 15% of overall hospital admissions and have psychological consequences resulting in reduction of physical function and social interaction. Falling puts a strain on the family and is an independent predictor of admission to a nursing home. For these reasons, fall prevention is one of the main priorities of the Innovation Partnership on Active and Healthy Ageing (EIP on AHA) program launched by the European Commission to enable EU citizens to lead healthy, active and independent lives while ageing. Falls are caused by numerous conditions including impaired vision, vestibular dysfunction, foot diseases, central and peripheral nervous system disorders, adverse drug effects, metabolic and hormonal disorders, sedentary behaviour, malnutrition, isolation, and by many other causes. A multidisciplinary approach of fall prevention is therefore optimal. The Languedoc-Roussillon Balance and Falls Prevention Centre has been set up in 2013 in the Montpellier university hospital to propose a multidisciplinary assessment for older people who have fallen or who have been screened as having a significant risk of falling by their general practitioner or through public awareness/information campaigns organized by the different municipalities around Montpellier. The Centre has been certified in 2014 by the European Commission as part of MacVialR EIP on AHA project.

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#### CO41-002-e

### Subjective Visual Vertical and Adolescent Idiopathic Scoliosis (AIS)



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**Objective** The AIS is pathology with multifactorial origin. It affects between 1–3% of the population aged 10–16 years. Many authors suggest orthostatic postural control disorders in AIS. The orthostatic postural control is the ability to organize the standing posture on the earth-vertical. The longitudinal body axis, the trunk and the spinal axis are oriented in an internal representation of the gravitational vertical. Our hypothesis is that AIS is the consequence of a re-organization of orthostatic postural control, on an erroneous internal representation of earth-vertical. Our objective is to show a disturbance of the sense of verticality in the AIS, by measuring the Subjective Visual Vertical (SVV) in AIS, particularly in dynamic visual condition.

**Methods** Prospective study: a group of adolescents with AIS versus a control group of non-scoliotic adolescents. The test is a measure of the SVV (Synopsis), standing posture, in static and dynamic visual conditions (visual disturbance by optokinetic stimulation 40°/sec). Six measures are evaluated. Norms for static condition –2.5° to +2.5°, and for dynamic condition –4 to +4°.

**Results** Preliminary results on 35 scoliotic adolescents (Group S: 31 girls, 14.2 ± 1.74 years, angle: 38.4 ± 15.7°), versus 5 non-scoliotic adolescents (Group C: 5 girls, 14.9 ± 1.14 years). Group S: static VVS = 1.59 ± 1.45°; dynamic VVS = 4.7 ± 8.27°. 57.1% with a least 1 pathological value, 28.5% with a least 2 pathological values, particularly in dynamic visual condition (clockwise rotation with right tilt of the VVS, average 12.39°). Group C: static

VVS = 0.72 ± 0.5°; dynamic VVS = 2.17 ± 1.5°. No subject control with pathological value.

**Discussion** This preliminary study shows a disturbance in the vertical evaluation in the AIS. One possible explanation is a disturbance of the sense of verticality by impaired multisensory central integration.

The authors are grateful to the Harps Association's members, for their helpful comments.

**Keywords** Adolescent idiopathic scoliosis; Subjective visual vertical; Pathophysiology; Verticality perception

**Disclosure of interest** The authors have not supplied their declaration of conflict of interest.

**Further readings**

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#### CO41-003-e

### Subjective Postural Vertical and Adolescent Idiopathic Scoliosis (AIS)



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**Objective** The origin of the AIS is unknown. Several studies in AIS have shown disturbances of orthostatic postural control and somatosensory modality. The orthostatic postural control is the ability to organize the upright position on the earth-vertical, by multisensory central integration, especially somatosensory information. Our hypothesis is that the somatosensory disturbances in the AIS involve change in the organization of orthostatic postural control, around an erroneous central representation of verticality. Our objective is to test, in the AIS, the existence of a disturbance of the somatosensory modality in orthostatic postural control by measuring the Subjective Postural Vertical (SPV).

**Methods** Uncontrolled preliminary study on 8 adolescents with SIA (7 girls, 13.8 ± 0.83 years, 38.8 ± 10.4° angle). Test = SPV measurement, vision obscured, head-trunk-members strapped, sitting on a seat, fixed to a German vertical wheel athletic gymnastics (external diameter: 1.90 m), with electronic inclinometer that measures the rotational tilt of the seat, with reference to the gravitational vertical. From 45° inclination, the subject is tilted (1°/sec) and evaluates the alignment with the vertical gravitational.

