Listening difficulties in children

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PERSPECTIVES OF DUTCH HEALTH PROFESSIONALS REGARDING AUDITORY PROCESSING DISORDERS; A FOCUS GROUP STUDY

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ABSTRACT

Objective: This study investigated the perspectives of professionals from the Dutch audiological centers on the definition and care pathways of children with suspected auditory processing disorders (susAPD).

Design: Focus group interviews.

Study Sample: In total, 45 professionals from 6 disciplines, representing 22 different audiological centers and one ambulatory service, participated in five parallel focus group interviews. Participants had a variety of experience in diagnosing and advising children with suspected APD.

Results: Qualitative analysis (open and thematic) identified four themes (“Definition”, “Causes”, “Diagnostic Procedures” and “Clinical Reasoning”) expressing a variety of perspectives. Differences in perspectives were mainly affected by two debates: (1) whether or not APD exists as a pure (auditory) disorder and (2) whether or not current AP-tests are suitable in diagnosing children with listening difficulties. They also expressed a need for more guidance from the literature in their clinical decision-making process.

Conclusions: Professionals from the Dutch audiological centers share a broad perspective on children with APD. The ICF framework supports this perspective, thereby diminishing the need for a clear definition. The use of AP-tests should be limited to children where broader developmental disorders are first ruled out; a possible “pure” APD could then be diagnosed in a limited number of children.
INTRODUCTION
When a child has problems understanding speech in complex listening situations (for instance with background noise, or a speaker speaks very quickly and/or the sound quality is poor), while a peripheral hearing loss is absent, an auditory processing disorder could be suspected. Both in the literature and in clinical practice, there is agreement that these problems exist (Moore et al., 2013). However, professionals disagree with the definition and management when it comes to diagnosing these difficulties as auditory processing disorders.

Definition and Terminology
Despite half a century of research on this subject, there is still much controversy about the definition, terminology and management of auditory processing disorders. First, there is a distinction between the actual deficit and the difficulties that arise from it. Regarding the deficit itself, several international consensus documents use the term “(Central) Auditory Processing Disorder ((C)APD)” or “Auditory Processing Disorder (APD)”, referring to a deficit in auditory information processing by the central nervous system (Jerger & Musiek, 2000; American Speech-Language-Hearing Association [ASHA], 2005). A growing body of research in neuroscience shows that besides low-level (bottom-up) auditory processing, higher-level processing is also involved (British Society of Audiology [BSA], 2011; Moore, 2016). So, both the terms “central” and “auditory” could be discussed because of these peripheral, but also non-auditory processes which are involved in processing auditory information. The difficulties which arise from APD are often named as listening difficulties, but this causes some confusion, because listening difficulties are broader and they could also be caused by other underlying deficits besides auditory processing deficits (Sharma, Purdy & Kelly, 2009; Rosen, Cohen & Vanniasegaram, 2012; Sharma et al., 2014, Gyldenkaerne et al., 2014). In this paper, the term “suspected APD” (susAPD) is used when children are not (yet) diagnosed with APD, but could be referred for diagnostic evaluation on auditory processing.

Diagnosis
Diagnosis of auditory processing disorders has changed from a pure auditory perspective to a cognitive perspective. Including other disciplines and types of tests (attention, language, memory) is evident in the literature (BSA, 2011; DeBonis, 2015). Furthermore, the validity of auditory processing tests is a point of discussion; traditional tests measure more than pure auditory skills and can test for attention or other cognitive skills (Moore, 2010). This could raise the question whether auditory processing tests should still be included in diagnostic procedures, as consensus documents advise (Jerger & Musiek, 2000; ASHA, 2005). However, some speech-in-noise tests, like Listening In Spatial Noise, that include intra-personal comparison and thereby ruling out cognitive aspects, could still possibly be useful in the diagnostic procedure to reveal the auditory deficit (Cameron & Dillon, 2011; DeBonis, 2015; Moore, 2016).

