



Network Models for Assessing Comorbidity between Stuttering and ADHD

Network Analysis of Stuttering & ADHD

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Background: Stuttering & ADHD

- **Attentional issues occur in:**

- people who stutter, PWS (Alm & Risberg, 2007; Druker et al., 2019)
- people with ADHD, PWADHD (American Psychiatric Association, 2023; Chhabildas et al., 2001)

- **Speech issues have been reported in:**

- people with ADHD, PWADHD (Engelhardt et al., 2010; Lee et al., 2017)
- people who stutter, PWS (American Psychiatric Association, 2023)

- **Phonological Working Memory, PWM, is affected in both conditions** (Marchetta et al., 2008; Martinussen et al., 2005)

Symptom Overlap in Stuttering & ADHD

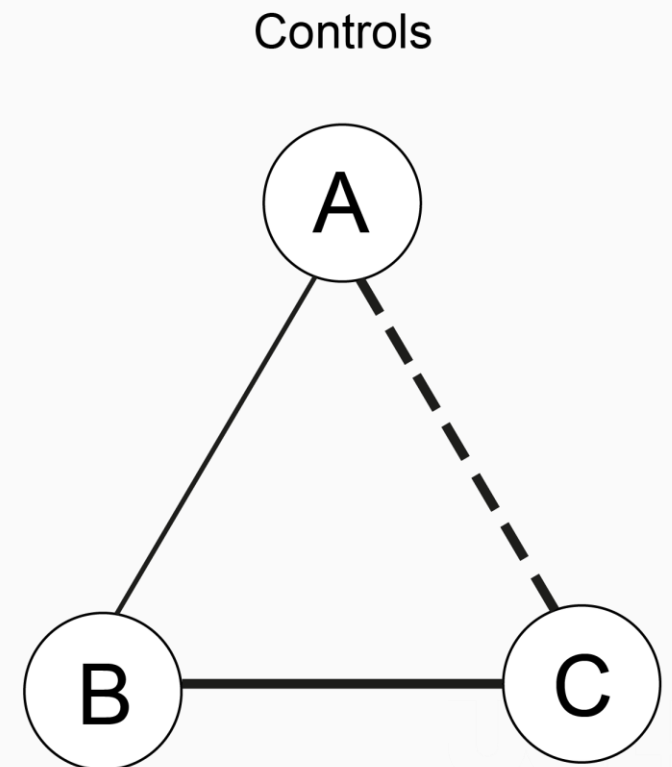
- 4-26% of PWS also have attention problems (Arndt & Healey, 2001; Riley & Riley, 2000)
- 18% of PWADHD also stutter (Engelhardt et al., 2010; Jacobson et al., 2011)

What remains unclear

Do overlapping symptoms in stuttering and ADHD reflect a shared underlying cognitive mechanism, or partially distinct cognitive architectures?

Network Models, NMs

- In a network perspective, conditions are viewed as clusters of directly related symptoms (Cramer et al., 2010; Epskamp et al., 2017).
- They involve nodes and edges:
 - Nodes represent the symptoms (in circles)
 - Edges are the lines that connect the nodes:
 - positively or negatively (green/solid line for positive connections; red/dashed line for negative connections)
 - may or may not be weighted for their strength (edges can have a value or no value)
 - may or may not be directed (lines are visualised with arrow)



NMs & Aim

Why useful?

- When prior knowledge about how variables are related is lacking.
- NMs provide excellent visualisations of statistical association patterns.
- NMs capture the statistical structure of the data and can be used to construct causal hypotheses.

Aim

To understand whether the underlying cognitive architectures of stuttering and ADHD differ (whether attention, fluency, and PWM are interconnected differently between groups).

