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Clinical Reasoning for Speech Sound Disorders: Diagnosis and Intervention in Speech-Language Pathologists' Daily Practice

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Purpose: This study aims to give an insight in clinical reasoning (diagnosis and intervention) of speech-language pathologists (SLPs) in the Netherlands for children with speech sound disorder (SSD).
Method: The study featured a mixed-method (qualitative and quantitative) design. Semistructured interviews containing nondirective, open-ended questions were conducted with 33 SLPs, which were analyzed using a constant comparative analysis. Other SLPs (137) filled out a questionnaire on the same topics. Multiple-choice questions were analyzed by descriptive frequencies, while open-ended questions were analyzed thematically.
Results: The results indicate that SLPs use a variety of assessments to diagnose SSD, complemented by observation

and, often, case history. In total, 85 different diagnostic labels were reported. The choice of intervention is based on what is appealing to the child and what matches his or her age as well as on the specific diagnosis and severity. Interventions are used for multiple speech disorders, and according to SLPs, parents play a large role in diagnostics and intervention.
Conclusion: These results reveal the need for (a) a clear and consistent terminology of diagnoses in the field of pediatric SSD, (b) a fast and easy-to-administer comprehensive differential diagnostic instrument in combination with an instrument to assess participation in everyday life, and (c) a tool to conduct a case history online.

C linical reasoning—or practice decision making—refers to thinking about and making decisions as a health care provider in a context-dependent situation. It is a contextualized interactive phenomenon (Higgs et al., 2008) that comprises two elements: (a) diagnostic reasoning, that is, collecting and analyzing information, and (b) therapeutic reasoning, that is, making sure the

patient's circumstances and needs are included (Ajjawi & Higgs, 2008).

Classification Systems for Speech Sound Disorders

Clinical reasoning is difficult to capture for speech sound disorders (SSDs). Clinicians rarely talk about clinical reasoning itself (Hoben et al., 2007), and the field of SSD underwent large changes in the last decades, which caused clinicians to change their way of thinking. Several diagnostic classification systems and models were presented with either an etiological, a descriptive-linguistic, or a processing approach (Tyler, 2010). Two systems are predominant at the moment (Terband et al., 2019; Waring & Knight, 2013): Dodd's Model of Differential Diagnosis (MDD; Dodd, 2014) and Shriberg's Speech Disorders Classification System (SDCS; Shriberg et al., 2010, 2017). The MDD is a psycholinguistic model of speech production and development containing the following categories: phonological disorder, phonological delay, consistent atypical phonological

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disorder, inconsistent phonological disorder, phonetic articulation disorder, and childhood apraxia of speech (CAS). The SDCS is based on the presumed etiological background of the speech problem and contains the following categories: speech delay-genetic, speech delay-Otitis Media with Effusion, speech delay-developmental psychosocial involvement, speech errors-/s/, speech errors-/r/, motor speech disorders-not otherwise specified, motor speech disorders-dysarthria, and motor speech disorders-CAS. However, not all categories have specific and sensitive diagnostic markers to provide a differential diagnosis (Terband et al., 2019). Also, a consensus on a classification system fails, due to the heterogeneity among children with SSD: They differ in severity, etiology, speech characteristics, involvement of other aspects of the linguistics system, treatment response, and maintenance factors (Dodd, 2011). As Waring and Knight (2013) concluded, there is a need for "an inclusive, universally agreed-upon classification system that meets the needs of clinicians and researchers" (p. 25). Furthermore, such a classification system should contain directions for speech-language pathologists (SLPs) to choose treatment and be universally applied and implemented (McLeod & Baker, 2014).

A framework that could help during the diagnostic process and provide a unity between languages is the International Classification of Functioning, Disability and Health (ICF; World Health Organization, 2001). The ICF comprises a holistic approach that covers all three possible angles (etiological, descriptive linguistics, and processing) in its different components. It also provides a description for three different perspectives: description of the physiological functions and anatomical parts of the body (body structures and body functions), description of the execution of a task or an action (activity), and description of the involvement in a life situation (participation). In the ICF, an SLP includes information about contextual factors (environmental factors and personal factors) as well. McLeod and Bleile (2004) described which kind of examination and intervention could be used for each of the levels of the ICF (body structures, body functions, activity, and participation). First, examinations are described, followed by examples of interventions. For body structures, SLPs should conduct an oromuscular assessment and an audiologic assessment. At the level of body functions, SLPs should analyze a speech sample to include analyses of phonological processes. McLeod and Bleile combined the levels of activity and participation; an SLP can conduct an intelligibility assessment and gather information about successes and difficulties in participating in everyday life. For the intervention, two sets of goals could be applicable: impairment-based goals and socially based goals. Interventions at the level of body structure are an operation and acceptance of the different facial structures. Goals for body functions entail achieving accurate productions, reducing unusual speech patterns, and increasing intelligibility. For activity and participation, McLeod and Bleile suggest using the following goals: correctly pronounce names and words the child likes to utter and promote communication successes by collaborating with a teacher and peers.