**Results** AIS SPV = 7.48 ± 4.86° with a tilt predominance to the right. It is impossible to realize statistical evaluation in this preliminary study. Our results are comparable with those reported in pusher patient.

**Discussion** This preliminary study shows a disturbance in the assessment of SPV in the AIS. Disorders of the central integration of somatosensory modality could explain this result.

The authors are grateful to the Harps Association's members, for their helpful comments.

**Keywords** Adolescent idiopathic scoliosis; Subjective postural vertical; Pathophysiology; Verticality perception

**Disclosure of interest** The authors have not supplied their declaration of conflict of interest.

**Further readings**

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dans le contrôle postural des adolescents avec scoliose. Clin Neurophysiol 2011;41:202.

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#### CO41-004-e

### Clinical equilibration tests, proprioceptive system and Adolescent Idiopathic Scoliosis (AIS)



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**Objective** The AIS is a three-dimensional deformation of the spine, frequent, potentially progressive, with unknown etiology. It is generally accepted as being multifactorial origin, including neurosensorial factors, with orthostatic postural control disorders. In particular, Assaiante et al. showed a selective impaired of the dynamic proprioceptive tract. However, the procedures used to establish this impaired are complex and require motion analysis laboratories, inaccessible in routine clinical practice. Our objective is to determine whether, by clinical equilibration tests, simple, realizable in routine care, it is possible to find the same result.

**Methods** A cross-sectional study comparing 114 adolescents with right thoracic AIS (including 94 girls, mean age: 14.5 ± 1.9 years, Cobb angle: 35.7 ± 15.3°) with 81 matched non-scoliotic adolescents (including 69 girls, mean age: 14.1 ± 1.9 years) was conducted between January 2013 and March 2015. Three clinical equilibration tests are performed: a dynamic test (Fukuda stepping test-Utenberger), two static tests (Romberg sensitized Support monopodal eyes closed).

**Results** For the static tests, no significant difference between the 2 groups. The difference is significant for the dynamic test, for the distance travelled ( $P < 0.01$ ) and the deviation angle ( $P < 0.0001$ ).

**Discussion** Our study confirms Assaiante's results, suggesting a specific impairment of dynamic proprioceptive tract in AIS. This clinical equilibration tests can be performed in daily practice. It is necessary to assess their validity as a biomarker for screening and progression of the AIS.

The authors are grateful to the Harps Association's members, for their helpful comments.

**Keywords** Adolescent idiopathic scoliosis; Pathophysiology; Proprioception; Postural control

**Disclosure of interest** The authors have not supplied their declaration of conflict of interest.

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#### CO41-005-e

### Maintaining trunk and head upright optimizes visual vertical measurement after stroke



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**Objectives** Visual vertical (VV) measurement provides information about spatial cognition and is now part of postural disorders assessment [1,2]. Guidelines for clinical VV measurement after stroke remain to be established, especially regarding the orientation settings for patients who do not sit upright. We analyzed the need to control body orientation while patients estimate the VV. **Methods** VV orientation and variability were assessed in 20 controls and 36 subacute patients undergoing rehabilitation after a first hemisphere stroke, in 3 setting: body not maintained (trunk and head free), partially maintained (trunk maintained, head free), or maintained (trunk and head). VV was analyzed as a function of trunk and head tilt, also quantified.

**Results** Trunk and head orientations were independent. The ability to sit independently was affected by a tilted trunk. The setting had a strong effect on VV orientation and variability in patients with contralesional trunk tilt ( $n = 11$ ; trunk orientation – 18.4 ± 11.7°). The contralesional VV bias was severe and consistent under partially maintained (–8.4 ± 5.2°) and maintained (–7.8 ± 3.5°) settings, whereas various individual behaviors reduced the mean bias under the non-maintained setting (–3.6 ± 9.3°,  $P < 0.05$ ). VV variability was lower under the maintained (1.5 ± 0.2°) than non- (3.7 ± 0.4°,  $P < 0.001$ ) and partially (3.6 ± 0.2°,  $P < 0.001$ ) maintained settings. In contrast, setting had no effect in patients with satisfactory postural control in sitting.

**Conclusion** Subject setting improves VV measurement in stroke patients with postural disorders. Maintaining the trunk upright enhances the validity of VV orientation, and maintaining the head upright enhances the validity of within-subject variability. Measuring VV without any body maintaining is valid in patients with satisfactory balance abilities.

**Keywords** Verticality perception; Postural disorders; Stroke; Lateropulsion

**Disclosure of interest** The authors have not supplied their declaration of conflict of interest.

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