Audiological Centers in The Netherlands
Internationally, children with susAPD, are mostly seen by audiologists and/or speech-language pathologists (Hind, 2006; Emanuel, 2011), and also by educational specialists (Logue-Kennedy et al., 2011).

In the Netherlands, these children are often referred to audiological centers. These centers consist of a multidisciplinary team that offers diagnosis, rehabilitation, and counselling of hearing problems in children and adults. Furthermore, they serve in diagnosing children with speech and language difficulties.
Within the Dutch audiological centers, wide variation exists in the procedures for diagnosing and advising children with susAPD (de Boer & Kuijpers, 2011; Neijenhuis, Dekelver, Van Herel-de Frel, 2016). Some centers use specific APD-procedures with standardized (auditory, language, psychological) assessments, other centers do not, instead focussing on assessing broader functioning of the child. These differences are, for professionals as well as for (parents of) clients, not desirable.

**Evidence Based Practice in Audiology**
According to Sackett et al. (1996), “Evidence-based medicine is the conscientious, explicit, and judicious use of current best evidence in making decisions about the care of individual patients” (p.71). Evidence-based practice (EBP) is the broader terminology most often used in audiology and related disciplines. It comprises of the integration of best available research evidence, clinical expertise, the clinical context and the client's preferences and goals, where professional and client are both involved through the process called “shared decision making” (Wong & Hickson, 2012). In the absence of research evidence, or when research evidence is inconclusive, the decision-making process depends on the other elements of evidence in EBP: the professional, the clinical context and the client.

In order to enrich evidence from the professionals' perspective of EBP, the current study gathered evidence from professionals who work with children with susAPD. It aims to explore the perspectives of professionals from Dutch audiological centers regarding definition, symptomatology, comorbidity and diagnostics of susAPD in children. Results from this study will be linked to results from a consensus study (Luinge et al., 2016) and two systematic reviews (de Wit et al, 2016 and de Wit et al, submitted) to form an evidence base for a uniform approach in the diagnosis and referral of children with susAPD.

The main questions addressed in this study are:
- How do professionals working in audiological centers describe auditory processing disorders?
- What is the optimal care pathway for children with susAPD, according to Dutch professionals of the audiological centers?

**METHODS**
**Study Design**
When exploring opinions and perspectives from professionals, qualitative research methods are best suited (Creswell, 2006). The method “focus groups” was chosen because this qualitative method provides for interaction, encouraging respondents to explore and clarify individual and shared perspectives (Tong, Sainsbury and Craig, 2007). They determine which aspects of evidence are most relevant in the translation to everyday clinical practice (Green & Britten, 1998; Knudsen et al., 2012). The aim of our focus group interviews was to explore the variety of definitions of APD and opinions about the optimal care pathway.

Data were gathered during a national 1-d conference for representatives from Dutch audiological centers, organized by the Federation of Dutch audiological centers (FENAC) on 21 May 2014. The title of the conference was “Diagnosing Auditory Processing Disorders”. The conference aimed to inform professionals about the up to date knowledge on the subject, and also to stimulate sharing of their own ideas and experiences. Participants were informed beforehand that focus group discussions would be part of the program and that participation was voluntary.
Participants and Context
Using convenience sampling, all audiological centers that were part of FENAC were asked to send two representatives from different disciplines to the conference. Forty-five professionals, representing 22 different audiological centers and one ambulatory service, participated in five parallel focus group discussions. Participants represented six different disciplines who are all concerned with diagnosis of APD. The allocation of participants across the focus groups was organized beforehand, so that disciplines and locations were evenly distributed.

A minority of the participants (18/45) once received formal training on APD, through a 3-d course where administration and interpretation of auditory processing tests (AP-tests) is taught. This course was not available anymore since two years before they were interviewed. Other participants only followed formal theoretical education (MSc or BSc) on this subject (Table 1).

