

How does the Assisting Hand Assessment relate to relative upper limb movement measured by actigraphy in children with hemiplegia?

Katie Khong* k.y.w.khong@newcastle.ac.uk

Supervisor: Dr Anna Basu, Institute of Neuroscience, Newcastle University

Introduction:

Hemiplegic cerebral palsy (HCP) affects approximately 12000 children in the UK, causing weakness and stiffness affecting one side of the body. This affects performance in tasks of everyday living which require good bimanual function.

The Assisting Hand Assessment (AHA) evaluates unforced spontaneous use of the affected hand in bimanual tasks in a play based setting (1). Whilst it measures quality of hand use, it does not quantify use, and it is unclear how AHA scores relate to hand use outside the assessment session.

Complementing this approach, actigraphy can quantify movement of each arm over a prolonged period in a real-world setting, using light-weight wrist-worn accelerometers (Figure 1).



Figure 1:
Wrist-worn accelerometer (2)

Objective:

To determine the relationship between AHA scores and relative movement of the affected vs. unaffected upper limb in children with HCP.

Methods:

Participants: 38 children with HCP age 7-15y

Assessments:

A) AHA (video recorded)

B) Lightweight triaxial accelerometers (Axivity) worn on each wrist for 3 days

Data analysis:

AHA scores - converted to logit-based AHA units (range 0-100).

Accelerometry data -

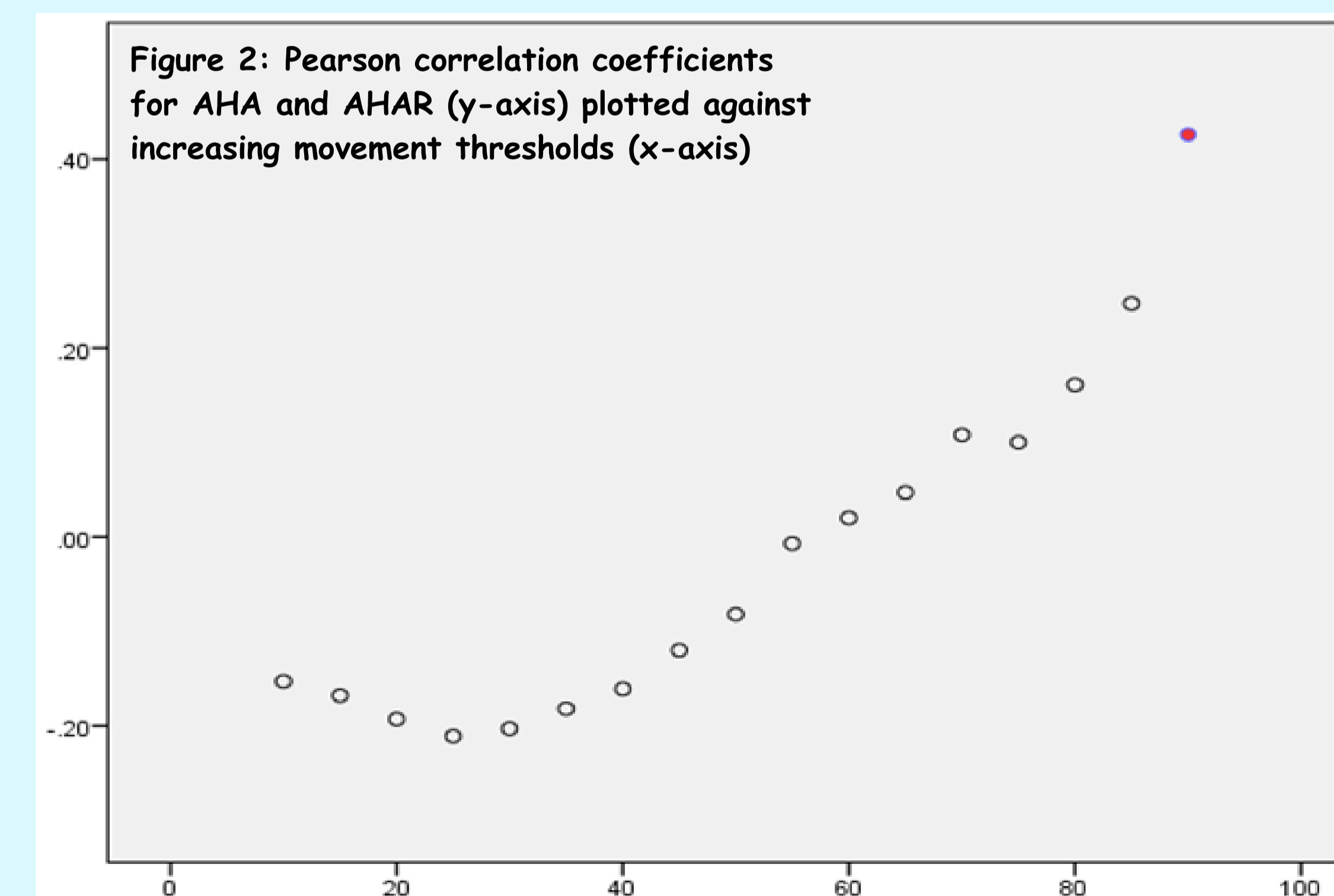
- sampled at 50 Hz, cleaned and signal vector magnitude (SVM) calculated over each 2s epoch.
- Area under the curve of the S.D. of the SVM (to avoid artefactual mean differences from altered orientation in the hemiplegic arm) was measured.
- The ratio of this activity on the unaffected vs. affected side ("AHAR, or Arm and Hand Activity Ratio") calculated
- AHAR calculated at various movement thresholds based on the paretic side

AHA vs AHAR scores—

- Relationship determined using Pearson's correlation coefficient.