Diagnostic Process

To diagnose children with SSD, clinicians have the choice of several assessments. In a survey of SLPs in the United States, more than 50% of the clinicians reported to estimate intelligibility. SLPs also conduct a standardized single-word test, a hearing screening, a stimulability test, and an oral motor skill test (Skahan et al., 2007). This should be supplemented with additional single-word testing to get an overview of all the consonants and vowels in all positions multiple times, a connected speech sample, and phonological analyses, and it may include inconsistency testing (Macrae, 2016). Fabiano-Smith (2019) provided an evidence-based protocol of 10 steps for SLPs to diagnose children with SSD. An SLP should (a) perform a detailed case history, (b) conduct routine assessments including an oral peripheral assessment and a full hearing evaluation, (c) obtain a connected speech sample, (d) determine the phonetic inventory, (e) calculate consonant accuracy, (f) perform an error analysis, (g) calculate the phonological error patterns, (h) measure the proportion of whole-word proximity and the phonological mean length of utterance, (i) test the stimulability, and (j) quantify the intelligibility of the speech.

However, what fails is a single assessment that can differentiate between the various diagnostic categories (Terband et al., 2016, 2019). Current diagnostic instruments tend to focus on SSDs separately, for example, Hodson Assessment of Phonological Patterns (HAPP-3; Hodson, 2004) and Metaphonbox (Leijdekker-Brinkman, 2005) for a phonological disorder, PROMPT (Hayden, 2008), The Nuffield Dyspraxia Programme (Williams & Stephens, 2004), or the pause marker (Shriberg et al., 2017) for CAS. SLPs depend on their own clinical reasoning to try to establish a differential diagnosis of the speech disorder.

All of the mentioned diagnostic instruments measure the problems on the function level of the ICF, but this is not enough to get a broad view on the problems parents and children experience during everyday activities (McLeod, 2004). SLPs also use a case history to ask parents about the problems they experience on the activity and participation levels. In addition, an SLP performs an observation to see how children function during, for example, a conversation. In order to examine the speech skills at the level of participation, the SLP can, for example, ask parents to fill out the Intelligibility in Context Scale (ICS; McLeod et al., 2013).

Intervention Process

After an SLP establishes a diagnosis, she or he has to choose from multiple interventions (Baker & McLeod, 2011a). In the case of a phonological disorder, an SLP can choose between 15 different interventions (Baker et al., 2018). In a survey of 2,084 SLPs in the United States, SLPs reported using a traditional intervention more often than other inventions (Brumbaugh & Smit, 2013). Traditional articulation interventions are aimed at improving isolated speech sounds, whereas a phonological intervention is aimed at changing the sound system. SLPs in the study also use certain

parts of phonological interventions and provide phonological awareness training. The choice for an intervention requires the SLP to consider the differential diagnosis, as well as the therapeutic and scientific perspectives, and elements of the child's background, such as age, family circumstances, and parents' collaboration (Baker & McLeod, 2011b; Dodd & Bradford, 2000). Clinical reasoning thus plays a critical role in the work of an SLP, both during the diagnostic process and during the intervention. However, little is known about how this process takes shape in daily practice.

Some authors concluded that SLPs use their experience rather than scientific knowledge (Baker & McLeod, 2004; Brumbaugh & Smit, 2013; Joffe & Pring, 2008). This is due to a lack of time to read scientific articles and to the lack of sufficient scientific evidence for certain (combinations of) interventions or methods (Baker & McLeod, 2004). Many SLPs were found to combine interventions or methods, without any scientific evidence such as a randomized controlled trial (Baker & McLeod, 2011b; Joffe & Pring, 2008). However, SLPs should be able to apply these combinations of interventions based on their clinical experience (Sizer et al., 2016). Although expert opinions are not the strongest evidence, this should play a bigger role in evidence-based practice (e.g., Hofmeijer, 2014). An expert can detect differences and patterns in treatment outcomes, and eventually, a randomized controlled trial can be started. Therefore, it is imperative to understand how clinicians diagnose children with SSD and how they plan the intervention. Patterns in the decision-making process can serve as starting points for further research, for example, treatment efficacy.