<table>
<thead>
<tr>
<th>Discipline</th>
<th>Focus Group 1</th>
<th>Focus Group 2</th>
<th>Focus Group 3</th>
<th>Focus Group 4</th>
<th>Focus Group 5</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speech-Language therapist (BSc)</td>
<td>3</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>15</td>
</tr>
<tr>
<td>Linguist or speech-language pathologist (MSc)</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Audiologist (MSc)</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>Behavioural Scientist (neuro psychologist, orthopedagogue) (MSc)</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>9</td>
</tr>
<tr>
<td>Audiology-assistant</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Social Worker (BSc)</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>9</strong></td>
<td><strong>9</strong></td>
<td><strong>9</strong></td>
<td><strong>8</strong></td>
<td><strong>10</strong></td>
<td><strong>45</strong></td>
</tr>
</tbody>
</table>

Data Collection
Five experienced moderators led the group discussions. They all had an assistant who organized the audio recordings, observed the discussion and took notes. Both moderators and assistants were unknown to the participants and had no prior knowledge about them. A focus group manual (based on Slocum, 2006) was developed in order to manage the focus groups in an equal way. In an instruction session, led by the first author, ambiguities or uncertainties were discussed and opportunity for practice was provided.

The following questions, derived from current literature on APD, were asked during the focus group discussions:

1. What kind of symptoms do you associate with children who have APD? (topic: symptoms)
2. What symptoms do you also recognize in other developmental disorders? (topic: comorbidity)
3. What causes could underlie these symptoms? (topic: causes)
4. What kinds of assessments are needed to diagnose these disorders? (topic: assessment)
5. What would be the optimal care pathway for APD, from detection to counselling? (topic: care pathway)

Before the audio recordings were started, participants were asked to manually sign informed consent forms, which they all did.

All focus group discussions were audio recorded by the assistant and later on transcribed verbatim and anonymized by an independent, non-participating research assistant.
**Credibility**
Credibility of the study data is ensured by minimalizing observer bias and member checking. In order to minimalize observer bias (Knudsen et al., 2012), the coding and analysis were carried out by the first author in cooperation with three other researchers without job experience in audiological centers. Two of them were familiar with the population and were also moderators of two focus groups. This ensured more perspectives with the data analysis and interpretation. A member check took place at a follow-up conference with the same audience in 8 June 2016. Results from data analysis were shown to the participants and in an interactive voting session, it was checked if the same perspectives still existed. As new perspectives did not arise and discussion points still existed, it was concluded that the results were still representative.

**Data Analysis**
Transcripts were imported and analyzed with qualitative data analysis software Atlas.ti (version 7, Scientific Software Development GmbH, Berlin, Germany). A combination of open and thematic coding techniques was applied. One researcher (K.N.) started open coding the transcript of focus group 1 and developed a preliminary coding structure. This preliminary coding structure was discussed with another independent researcher, who consecutively used this coding structure in coding the focus group 2, independently from the first researcher. In a second discussion session with two other researchers (E. d. W. & M. L.), the coding structure was fine-tuned, and consensus was reached. In this review process, new information was constantly compared with previous information, leading to (re)arrangement of codes, themes and relationships between codes and themes.

**Theoretic Models**
Theoretic models (International Classification of Functioning, Disability and Health [ICF], World Health Organization [WHO], 2002; Evidence Based Practice [EBP], Sackett et al., 1996) provided themes for applying thematic coding. ICF (WHO, 2002a), a biopsychosocial model of health, proved to be a useful framework to categorize data on definition and causes of APD (see figure 1). Within this framework, a person’s health is not defined solely by one’s anatomical and physiological features (i.e. body parts and structures). Rather, it is recognized that one’s health condition is also influenced by other factors at the level of the person and by environmental factors (including the physical and social context).

In audiology, this model proved to be useful to make functional descriptions of health, even in case of irreversible disorders of body functioning like permanent hearing loss (Gagné, 2016). In the case of APD, underlying disorders of body functioning are mostly unclear, but the ICF gives room to describe functioning in a broader perspective (see also Baas, 2011).

The model of EBP (figure 2) provided for the themes “scientific evidence”, “professional”, “(clinical) context” and “client”.

