Visuospatial Neglect and Processing Speed: Importance of Lateralized and Nonlateralized
Symptoms as Predictors of Functional Outcome after Stroke

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I.   Viken, J. I., Samuelsson, H., Jern, C., Jood, K., & Blomstrand, C. (2012). The prediction of
        functional dependency by lateralized and non-lateralized neglect in a large prospective stroke
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II.   Viken, J. I., Jood, K., Jern, C., Blomstrand, C., & Samuelsson, H. Ipsilesional bias and processing
        speed are important predictors of functional dependency in the neglect phenomenon after a right
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III.   Viken, J. I., Jood, K., Jern, C., Blomstrand, C., & Samuelsson, H. Post-acute neglect symptoms:
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IV.   Viken, J. I., Jood, K., Jern, C., Redfors, P., Holmegaard, L., Blomstrand, C., & Samuelsson, H.
        Processing speed and symptoms of neglect as predictors of long-term outcome after right-
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Abstract

Viken, J. I. (2013). *Visuospatial neglect and processing speed: importance of lateralized and nonlateralized symptoms as predictors of functional outcome after stroke.* Department of Psychology and the Stroke Research Group at the Department of Neuroscience and Physiology, University of Gothenburg, Sweden.

Visuospatial neglect (VSN) is a disorder that is commonly observed in the acute phase after stroke, especially following right hemisphere damages. Patients who have VSN exhibit impaired awareness and responses to visual stimuli located towards the side opposite the brain lesion (contralesional side). Previous studies have shown that the presence of VSN is a predictor of functional dependency following stroke. The present paper investigated how different sub-symptoms of VSN are related to recovery from VSN and later functional outcome. The sub-symptoms of VSN were assessed in an early stage after stroke (baseline ~7 days) and in a follow-up at about three months using standard paper and pencil tests of cancellation and visual search. Neurological deficits were examined with the Scandinavian Stroke Scale within the first week and about three months after stroke. Functional dependency was measured with the modified Rankin Scale at a three month (Studies I- III), two year (Study II) and 7 year (Study IV) follow-up and scores of ≤2 were classified as functional dependency. The Frenchay Activities Index was used to assess level of activity at 7 years post stroke (Study IV). Patients in the current studies were sub-samples from the prospective Sahlgrenska Academy Study on Ischemic Stroke (SAHLSIS).

Study I included 375 consecutive stroke patients who were divided into three groups having lateralized-, nonlateralized-, or no visual inattention. The study examined the course of lateralized and nonlateralized symptoms of inattention across time in relation to functional outcome and neurological symptoms. Compared to the other two groups, participants with lateralized inattention exhibited significantly more severe neurological symptoms, functional dependency and persisting visual inattention, both at baseline and after three months. Stepwise logistic regressions revealed that lateralized inattention at baseline was an important and independent predictor of functional dependency following right hemisphere damage, but not after left hemisphere damage.

In **Study II** a consecutive series of 105 patients with right hemisphere stroke was included. The relative importance of sub-symptoms of VSN as predictors of functional dependency was investigated. Three sub-symptoms of visuospatial neglect (the total number of omissions, asymmetry of omissions, and right capture of attention in orientation) and two symptoms related to VSN (visual processing speed and repetitive identification of previously detected targets) were analyzed as predictors of functional dependency. The univariate analyses showed that right capture of attention in orientation, asymmetry of omissions and slowed processing speed all had strong and significant associations with functional dependency at three months and at two years after stroke. Moreover, stepwise logistic regressions identified right capture of attention as the only significant predictor of dependency at three months whilst slowed processing speed was the only significant predictor of dependency at two years.

In **Study III** the same right hemisphere patients as in Study II were included. The aims were to investigate the pattern of change in the sub-symptoms of VSN and processing speed from baseline to the three month follow-up, and to explore the concurrent associations at three months between the classification of functional dependency and the sub-symptoms of VSN and processing speed. For pattern of change in VSN symptoms, the results indicated that the patients with VSN at baseline had less improvement in the measures of right capture of attention and asymmetry of omissions than in processing speed and omissions. At three months, the most important correlates with functional dependency were processing speed and right capture of attention in orientation.

Study IV examined the relative importance of symptoms of VSN and symptoms related to VSN as predictors of functional dependency and activity level at 7 years in 57 right hemisphere stroke patients. Multivariate logistic regression and partial correlations identified deficits in processing speed at baseline as the most important predictor of long term outcome regarding dependency and activity level. This was true also after controlling for overall stroke severity at baseline and year of education at the time of the follow-up.

Conclusions: The results show that assessing sub-symptoms of VSN and symptoms related to VSN at an early phase after a right hemisphere stroke can provide relevant prognostic information regarding long-term outcome. Overall, processing speed at baseline was found to be the most important predictor of later outcome, and processing speed was also the symptom associated with VSN that showed the least improvement from baseline to the three month follow-up.

Keywords: Functional outcome; Neglect; Recovery; Stroke; Visual inattention; Visual search, Processing Speed