Aims of the Study

The aim of this study was to investigate the clinical reasoning of SLPs in daily practice using a mixed-method (combining qualitative and quantitative) design. SLPs active in several settings in the Netherlands participated in either a semistructured interview containing nondirective, open-ended questions or a questionnaire containing both closed (multiple-choice or rating) and open-ended questions. Both the interview and questionnaire focused on what choices the SLPs make during the processes of diagnosing children with SSD as well as planning and administering the intervention. The research questions were as follows:

1. When SSD is suspected, which steps does an SLP take to eventually diagnose a child with SSD and are there differences in method between SLPs?

2. What are the labels (diagnosis), and which labels are more common?

3. Which methods and didactics are used by the SLPs?

4. What is the role of the parents in the whole process?

Mixed-Method Design

A concurrent triangulation (use of multiple methods) design mixed-method study was used in which quantitative and qualitative data are gathered. An important advantage of such a research design is that two complementary data sets are analyzed and cross-verified with the results merged into a single overall interpretation, thereby increasing the validity of the findings (Bekhet & Zauszniewski, 2012).

The interview was used as the qualitative method design to get a more in-depth view on the decisions an SLP makes during the diagnostic and intervention process for children with SSD, while the questionnaire was used as the quantitative method design to collect data from a large group of participants. The data from the interviews were used to supplement the questions in the questionnaire.

Note that, throughout the article, n_{ss} is used to denote sample size (the total number of SLPs who responded to the questionnaire/interview or to a specific question), whereas n_{rt} denotes the number of response types (the number of specific answers to a question).

Medical–Ethical Permission From an Ethical Review Board

Given the fact that all the participating SLPs were adults and the questions in the interview and questionnaire did not solicit any personal information about their clients, permission from an ethical review board was not required for this study according to the Dutch administrative authority (Centrale Commissie Mensgebonden Onderzoek, 2018).

Study 1: Interview

Method
Participants

Thirty-three SLPs working in a private practice or school in the Netherlands were interviewed, 23 from the province of Gelderland (eastern part of the Netherlands) and 10 from Brabant (southern part of the Netherlands), between September 2013 and December 2014. Table 1 presents an overview of the background of the participants. The SLPs were recruited via e-mail and/or telephone (obtained via an Internet search). The trained research assistants conducted the interview in pairs at the participating SLPs' workplace. The participants gave their written informed consent. They could withdraw from the study at any time. One research assistant executed the interview, while the other observed and intervened if necessary, by asking to clarify an answer or to get additional information. The interviews were audio-recorded. The data were processed anonymously.

Data Collection

Semistructured interviews were conducted comprising nondirective, open-ended questions organized in three sections: background of the SLP, decision making in diagnosis of SSD, and intervention of SSD (see Appendix A). Ten research assistants from HAN University of Applied

Table 1. Demographic background of the speech-language pathologists who participated in the study (questionnaire: $n_{ss} = 137$, interview: $n_{ss} = 33$).

Demographic variable	No. of questionnaire participants	% of questionnaire participants	No. of interview participants	% of interview participants
Gender				
Female	135	98.5	32	97.0
Male	2	1.5	1	3.0
Region				
North	10	7.3	0	0.0
West	64	46.7	0	0.0
East	36	25.5	23	69.7
South	27	20.5	10	30.3
Years of experience				
0–5	20	14.6	5	15.2
6–10	23	16.8	7	21.2
11–15	19	13.9	4	12.1
16–25	42	30.7	11	33.3
25+	33	24.1	6	18.2
Work setting				
Private practice	97	70.8	29	87.9
Primary school	5	3.6	0	0.0
Primary school (special education)	10	7.3	4	12.1
Secondary school (special education)	7	5.1	0	0.0
Hospital	3	2.2	0	0.0
Specialist day care center: young children	15	10.9	0	0.0
Work hours per week				
0–8	1	0.7	0	0.0
9–16	10	7.3	0	0.0
17–24	42	30.7	13	39.4
25–32	42	30.7	7	21.2
33–40	33	24.1	11	33.3
> 40	9	6.6	0	0.0
				Missing = 2
Degree				
MA	35	25.5	1	3.0
BA	102	74.5	32	97.0
Education course in SSD after graduation				
Yes	100	73.0	31	90.9
No	37	27.0	2	9.1
Number of courses in SSD after graduation[a]				
1	46	33.6	8	24.2
2	30	21.9	12	36.4
3	14	10.2	5	15.2
> 4	9	9.1	5	15.2

Note. SSD = speech sound disorder.

[a]Most followed courses: Metaphon, Cycles approach, and PROMPT.

