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## Interpreting spatial dysgraphia after stroke: Straight ahead or straight above?

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## ISPR8-1688

**Plasma D-dimer level for prediction of functional outcome in ischemic stroke**I.S. Choi<sup>1,\*</sup>, H.G. Prof<sup>2</sup><sup>1</sup> Chonnam National University Hospital, Department of Physical & Rehabilitation Medicine, Gwangju, Republic of Korea<sup>2</sup> Chonnam National University Bitgoeul Hospital, Department of Physical & Rehabilitation Medicine, Gwangju, Republic of Korea

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**Introduction/Background** Elevated D-dimer level has positive relations with infarction volume and stroke severity on admission. Previous studies have demonstrated that D-dimer levels predict a progressing stroke, which is associated with poor short-term outcome in acute ischemic stroke. Conflicting data about the relationship between D-dimer level and functional outcomes were reported. We aimed to investigate the relations between serum D-dimer levels on admission and functional outcome of subacute stage in ischemic stroke patients.

**Material and method** We retrospectively reviewed the medical records of 68 first-ever acute cerebral infarction patients (35 men, 33 women; age  $67.2 \pm 13.8$  years). Plasma D-dimer level was measured on admission within 24 hours after stroke onset. The patients were classified into elevated group (plasma D-dimer  $> 0.55$  mg/L FEU, 31 patients) and control group ( $\leq 0.55$  mg/L FEU, 37 patients) based on the level of plasma D-dimer. National Institutes of Health Stroke Scale (NIHSS) was checked within a week after stroke onset. Modified Barthel Index (MBI) and PULSES profile were assessed on admission and at 3 months after stroke onset.

**Results** (1) Plasma D-dimer level on admission was  $0.32 \pm 0.11$  mg/L in control group and  $2.59 \pm 3.61$  mg/L in elevated group. (2) NIHSS was  $6.32 \pm 3.80$  in control group and  $9.30 \pm 6.63$  in elevated group. There was no significant difference in NIHSS between both groups ( $P=0.073$ ). (3)  $\Delta$ MBI was  $23.39 \pm 16.28$  in control group,  $12.00 \pm 13.05$  in experimental group. There was significant difference in  $\Delta$ MBI between both groups ( $P=0.004$ ). There was a significant correlation between the level of plasma D-dimer on admission and  $\Delta$ MBI ( $r=-0.304$ ,  $P=0.012$ ). (4)  $\Delta$ PULSES was  $2.00 \pm 2.42$  in control group and  $1.03 \pm 1.83$  in elevated group. There was no significant difference in  $\Delta$ PULSES between both groups ( $P=0.059$ ).

**Conclusion** Plasma D-dimer level measured on admission would be helpful for predicting the functional outcome at subacute stage in ischemic stroke patients.

**Keywords** D-dimer; Functional outcome; Subacute stroke

**Disclosure of interest** The authors declare that they have no competing interest.

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## ISPR8-0340

**A pilot study on the immediate and long-term effects of hybrid therapy of computer-based cognitive training and aerobic exercise in stroke patients with cognitive decline**C.Y. Wu<sup>1,\*</sup>, T.T. Yeh<sup>1</sup>, K.C. Chang<sup>2</sup><sup>1</sup> Chang Gung University, Department of Occupational Therapy & Graduate Institute of Behavioral Sciences, Taoyuan City, Taiwan, ROC<sup>2</sup> Chang Gung Memorial Hospital, Department of Neurology, Kaohsiung city, Taiwan, ROC

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**Introduction/Background** While the salient physical disability after stroke has long been emphasized, post-stroke cognitive decline hindering motor and functional recovery is often ignored. This study evaluated the immediate and long-term effects of hybrid

therapies of computer-based cognitive training and aerobic exercise in stroke patients with cognitive decline.

