Auditory Processing Disorders (APD): A distinct clinical disorder or not?

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Diagnostic procedures of APD in the Netherlands

- Leeuwarden
- Groningen
- Zwolle
- Arnhem
- Sint-Michielsgestel
- Hoensbroek
- Amersfoort
- Den Haag
- Rotterdam
- Bergen op Zoom
Diagnostic procedures of APD in the Netherlands

Conclusions:

• A lot of diversity in diagnostic procedures across audiologic centers in the Netherlands.
• Doubts about validity and reliability of the APD test batteries.
• No consensus on the definition of APD.
Aim:
To describe characteristics of auditory processing disorders (APD) by evaluating the literature in which children with suspected or diagnosed APD were compared with typically developing children.

Central question:
Are the listening difficulties of children with (suspected) APD due to a specific auditory deficit, or to a multimodal deficit?
Method

- Pubmed, CINAHL, ERIC, PsychINFO, Communication & Mass Media Complete & EMBASE

- Studies published from 1954 up to 15 December 2013
- Peer-reviewed journals
- English
- < 18 with diagnosis of APD or suspected APD compared to the performance of typically developing children
Records excluded (n=270)        (n=56)
Duplicates excluded (n=1717)        (n=113)
Duplicates excluded (n=15)        Records after duplicates with 1st search removed (n=297)

Records after duplicates removed (n=2344)        (n=232)

Duplicates excluded (n=1717)        (n=113)

Records after duplicates removed (n=312)

Records after duplicates removed (n=2781)

Records after duplicates removed (n=502)

Records after duplicates removed (n=4923)

Full-text articles assessed for methodological quality (n=36)
(n=131) No APD group (n=67)
Not address question (n=31) Case report (n=7)
Other language (n=19) Not contain primary data (n=7)

Full-text articles assessed for methodological quality (n=3)
(n=6) No APD group (n=1)
Not address question (n=4) Case report (n=1)

Studies included in systematic review (n=36 + n=3 = n=39)

N = 4923

N = 3078

N = 502

N = 176

N = 39
ASHA’s levels-of-evidence (ASHA’s LOE) scheme (Mullen, 2007)

<table>
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<th>✓</th>
<th>✗</th>
<th>Points</th>
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<td>✓</td>
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<tr>
<td>Assessor Blinded</td>
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<td>Valid Primary Outcome Measure(s)</td>
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<td>Significance Reported or Calculable</td>
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<tr>
<td>Precision Reported or Calculable</td>
<td>✗</td>
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Weak intern validity: 0 – 1 points
Moderate intern validity: 2 – 4 points
Strong intern validity: 5 – 7 points
Weak intern validity: 0 – 1 points \( N = 4 \)

Moderate intern validity: 2 – 4 points \( N = 34 \)

Strong intern validity: 5 – 7 points \( N = 1 \)

<table>
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<tr>
<td>33 x Precision Reported or Calculable</td>
<td>✓</td>
</tr>
</tbody>
</table>
Significant group differences between children with (suspected) APD and typically developing children.

Type of measurements used:

- Questionnaires & Checklists;
- Auditory and visual behavioural tests;
- Cognitive, language, and reading behavioural tests;
- Brain measurements.
All reported significantly less adequate performances in children with APD.

- **CHAPPS** *(Smoski et al., 1998):* poorest scores on the subscales ‘noise’, ‘memory’ and ‘attention’.

- **Children’s Communication Checklist -2 (CCC-2; Bishop 2003):** poorer General Communication Composite (GCC) scores and all individual CCC-2 scale scores.

- **Observational Rating Scale from the CELF-4** *(Semel et al., 2003):** poorer listening skills
Sixteen of the 17 studies found significantly lower scores in children with APD.

- All studies used various tests to measure auditory behavior (e.g., Dichotic digits test; Duration Patterns test; Frequency Patterns test; Listening in Spatialized Noise test; Random Gap Detection test).

- Lower scores on auditory as well as on visual behavioural tests.

- The only study with strong intern validity (Moore et al., 2010): Poor performance of children on individual AP tests is related to poor speech-in-noise performance and more deficient speech-in-noise is also associated with lower cognitive scores.
All found significantly lower scores in children with APD.

- Lower verbal and/or non-verbal cognitive abilities on subtests from the WISC (Wechsler, 1991; Wechsler et al., 2004).

- Lower scores on tests for language (grammar, phonology, and vocabulary) and reading.

- More inferior performance on a visual alertness task and intrinsic auditory attention measures.
Ten of the 12 studies reported significantly abnormal performance in children with APD.

- 6 studies → Auditory Brainstem Responses (ABR)
- 5 studies → Otoacoustic emissions (OAE)
  → Two of the 5 reported no group differences.
- 1 study → Functional MRI (fMRI) and diffusion tensor MRI (DTI)
Conclusion

• Significant dissimilarities were found between typically developing children and children with (suspected) auditory processing disorders.

• The listening difficulties are not specific to the auditory modality.

• The listening difficulties may be a consequence of cognitive, language, and attention issues rather than bottom-up auditory processing.
Discussion

- Distinct clinical disorder, or not?
- The listening difficulties are not specific to the auditory modality.
- Interdisciplinary perspective → auditory, cognitive, language and reading functioning.
- Lack of valid and reliable auditory processing tests.
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Thank you for your attention

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