Sciences (final-year SLP students) were trained to conduct the interviews according to a predefined protocol (interview guide, see Appendix A) developed by the first author in consultation with the co-authors and three independent SLP lecturers. The training comprised both theoretical knowledge about collecting qualitative data (reading and attending lectures) and practical skills (role playing and conducting several pilot interviews with feedback from the first author).

Data Analysis

The interviews were transcribed verbatim by the research assistant who was present at the interview and was checked by a research assistant who was not present at the interview. All SLPs participated in a member-checking process of the verbatim; no changes were necessary according

to the SLPs. During the analysis process, the objective was to identify key issues in the data. A constant comparative method was used (Corbin & Strauss, 2008); this is the reason why validity could not be determined. First, one interview was segmented and coded independently by the first author and three research assistants. Comments of the SLP were labeled with a word or short phrase that expressed the key issue (code). The resulting codes were then evaluated between the first author and the research assistants, and a consensus list of codes was composed. Second, this list was used to code the remaining interviews with assistance of the computer software Atlas-TI Version 7 (http://www.atlasti.com, 1993–2013) to organize the data. Each interview was coded individually; the code list was adapted when new codes appeared in the interviews. The new codes were discussed between the first author and the research assistants

to increase the rigor and transparency of the process. No new codes appeared after the 29th participant, meaning saturation was reached. All interviews were then checked again with the completed list. After coding all interviews, the codes were organized in coherent themes or subthemes (axial coding; Corbin & Strauss, 2008), if possible, by the first author and the research assistants independently. The themes or subthemes were compared and discussed if these did not match.

Results

The results regarding the processes of diagnostics, planning, and administering intervention are described in the following sections.

Diagnostic Process

The participants reported that they take between two and four sessions (one session is 30 min in the Netherlands) to do a complete assessment, including a case history, before they diagnose a child. The number of sessions depended on the severity of the speech difficulties and the child's cooperation during the assessment. In the following sections, the results of the different steps of the diagnostic process are presented separately.

Case History: Manner of Conducting and Themes

Not all SLPs conduct a case history; this is the case for SLPs in schools, special day care centers, or hospitals. Parents are often not present at the SLP sessions: "…it is difficult to get all the information; it depends on the collaboration of the parents. I do not have the time to conduct a case history; my caseload is large" (P5). SLPs who conduct a case history differ in four aspects of the case history: which questions they ask the parent or guardian, the presence or absence of the child during the intake, and whether they combine an interview with an assessment during the first session or not—"…I hear from some colleagues, that they do not conduct an interview, …and they start with an assessment. I never do an assessment the first time" (P30).

All responses to questions about the case history from the interviews were labeled and then clustered in 19 items.

Subsequently, these items were included in the questionnaire (see Table 2).

Assessments Used by SLPs

In the interviews, the SLPs were asked which assessments they use for a suspected diagnosis and why they prefer those assessments for that specific SSD. An overview of the responses for the three most common speech problems in children, namely, phonological disorder, phonetic articulation disorder, and CAS, is presented below.

1. Phonological disorder: Nine SLPs reported to use the HAPP (Hodson & Paden, 1983) because of the ability to calculate the severity of the disorder. This instrument is mostly used with children of 4 years of age or younger because it contains objects instead of pictures. Another reason to assess a child with HAPP is if the child has a severe speech disorder. One SLP (P1) stated to regret not being able to use HAPP with older children and to use the assessment of Metaphon (Leijdekker-Brinkman, 2005) instead for older children. Metaphon is also chosen for children with a severe disorder (n_{rt} = 5). When the disorder is less severe, seven SLPs reported to prefer the Nederlands Articulatie Onderzoek (NAO; Baarda et al., 2014; picture naming), which is a two-way scoring assessment (correct or false analysis). One of the SLPs indicated to also assess the nonspeech oral movements of children with a phonological disorder.

2. Phonetic articulation disorder: Seven SLPs indicated to rather observe a child than conduct an assessment. One (P15) argued that she can see a lisp during a conversation with a child. When SLPs do an assessment, they use the NAO (n_{rt} = 8) or HAPP (n_{rt} = 3). Four SLPs stated that they assess the nonspeech oral movements of children with a phonetic articulation disorder.

3. CAS: Seventeen SLPs mentioned how they assess children with a suspicion of CAS. Most of them reported to use the Dyspraxieprogramma (Erlings-van Deurse et al., 1993) based on The Nuffield Dyspraxia Programme, but not the whole assessment. As one SLP indicated, "The whole program is too long and boring…" (P7). The items from the Dyspraxieprogramma

Table 2. Most important questions in speech-language pathologists' (SLPs') case history as reported in the questionnaire (n_{ss} = 137; SLPs had to choose five items).