**Material and method** Stroke survivors with cognitive decline were separated into sequential (SEQ) and control groups (CON). Participants in the SEQ group ( $n=15$ ) received 30-minute aerobic exercise followed by 30-minute computerized cognitive training; participants in the CON group ( $n=12$ ) received 30-minute non-aerobic exercise (e.g., stretching and muscle strengthening) and 30-minute unstructured cognitive training (e.g., reading newspapers and playing board games). All participants received trainings for three days per week for 12 weeks. The cognitive function outcomes included Montreal Cognitive Assessment (MoCA) and Verbal Paired Associates and Word Lists subtests from the Wechsler Memory Scale-III (WMS-III). Health-related quality of life was measured by EQ5D. Outcome measures were administered at baseline, immediately after training (3rd month), and at 6-month follow-up (9th month).

**Results** Preliminary results showed that the SEQ group showed greater improvement in MoCA, WMS-Verbal Pair and Word Lists at post-training than the CON group, but not the EQ5D. These effects remained or had less decrements 6 months post-training compared to the CON group.

**Conclusion** Hybrid therapy of computer-based cognitive training and aerobic exercise training is favored to facilitate cognitive function in stroke survivors with cognitive decline. Our study demonstrates the potential benefit of this hybrid approach for long-term enhancement of cognition following stroke.

**Keywords** Stroke; Cognitive decline; Computer-based cognitive and aerobic exercise training

**Disclosure of interest** The authors declare that they have no competing interest.

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## ISPR8-2497

**Interpreting spatial dysgraphia after stroke: Straight ahead or straight above?**C. Jolly<sup>1</sup>, C. Piscicelli<sup>1,2,\*</sup>, L. Mathevon<sup>1</sup>, C. Berenger<sup>1</sup>, A. Chrispin<sup>1</sup>, D. Pérennou<sup>1,2</sup><sup>1</sup> CHU Grenoble-Alpes, Médecine Physique et Réadaptation Neurologique, Grenoble, France<sup>2</sup> Université Grenoble-Alpes, Laboratoire de Psychologie et Neurocognition (LPNC), Grenoble, France

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**Introduction/Background** Spatial dysgraphia after a right hemisphere lesion, associates signs of spatial compression in relation to spatial neglect, and a tilted writing which remains to be explained. Here, we present a case study suggesting that tilted writing is due to a tilted representation of the vertical.

**Material and method** J.W., a 75-year-old patient who underwent a right parietal hemorrhage showed a pusher syndrome and a writing tilted  $11.1^\circ$  upwardly without other signs of spatial dysgraphia. We comprehensively assessed and followed most aspects of spatial cognition (spatial neglect, verticality perception) and handwriting, until nine months post-stroke. Examination of J.W.'s handwriting was performed by means of a graphic tablet quantifying writing orientation and speed, in the presence or not of spatial indexes, and after a transient modulation of verticality perception.

**Results** In acute stage, spatial neglect was severe with predominant signs of body neglect. At three months, visual (VV) and postural (PV) perceptions of the vertical were tilted of  $11^\circ$ , counterclockwise. This transmodal tilt was similar both in direction and magnitude to the tilt found congruent on both features of writing: left-hand margin and lines. J.W.'s writing speed was found slower than a control subject in the blank paper condition ( $1.67$  vs.  $0.82$  s/letter;  $P<0.001$ ), and faster when writing on lines inclined  $24^\circ$

upwardly (1.11 s/letter;  $P < 0.05$ ). The transient modulation of verticality perception ( $PV = 0.5^\circ$ ) was performed by tilting the patient for 10 min at  $30^\circ$  to the right side, in the dark. This PV modulation reduced the writing tilt, measured 20 min later ( $6.2^\circ$ ;  $P = 0.001$ ) and increased the writing speed (0.89 s/letter;  $P = 0.002$ ). Nine months post-stroke, while spatial neglect had completely recovered, a congruent tilt both in verticality perception and writing persisted ( $5^\circ$  and  $8.8^\circ$ , respectively).