Methods

Participants

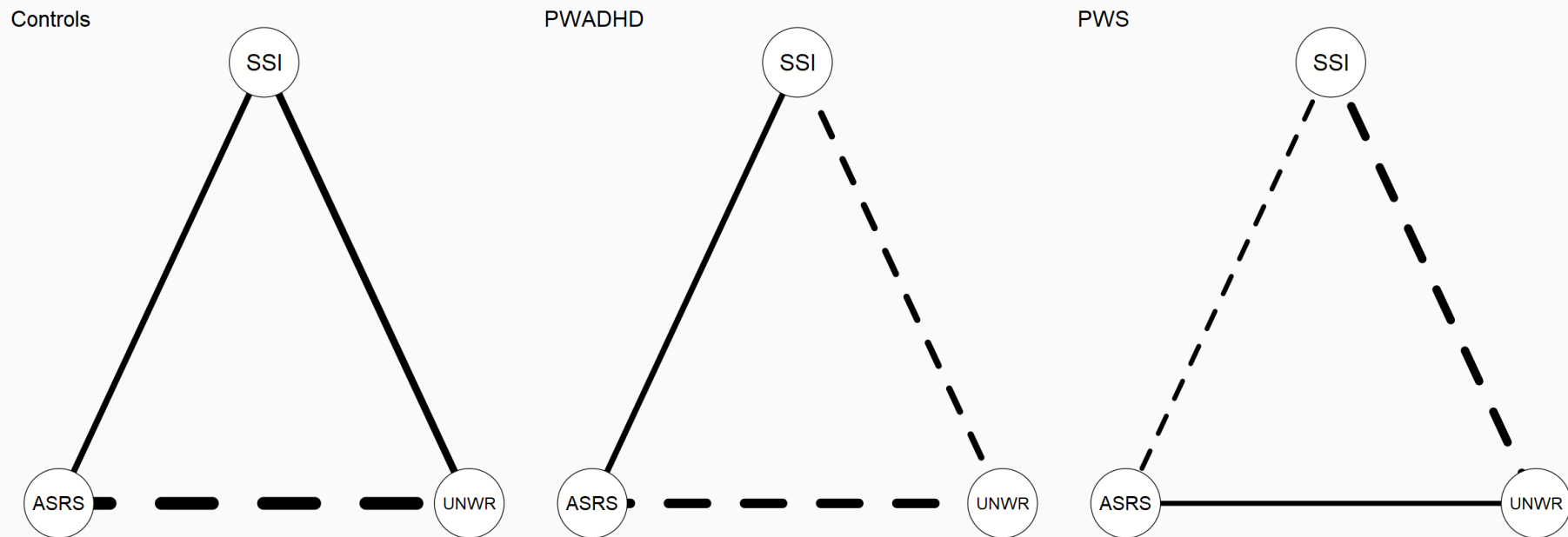
- 67 Controls (Mean age: 24.25; 42 Females, 25 Males)
- 79 PWADHD (Mean age: 24.66; 35 Females, 44 Males)
- 33 PWS (Mean age: 34.18; 14 Females, 19 Males)

Measures

- **Attentional Abilities:** Adult ADHD Self-Report Scale Screener (ASRS; Ustun et al., 2017)
- **Fluency:** Stuttering Severity Instrument, version 3 (SSI-3; Riley, 1994)
- **PWM:** Universal Non-Word Repetition task (UNWR; Howell et al., 2016)

Results

- While controls and PWADHD exhibited broadly similar architectures, both differed from PWS.