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*your previous content here*
Figure 1. Model of functioning and disability illustrating the interaction of different health aspects according to the International Classification of Functioning, Disability and Health (ICF) (World Health Organization, 2002b, p.9).

Figure 2. Elements of evidence-based practice: underlying the clinical decision, there are four elements: scientific evidence, the professional's knowledge and experience, patients’ (or clients) values and organizational context.
RESULTS

General Remarks
All interview questions (topics) were discussed in every focus group, but there were differences in depth of discussions. Some groups also discussed perspectives regarding intervention (FM systems, auditory training, etc.), showing the need for guidelines on this topic. However, as this was not the focus of the present study, data on this topic were not included.

The resulting themes were a combination of the previously defined interview topics (see Table 2) and themes appearing from the focus group data. Initially, there were 5 interview topics: symptoms, comorbidity, causes, assessment, and care pathway. Consecutively, the topics “symptoms” and “comorbidity” were combined into the theme “definition”, as they appeared to be connected in the interview data. In the discussions on assessment and the optimal care pathway, it proved to be difficult for participants to switch between current and ideal pathways; some stated that their current pathway was already ideal. Thus, “assessment” and “optimal care pathway” were combined into the theme “diagnostic procedures”. The theme “clinical reasoning” was added, as this topic emerged in the data as an important underlying theme.

Table 2. Resulting themes, related to the interview topics.

<table>
<thead>
<tr>
<th>Interview topics</th>
<th>Resulting themes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Symptoms</td>
<td>Definition</td>
</tr>
<tr>
<td>Comorbidity</td>
<td></td>
</tr>
<tr>
<td>Causes</td>
<td>Causes</td>
</tr>
<tr>
<td>Assessment</td>
<td>Diagnostic Procedures</td>
</tr>
<tr>
<td>Care pathway</td>
<td>Clinical Reasoning</td>
</tr>
</tbody>
</table>

Theme: Definition

Symptoms
In response to the question on symptoms, related to APD, participants mentioned a broad range of symptoms. They did not agree on a specific set of symptoms, but accepted that there is heterogeneity.

Well, my experience is, that there is actually not one symptom that can be observed and is specific for this population. And that’s what makes it so difficult (p43, behavioral scientist).1

The symptoms cover a broad range of health aspects and could be categorized in the ICF-model. According to the participants, children with susAPD can have disabilities in all domains of ICF, which is illustrated in Table 3. Additionally, participants mentioned several discrepancies in functioning and activities, like poor speech understanding in noise versus normal speech understanding in quiet.

…… a child reacting as if he is hearing impaired, so in complex listening situations he reacts slowly or he does not react when called by his name. But there is no problem when it is quiet, which is the typical image of a hearing impaired (p1, audiologist).

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1 Quotes are originally in Dutch, but translated for the purpose of this paper.
Possible comorbid developmental disorders that were mentioned were categorized in the ICF-model (Table 3) under “personal factors”.

In all focus groups, a discussion developed around the existence of APD as a separate entity or diagnostic label. Also, the specificity of the disorder to the auditory modality played a role in this discussion. All participants agreed that a lot of the named symptoms overlap with the symptoms of other developmental disorders, like attention disorder or developmental language disorder. However, two perspectives arose: one group shares the perspective that these symptoms are not evidence of a separate disorder (“APD does not exist”). Another group finds that APD does exist as a separate disorder, although it is scarce (see Figure 3). Both groups, however, recognize that listening problems can exist in children but there is an overlap with other developmental disorders; the main difference arises from the opinion of the existence of pure, auditory-specific processing disorders.

*Well, sometimes you see children, sometimes, really once-in-a-while, when you exclude a lot of other possibilities, and that’s of course a specific information processing disorder in the auditory system, and then you could define an auditory processing disorder.*

* (p37, behavioral scientist).

*In my mind it’s always part of something else and I don’t believe that APD exists* (p1, audiologist).