**Conclusion** After right hemisphere stroke, a tilted writing is likely a sign of a tilted verticality representation.

**Keywords** Spatial dysgraphia; Verticality representation; Stroke  
**Disclosure of interest** The authors declare that they have no competing interest.

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#### ISPR8-1668

### Effects of physiological ischemic training on post-stroke neuroprotection and angiogenesis in adult rats

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**Objective** To examine potentially beneficial effects of physiological ischemic training (PIT) following stroke.

**Methods** Three hundred seventy-five adult male rats were subjected to 90-min transient middle cerebral artery occlusion (MCAO) and randomized into a PIT group and a non-PIT control group. A sham-operated group was used as negative control. After 1- and 2-weeks of PIT, brain infarct volume was measured by Triphenyl tetrazolium chloride (TTC) staining, and behavioral outcomes, presence of intact neurons, apoptosis, and cerebral edema were assessed with modified neurological severity score (mNSS), Nissl staining, TdT-mediated dUTP Nick-End Labeling (TUNEL) staining and cerebral water volume. The mRNA expression of vascular endothelial growth factor (VEGF) was assayed with RT-PCR and protein expression of VEGF was quantified with Western blot.

**Results** Cerebral infarction, neurological deficits and neuronal apoptosis were reduced significantly in the PIT groups, while the presence of neurons was increased in comparison with MCAO controls. Moreover, mRNA and protein expression of VEGF were enhanced after 1 and 2 weeks of PIT.

**Conclusion** PIT may promote angiogenesis and neuroprotection during post-stroke rehabilitation and provide a novel strategy for rehabilitation of stroke patients.

**Keywords** Physiological ischemic training; Middle cerebral artery occlusion; Neuroprotection against stroke

**Disclosure of interest** The authors declare that they have no competing interest.

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#### ISPR8-2576

### Within-session effects of selected physical rehabilitation interventions for a dysfunctional arm post-stroke on arm movement and muscle firing patterns

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**Introduction/Background** Upper extremity (UE) impairments and activity limitations are a common problem in individuals following a cerebrovascular accident (CVA). Eighty-five percent of individuals with CVA report UE functional limitations that are associated with decreased health-related quality of life. Occupational therapy (OT) and physical therapy (PT) approaches are typically aimed to treat impairments, activity limitations, and participation restrictions following a CVA. This study examines the effects of five therapeutic approaches on upper extremity (UE) movement and muscle activation patterns in persons with CVAs: (1) proprioceptive neuromuscular facilitation (PNF); (2) neurodevelopmental treatment (NDT); (3) functional electrical stimulation (FES); (4) weight-bearing and (5) modified Constraint-Induced Movement Therapy (mCIMT).

**Material and method** This is a case report involving a 61-year-old male who underwent 30-minute intervention sessions for each approach stated above. Electromyography (EMG) and 3D motion capture data were collected pre- and post-intervention and at 30 minute follow-up. Data were analyzed for reaching a cup at waist level, maximum shoulder flexion, and moving cup to mouth as in drinking.

**Results** No significant differences were seen for UE movements across all interventions for kinematic or EMG data. There appears to be a trend towards normal elbow movement following NMES, mCIMT and PNF and increased variability in shoulder flexion in mCIMT and NDT interventions. Weight-bearing provided the least amount of evidence for improved kinematic motion. Improvement in elbow kinematics may indicate proximal stability following PNF, FES, and mCIMT allows for increased distal mobility at the elbow.

**Conclusion** Some interventions produced trends that indicate better UE movement. Increased proximal stability may have caused better distal mobility as shown by improved elbow movement. Increased variability of shoulder flexion may indicate the participant learned different options to perform the same movement. Further research is needed to provide a more transparent understanding of the efficacy of interventions for individuals with hemiparesis following a CVA.

**Keywords** Stroke; Paresis; Rehabilitation

**Disclosure of interest** The author declares that he has no competing interest.

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