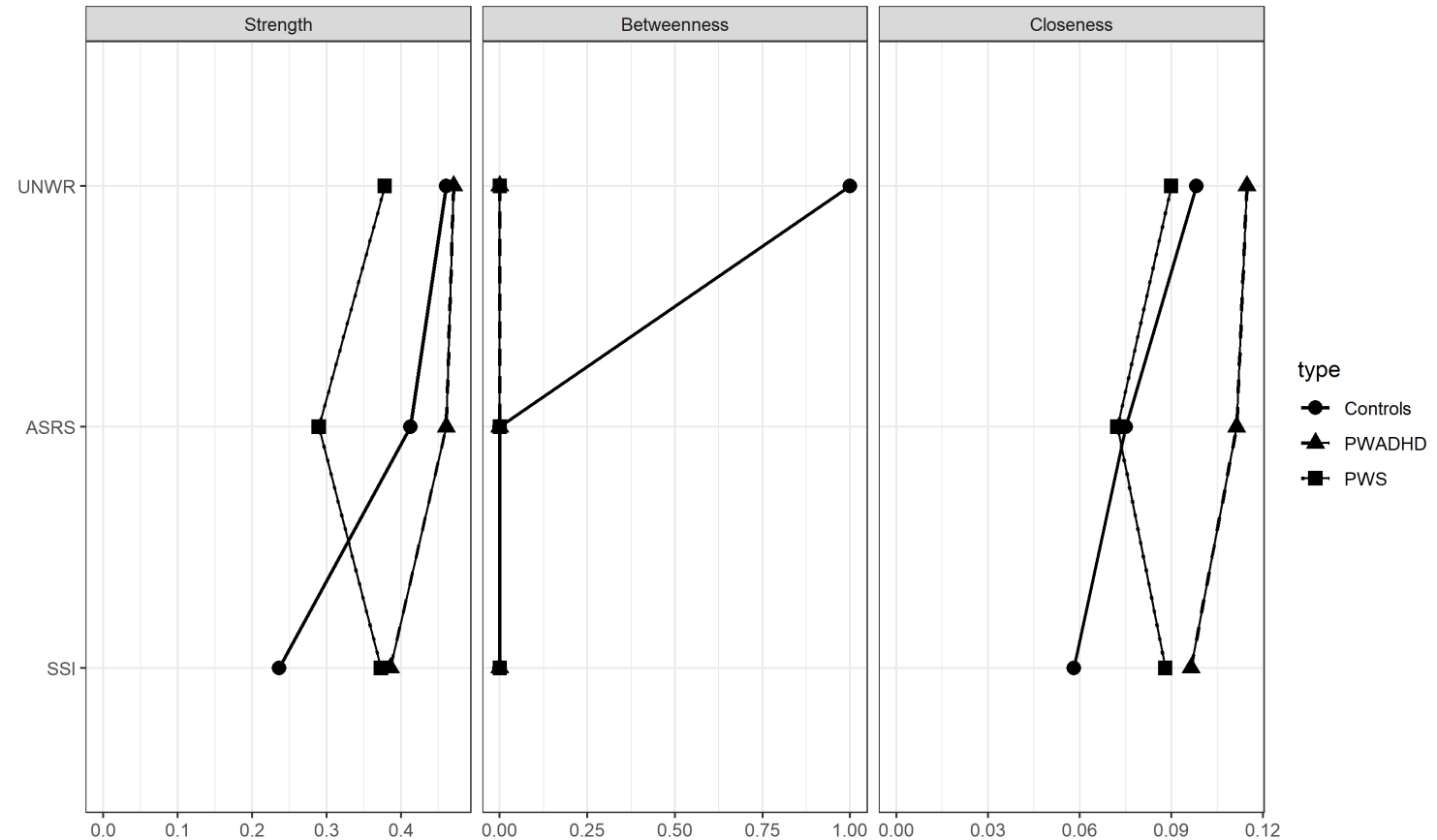
— Positive partial correlation

- - Negative partial correlation

— Stronger connection (thicker line)

Results

- In all groups, PWM is the most central factor as observed from strength.
- Only in controls PWM has importance in acting as a bridge to other nodes (betweenness).
- PWM has the highest closeness in all groups suggesting PWM is an important factor.



Conclusions

- Findings do not support a unified network structure consistent with a single shared underlying mechanism.
- Instead, they support partially distinct cognitive architectures.
- PWADHD resembles controls architecture: PWM affects attention.
- PWS shows reorganised network: PWM affects fluency rather than attention.
- PWM central in all groups but has a different mechanistic role across conditions.
- NM can be utilised to understand whether overlapping symptoms have different or similar cognitive organisation.



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