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Letter to the editor

Is there an excess of left-handedness after neonatal stroke?

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Asymmetric motor activity has emerged strongly during hominid evolution, with nine of out ten people showing a predilection for manipulating objects with the right hand (Gilbert & Wysocki, 1992; Peters, Reimers, & Manning, 2006). This hemispheric leftward motor system asymmetry for voluntary movements develops early in life (Dinomais et al., 2016). However, it does not become definitively established until ≥5 years.

Motor lateralization is thus part of a global dynamic process entailing genetic, environmental, sociocultural and even brain-damaging factors, and manual preference cannot be dissociated from other developmental aspects (Cochet, 2016). It is therefore not so surprising that non-right handedness is more often encountered in developmental disorders, which at first glance have no relationship with motor function such as autism, speech and language developmental disorder or in psychiatric pathologies (Cochet, 2016; Hodgson & Hudson, 2017; Knaus, Kamps, & Foundas, 2016). Hand preference is

Abbreviations: Confidence Interval, CI; Neonatal Arterial Ischemic Stroke, NAIS; (Unilateral) Cerebral Palsy, (U)CP.

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also expected when there is an asymmetrical motor output, and lateralization for grasping and reaching during early infancy is often the first sign of unilateral cerebral palsy (UCP) (Kitai et al., 2016; Wu et al., 2006).

Neonatal arterial ischemic stroke (NAIS) is a leading cause of UCP that predominantly affects the left hemisphere of the brain (Chabrier et al., 2016; Kitai et al., 2016; Wu et al., 2006). The atypical handedness observed after NAIS may thus reflect the inherent left motor lateralization of children with right UCP. But—beyond its motor consequences—, NAIS is also a global developmental disorder (Chabrier et al., 2016). Thus, as observed in other populations of children with atypical development, we hypothesized that handedness in children having suffered from a NAIS would differ from the general population, even in those without UCP.

1. Methods

This work is part of the longitudinal follow-up of the AVCnn cohort. From the initial population of 100 term-born children with NAIS, 73 (45 boys) were enrolled in the current study at age 7. Neonatal imaging was used to determine the side of the stroke: left, right or bilateral.

Cerebral palsy was addressed according to the criteria of the network *Surveillance of CP in Europe* (Chabrier et al., 2016). Hand-motor lateralization was obtained through a single closed question to the parents: "Which is your child's hand preference in daily activities: right, left or either?"

The proportions of left-handers are presented in percentages and 95% confidence intervals (CI) in overall cohort, in children without CP and within stroke side subgroups. Odds ratio (OR) and Fisher's Exact Test were used to compare these values versus the reference of 10.7% ($n = 232{,}580$) left-handers found by Peters et al. (2006).

2. Results (Fig. 1)

Among the 73 children, 42 were right-handed, four were either-handed and 27 (37%; 95% CI 26–48) were left-handed: OR = 4.9 (95% CI 2.9–8.1; $p < .001$). 23 out of the 73 children were diagnosed with UCP. Their hand preference was contralateral to the motor impairment except in a single right-handed child with isolated left lower limb involvement.

Among the 50 children (30 boys) without CP, the proportion of left-handers ($n = 13$; 26%; 95% CI 14–38) remained significantly higher than in the general population (OR = 2.9; 95% CI

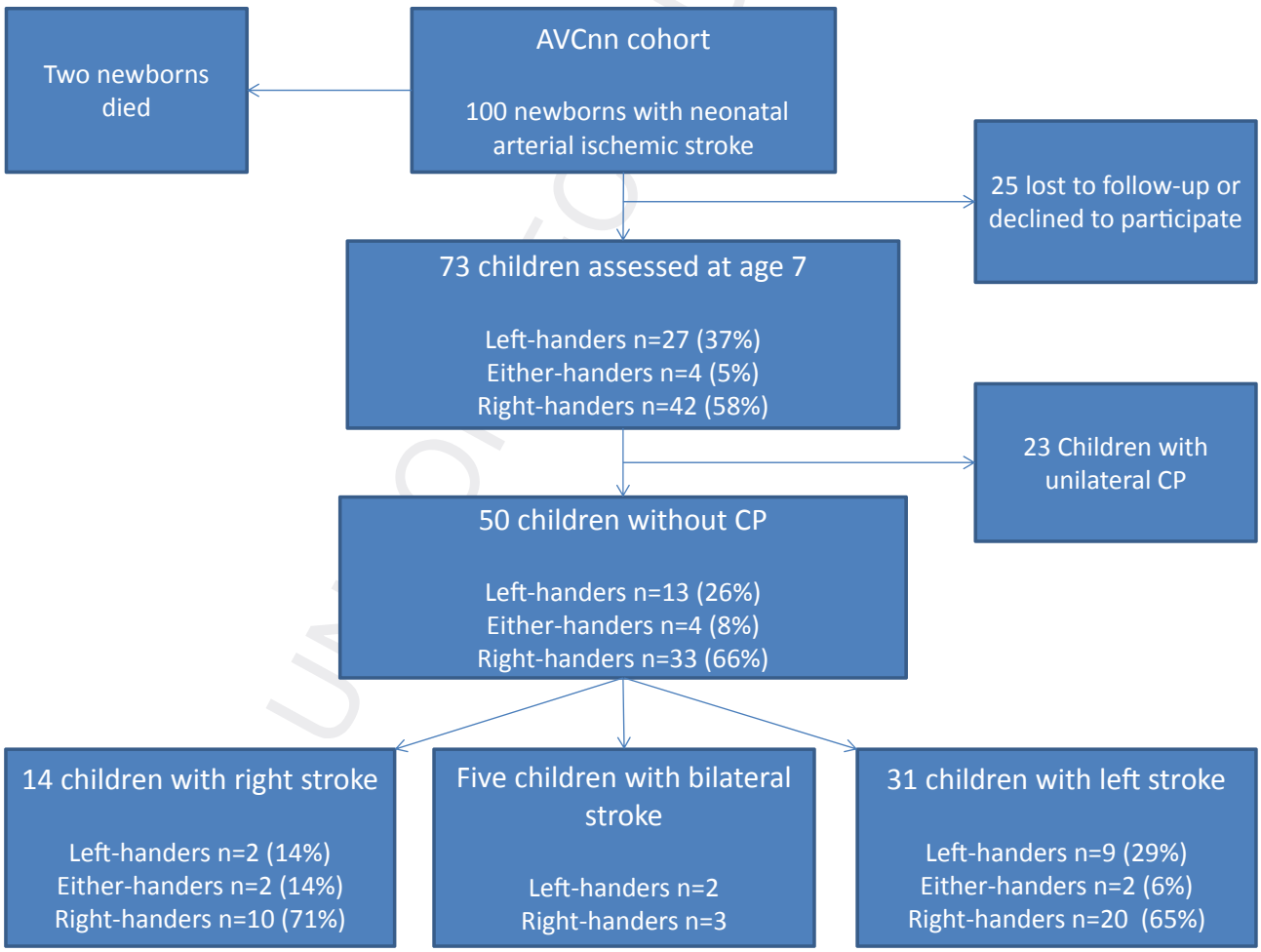

Fig. 1 – Longitudinal follow-up of the AVCnn cohort. From the 100 newborns who were included in the AVCnn cohort, 73 participated in the full multimodal 7-year assessment. Whatever the population considered, left-handers are over-represented. CP: Cerebral Palsy.

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