**APD as a Diagnostic Label**
Repeatedly, discussions arose on using the term “APD” as a diagnostic label. Advocates, who stress that this label should only be used in “pure, auditory-specific” cases of APD, find that it is needed for indicating interventions (like an FM system or referral for special educational needs) although others mention that interventions do not need the label APD as an indicator; a broader description of functioning in terms of strengths and weaknesses could be just as useful. Advocates also argued that parents and referrers would prefer a clear diagnostic label for their child or client. Opponents of the use of an APD label, argue that they want to prevent parents becoming too anxious by receiving a diagnosis. They argue that a description of strengths and weaknesses justifies the heterogeneity of the listening problems. By using a label, it could appear that the diagnosis is definitive and long lasting, while, in many cases, variability is shown in the developmental profile of children. Furthermore, an argument for not using the label “APD” is that a standardized definition for a diagnosis of APD does not exist.
Table 3. Categorization of symptoms that could, according to professionals, characterize APD. This includes discrepancies and possible causes as part of the characterization.

<table>
<thead>
<tr>
<th>Body functions and structures</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sensory Functions: Hearing</strong></td>
<td>Learning and applying knowledge: directing attention</td>
</tr>
<tr>
<td>Behaves like having hearing loss</td>
<td>Less communicative</td>
</tr>
<tr>
<td>Difficulty hearing in noise</td>
<td>Absent behavior</td>
</tr>
<tr>
<td>Difficulty filtering sound</td>
<td>Easily distracted</td>
</tr>
<tr>
<td>Difficulty in processing rapid auditory information</td>
<td>Information does not arrive</td>
</tr>
<tr>
<td>Difficulty in processing verbal information</td>
<td>Slow responses</td>
</tr>
<tr>
<td>Difficulty in processing complex information</td>
<td>Frequently asks for repetition</td>
</tr>
<tr>
<td>Hypersensitivity for sounds</td>
<td></td>
</tr>
<tr>
<td>Difficulty hearing in complex listening situations</td>
<td></td>
</tr>
<tr>
<td>Difficulty processing instructions</td>
<td></td>
</tr>
<tr>
<td>Difficulty in speech understanding</td>
<td></td>
</tr>
<tr>
<td><strong>Mental functions: attention</strong></td>
<td>Learning and applying knowledge: learning</td>
</tr>
<tr>
<td>Attention problems because of speech understanding difficulties</td>
<td>Difficulty learning to read</td>
</tr>
<tr>
<td>Attention problems</td>
<td></td>
</tr>
<tr>
<td>No attention problems</td>
<td></td>
</tr>
<tr>
<td>Difficulties double tasking</td>
<td></td>
</tr>
<tr>
<td>Motoric restlessness</td>
<td></td>
</tr>
<tr>
<td>Fatigue</td>
<td></td>
</tr>
<tr>
<td><strong>Mental functions: memory</strong></td>
<td>Learning and applying knowledge: active listening</td>
</tr>
<tr>
<td>Poor auditory memory</td>
<td>Difficulty handling background noise</td>
</tr>
<tr>
<td>Mental functions: receptive and expressive language</td>
<td>Poor listening attitude</td>
</tr>
<tr>
<td>Language disorder</td>
<td>Difficulty following telephone conversation</td>
</tr>
<tr>
<td>Reading disorder</td>
<td></td>
</tr>
</tbody>
</table>

**Discrepancies**

- Verbal vs non-verbal processing
- Visual vs auditory processing
- General vs auditory attention
- Auditory vs non-auditory tasks
- Hearing in quiet vs noise
- Hearing problems despite normal hearing thresholds