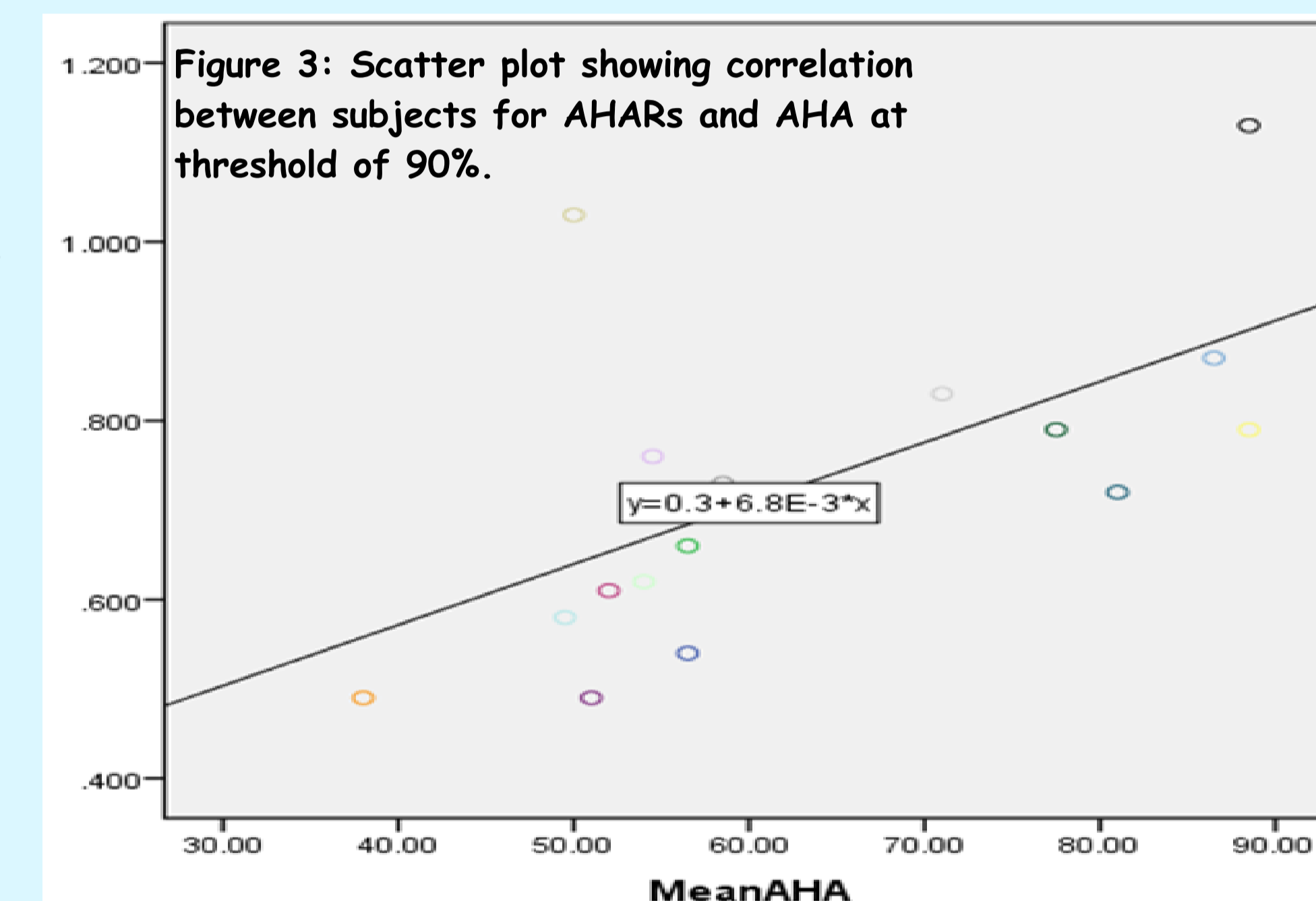
Results:

- Mean AHA score was 61.4 (S.D. 17.0).
- Mean "AHAR" score was 0.761 (S.D. 0.135).
- A positive correlation was observed between AHA and "AHAR" scores (Pearson's correlation coefficient 0.474, $p=0.003$).



Results (cont.)

There was significant correlation between the AHA scores and the AHARs at a 90% threshold (r -value = 0.426, $p = 0.01$): Figure 3.



Conclusion:

1. The AHA assessment reflects relative use of the affected versus unaffected upper limb in children with hemiplegia in everyday life. This provides further validation for the AHA.
2. Accelerometry provides an additional, objective method of quantifying upper limb motor activity.
3. Effects of movement threshold on correlation with AHA require further exploration.

References:

1. Kruminde-Sundholm, L., Eliasson, A.C., 2003, Scand J Occup Ther 10, 16-26.

2. http://axivity.com/v2/index.php?page=product.php&product=ax3_watch

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