

# Towards an automatic assessment of impaired handwriting (and visuo-motor skills) in children with ADHD

Zysset, A.E.<sup>1</sup>, Stapel, L.<sup>2</sup>, Dravta, J.<sup>1</sup>, Juvalta, S.<sup>1</sup>, Robin, D.<sup>1</sup>, Albermann, K.<sup>3</sup>, von Rhein, M.<sup>3,4</sup>, Wieber, F.<sup>1,2</sup>

<sup>1</sup> Zurich University of Applied Sciences ZHAW, Winterthur, Switzerland; <sup>2</sup> University of Konstanz, Konstanz, Germany; <sup>3</sup> Centre of Social Pediatrics, Cantonal Hospital Winterthur, Winterthur, Switzerland; <sup>4</sup> Child Development Center, University Children's Hospital Zurich, Zurich, Switzerland

## Background

- Handwriting is relevant for school achievement and children spend up to 60% of their day performing fine motor skills.<sup>1</sup>
- More than 50% of children diagnosed with ADHD experience difficulties with fine motor skills such as handwriting.<sup>2</sup>
- *Digital pens* revealed that children with ADHD exert more pressure, write slower and vary their strokes more.<sup>2</sup>

**Aim:** Is it feasible to use digital pens to assess handwriting and fine motor skills to investigating potential differences between children with and without an ADHD diagnosis?

## Method

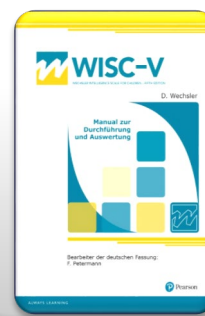
- As sample we target to assess 40 school-aged children between 8 and 12 years. Children with an ADHD diagnosis (n=20) will be recruited and diagnosed through the Centre of Social Pediatrics in Winterthur, children without an ADHD diagnosis (n=20) will be recruited through primary schools and pediatricians in Winterthur.
- Fine motor skills and handwritings skills are assessed by Beery VMI and SEMS handwriting test using a digital pen.
- Motor activity is measurement by Actigraphs on both wrists and on the hip as a covariate.
- IQ-Scores are assessed by WISC-V as a covariate.



## References

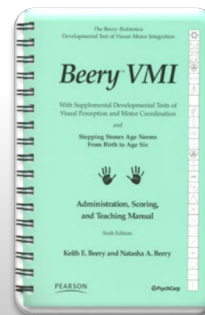
- <sup>1</sup> Feder, K. P., & Majnemer, A. (2007). Handwriting development, competency, and intervention. *Developmental Medicine & Child Neurology*, 49 (4), 312–317.
- <sup>2</sup> Kaiser, M.-L., Schoemaker, M. M., Albaret, J.-M., & Geuze, R. H. (2015). What is the evidence of impaired motor skills and motor control among children with attention deficit hyperactivity disorder (ADHD)? Systematic review of the literature. *Research in developmental disabilities*, 36, 338–357.

## Study procedure and measures



### 1. WISC-V

- Wechsler Intelligence Scale for Children



### 2. Beery VMI

- Developmental Test of Visuo-Motor Integration



### 3. SEMS

- Systematic Screening for Handwriting Difficulties test



## Expected Outcome

- Children with an ADHD diagnosis are expected to score lower in the Beery-VMI and SEMS writing test and
- show different pressure and speed during the performance of the Beery-VMI and SEMS handwriting – compared to children without ADHD.
- Additionally, most children with ADHD are expected to show a different movement pattern during the test situation that can be distinguished from children without ADHD.

## Contact

Annina Zysset, [zyss@zhaw.ch](mailto:zyss@zhaw.ch), Frank Wieber, [wieber@zhaw.ch](mailto:wieber@zhaw.ch), ZHAW, School of Health Professions, Institute of Health Sciences.