**Causes:**

- Neurological disorder
- Auditory deprivation
- Sensory disorder (hearing loss)
- Social disorder
- Cognitive disorder (attention, memory, language)
- No explanation
<table>
<thead>
<tr>
<th>Participation</th>
<th>Environmental factors</th>
<th>Personal factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delay in academic performance</td>
<td>Eye contact required</td>
<td>Insecure</td>
</tr>
<tr>
<td>Inadequate reactions at parties</td>
<td>Thorough questioning of parents needed</td>
<td>Compensating behavior</td>
</tr>
<tr>
<td>Unable to follow TV at normal loudness level</td>
<td></td>
<td>Disturbing behavior</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Withdrawal</td>
</tr>
<tr>
<td><strong>Comorbidity</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poor intelligence</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Autism spectrum disorder</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Attention disorder</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dyslexia</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Language disorder</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hearing loss</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Discrepancies</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Communicative behavior in group vs one-on-one situations</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Communicative behavior at home vs at school</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Behavior in classroom does not match test scores</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Causes:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Too much noise in classroom</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High expectations (from parents, teachers)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lack of structure in classroom</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Figure 3. Two perspectives that constantly recurred in the focus group discussions. They appear to oppose each other regarding the acknowledgement of APD as a separate disorder. However, they agree that there is a lot of overlap in symptoms (listening problems, horizontally striped areas) with developmental disorders (the circles).

**Theme: Causes**

The professionals mentioned causes related to body functions, and also environmental factors (see also Table 3). Disordered body functions that could possibly cause APD, according to the professionals, are:

- (deprived) hearing (e.g. middle ear problems in the past);
- (auditory) nervous system (delay or disorder);
- sensory system (hypersensitivity);
- cognitive ability (memory, reading, speech-language);
- social skills (e.g. less contact with others lead to deprivation of auditory input).

You have had intermittent conductive hearing loss, thus the brain never had the chance to make a template from the auditory reality (p13, audiologist).

Possible environmental factors that could cause APD, according to the professionals, are:

- A lack of structure in the classroom.
- Too much environmental noise (resulting in deprivation of good quality speech).
- Too high expectations from others (parents, school).

This discussion was complicated, because professionals also argued that causes and effects are mostly not clear; is APD a primary or secondary disorder, or even a disorder at all?

Well, you can also turn it around: it is caused by APD or: APD is just part of those, all those problems that exist: short attention span, weak auditory memory, oh well name it all. And the whole expresses itself among the other things in problems with auditory processing. And which is the chicken and which the egg? (p30, speech-language therapist).
Theme: Diagnostic Procedures

Professionals agreed on the multidisciplinary approach that audiological centers already use in diagnosing children with susAPD. Applied diagnostic procedures minimally consist of administering questionnaires about auditory functioning (e.g. CHAPS-NL; Neijenhuis & Nijland, 2005, based on Smoski et al., 1998), audiometry, psychological assessment (IQ-testing) and (mostly) speech-language assessment. Other types of assessment that are mentioned are: AP-tests (Simkens & Verhoeven, 2000; Neijenhuis et al., 2003; Stollman et al., 2004), speech-in-noise tests (Bronkhorst & Plomp, 1990; Smits et al., 2013), neuropsychological assessment (incl. attention and memory), observation at school/home, and educational assessment. The order in which different assessments take place differs between centers, although all centers start with the intake and standard (pure tone and speech) audiometry. Regarding the choice for using auditory processing tests (AP-tests), there were four options mentioned by the professionals, illustrated in Figure 4.

Some centers continue their diagnostic pathway with AP-tests (speech-in-noise testing and/or full AP test batteries) and continue assessing higher level capacities later on.

Other centers start with broader-oriented assessment (intelligence, speech-language) and use AP-tests to focus on auditory processing at the end of the pathway.

Centers that use AP-tests at the beginning of the pathway, tend to administer them more often. One center uses shortened versions of all different assessments, as a multidisciplinary screening procedure, because of financial considerations.

In contrast to the agreement on the multidisciplinary approach, the professionals differed in their opinions about the use and usefulness of auditory processing tests as part of this approach. AP-tests were seen as useful for excluding APD when scores are normal, but in the case of abnormal scores, there is a lot of uncertainty regarding the interpretation and the validity for real-life listening situations.

Figure 4. Diagnostic pathways, mentioned by the professionals. Start of the pathway is the same, everybody agrees with multidisciplinary diagnostics, but the order and the choice for auditory tests differs.
But regarding these (auditory) skills, it is always difficult, because: what do these small subtests mean for classroom functioning? And that's actually the same with neuropsychological assessment… (p16, behavioral scientist)

The psychometric quality of AP-tests was also questioned regarding the available Dutch test batteries. Some participants expressed a need for better tests. Current norms are based on small groups and reliability is regarded as low. Three centers mentioned that they would prefer if a shorter procedure for AP-testing, like a single speech-in-noise test, was added to standard audiometry. Professionals from one specific audiological center independently mentioned that they chose not to use the AP-tests anymore, due to lack of validity. This combines with their opinion that APD is not a separate disorder, but a set of symptoms, resulting from overlapping developmental disorders and that the label “APD” should not be used anymore (see Figure 3, right-hand side).

Well, because scientific studies proved that auditory test batteries don’t assess what they should assess. So that children fail who actually have attention problems. That’s why we chose […] not to use them anymore. (p15, speech-language pathologist).

For some professionals, AP-tests were seen as useful for indicative purposes: intervention with an FM-system can be indicated if a speech-in-noise test score is abnormal. Also, AP-testing can help in completing the file that is needed for the referral for children with special educational needs and speech-language impairment, because one of the indicators is abnormal test scores in “auditory processing”.

But what they (= AP-tests) sometimes do prove is the question: will an FM system work, and sometimes you see that they (= children) don’t fail speech in noise areas but on other areas of auditory processing. And then we use this as an argument to say that an FM system is probably no solution. (p13, audiologist)

Theme: Clinical Reasoning
Decisions of professionals are based on all elements of evidence-based practice (scientific evidence, the professional’s experience, clients’ values and organizational context, see Figure 2).

Regarding the scientific evidence, there is uncertainty among the professionals. On the one hand, there is a lack of evidence and on the other hand, the available evidence is not straightforward according to the participants. They source the evidence in different ways: few of them mentioned scientific literature; others mentioned courses and conferences as sources of information. They expressed a need for practical guidelines for diagnosing APD, but also for more evidence on effects of auditory training.

Regarding the professionals’ experience, it was mentioned that development of diagnostic care pathways was mostly based on practical experiences. In one case this was illustrated by a small pilot study of the center’s own population.

Well, if you look at case research, case studies we did with AP-tests, and my colleague will tell you more later on, then it appears that we don’t have pure APD. (p33, linguist)
The client’s values are mostly advocated by the parents, who were considered as very important. Although participants consider it very important that parents have a full understanding of their child’s problems, some do this by administering a lot of different assessments and others perform less tests, but emphasize observation and subsequent counselling.

*But that [=psychological assessment] is sometimes hard to sell to parents. They came with a request for help on auditory processing and what do you do? You carry out a psychological assessment. Many parents in our area do not buy this. (p14, audiologist)*

Finally, the organizational context also plays a role in care pathways, because centers have the different financial circumstances. One center mentioned financial reasons underlying their choice to perform only shortened versions of different tests, to keep a broad view. Only in special cases, do they choose to perform full testing.

**DISCUSSION**

The perspectives on APD of professionals working in audiological centers in the Netherlands can be categorized into four themes: definition of APD, causes of APD, diagnostic procedures, and clinical reasoning. The results showed that professionals have different as well as common perspectives on APD. Regarding the first theme, definition, consensus exists about the existence of comorbidity and broader view on listening problems that is needed to describe this population. However, there was a lot of discussion and dissension about terminology: does APD exist as a pure disorder or not? The second theme, causes of APD, showed that both internal and external causes are not clear to professionals. Third, different diagnostic procedures are in use with the order and the choice of AP-tests having the greatest variation. Lastly, analysis of clinical reasoning according to the elements of EBP showed that professionals are insecure in making decisions about children with APD; among other things, they experience a lack of a high-quality evidence base, combined with confusion with the existing evidence.

Perspectives on definitions and terminology are similar to international discussions regarding modality specificity (i.e. is APD a pure auditory disorder?) (Cacace & McFarland, 2005; Rosen, 2005) and comorbidity (i.e. how does APD associate and overlap with other developmental disorders?) (Moore et al., 2013). Regarding the usefulness of AP-tests, Dutch professionals concurred with the internationally recognized importance of cognitive aspects in the diagnosis of hearing problems (Moore, 2016). However, the position of AP-tests in the diagnostic pathway proved to be different. In this case, DeBonis’ suggestion (2015) might be a solution: diagnosis of listening difficulties starts from a broad developmental perspective; AP-tests are only used until all other (non-auditory) diagnoses are ruled out. It could then be expected that only a small minority of children (possibly those, illustrated by the small area in the left part of Figure 3) with listening difficulties would undergo these tests in the end. For some audiological centers, this is already standard practice and for other centers this would mean a change of the diagnostic process and possibly also in their clinical reasoning. Taking the comorbidities and lack of validity of AP-tests into account, it seems logical to start the diagnostics by ruling out non-auditory disorders, and possibly end with assessing a pure auditory disorder (whose existence is denied by some professionals and doubted by most of them).

Insecurity of professionals in clinical reasoning around APD seems likely to be caused by a lack of strong scientific evidence. It would be helpful to have a firmer evidence base, as the current literature lacks high quality studies (de Wit et al., 2016). A Dutch Position Statement would partly be a solution to this by
providing the available high-quality evidence, together with consensus among professionals. However, clinical reasoning processes should always lead to different clinical decisions, because in EBP the individual client (and/ or his parents) is always participating in this process, by sharing in the professional’s decisions (also called “shared decision making”, see also Laplante-Lèvesque, Hickson and Worrall, 2012).

There are two discussion points regarding the participants in this study. First, if the distribution of participating professionals in the sample can be considered as representative. The present study sample represented professionals from two-thirds of all Dutch audiological centers and the distribution of disciplines was also representative for the distribution within a center. This was reflected by the diversity in opinions and perspectives. Second, they may have shown circular reasoning; they often mentioned behavior that was already described in available checklists and questionnaires, (CHAPS; Smoski et al, 1992; Keith’s checklist, 2000). The data of this study may thus not fully be based on real clinical experience, as professionals were not able to separate their own experience from external evidence. Furthermore, perspectives on the ideal care pathway were greatly influenced by the current pathway from their own center (which was often already ideal, as they said). Therefore, differing between perspectives of disciplines proved to be not useful: perspectives on care pathways were mostly dependent on the center they worked for.

Regarding the methodology in this study, the focus group method proved to be appropriate. Participants discussed at length with each other, which revealed a lot of underlying clinical reasoning that would not be revealed in individual interviews. Although moderators tried to give every participant the chance to speak, some participants might have expressed their opinions more often than others.

As many similar issues were discussed in the focus groups (especially the main topics: definition and use of AP-tests), it is concluded that there is saturation in the data. However, participants also expressed their needs to discuss other subjects on interventions, like FM-system or auditory training. As these subjects were not discussed in every focus group, they were not further analyzed.

CONCLUSION
The main research questions about defining APD and describing the optimal pathway of care did reveal different perspectives from professionals, working in Dutch audiological centers. Two debates seem to underlie all discussions: (1) Whether or not APD exists as a pure (auditory) disorder and (2) whether or not current AP-tests are suitable in diagnosing children with listening difficulties. For clinical practice, we suggest two implications for these two issues. Regarding the first issue, using the ICF-framework could pose a solution; The ICF forces the professional to view the client’s functioning in a holistic manner, rather than focussing on the disorder itself. Rather than solving the issue of modality specificity of an auditory disorder, a broad description of listening difficulties will be starting point for broad intervention. Regarding the second issue of using AP-tests, focussing on broad multidisciplinary testing lessens the need for AP-tests. As professionals mentioned in this study: if first all broader developmental disorders are ruled out, may be in the end, AP-testing could define a possible “pure” auditory deficit in a very limited number of children.
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