Theme	n	Item	n
Hearing	103	Speech and language disorders in the family	30
Speech and language development	94	Reactions of the environment on intelligibility	28
Course of the disorder	71	Child's awareness of intelligibility	25
Reactions of the child when misunderstood	53	Multilingualism	25
Oral habits	44	Compensatory behavior	24
Feeding development	35	Pregnancy and childbirth	13
Sensorimotor development	34	Psychosocial development	11
Babbling	33	Sensory perception	8
First word	33	Diseases	1
Cognitive development	31		

that are used the most are as follows: repeating speech movements, diadochokinetic sequences, repeating long words, nonspeech oral movement assessment, repeating a word 5 times, and an observation of groping behavior.

Some SLPs (n_{ss} = 4) stated to use a language assessment to diagnose children with SSD. Two SLPs gave a reason for the use of a language assessment; P14 stated, "I want to get a clear understanding of the language development." While the other (P7) reported, "I use a language assessment to observe the speech of the child."

Overall, three reasons why an SLP uses an assessment were given frequently: (a) The assessment is in possession of the SLP; (b) the assessment is quick, easy to use, and clear; or (c) the SLP recently followed a course on the assessment. One SLP (P9) indicated, "I have got all the other assessments in my cupboard, but I do not use them. It is time consuming and an observation combined with a simple picture naming task, namely the NAO, and some good thinking gives me plenty of information."

The SLPs were also asked to give their view on the most optimal way to conduct an assessment. Sixteen SLPs responded that they would like to have an assessment that can be used for a differential diagnosis. An additional eight SLPs reported that they want to have a tool that is fully computer based to save time and make the process easier.

Differential Diagnosis

All interviewed SLPs see children with a phonetic articulation disorder. Most (97%) of the SLPs who participated in the interview have children with phonological disorders in their caseload. The majority of the SLPs (69.7%) stated that they diagnose children with CAS. However, most SLPs expressed that the children in their caseload do not have a pure CAS but rather some characteristics of CAS in combination with a severe phonological disorder. As one participant said, "Yes, a pure dyspraxia almost never occurs. It is frequently combined with a phonological problem" (P24). Only one of the five SLPs with less than 5 years of experience diagnosed a child with CAS. Furthermore, only a small number of SLPs see children with dysarthria (9.1%), reportedly because "the children with dysarthria are already in a special day-care centre" (P16). In private practices, only SLPs with more than 16 years of experience reported to have had children with dysarthria in their caseload. Finally, eight SLPs reported that their caseload also comprises children who stutter or clutter or children with a cleft palate.

During the interviews, the SLPs were also asked how they recognize the different speech disorders. The responses are presented in Table 3. Following McLeod (2004), the reported distinctive characters were matched with an ICF level. Some of the distinctive characters could not be specified because the characters were too broadly formulated to fit into a single ICF level and were therefore labeled as "Other." The characters of a phonetic articulation disorder

as mentioned in this survey only regarded the level of body functions, whereas the reported characters of phonological disorder, CAS, and dysarthria regarded all levels of the ICF.

Intervention

Several reasons were mentioned to why an SLP chooses a particular intervention. The most frequently named reasons were age (n_{ss} = 30) and appeal to the child (n_{ss} = 28); for young children, they often choose three-dimensional materials in the intervention. Another reason was the behavior of the child (n_{ss} = 19): "…and shy children…you just keep in mind the behaviour" (P23). The experiences of the SLP were frequently expressed in the interviews (n_{ss} = 17): "What is your own experience, what works and what does not work…" (P31).

For the intervention of children with a phonetic articulation problem, all SLPs state to use an intervention that starts at the sound level, such as the Van Riper method. SLPs use the pictures from the Logo-Art binder. One SLP uses the Metaphon method to teach the child the right placement of the tongue in the mouth at the sound level. One SLP (P30) said: "If the child has a cleft palate I use Prompt in my intervention."

Almost all SLPs use HAPP and/or Metaphon for a child with a phonological disorder. One SLP uses Metaphon and no other method. Ten SLPs use Prompt or Van Riper as well. One SLP (P15) stated: "I think HAPP does not work well in all cases. Sometimes I have to combine HAPP with a speech motor approach." Seven other SLPs communicate to use a sound gesture in combination with HAPP or Metaphon.

For children with CAS, SLPs (n_{ss} = 29) use the Dyspraxieprogramma. Three SLPs said they use this program not often, because CAS is rare. Five SLPs use nonspeech oral movements during the intervention.

The SLPs were also asked to explain which didactic strategies they use when administering the intervention. The responses (n_{ss} = 33) were combined for the three most common diagnoses (phonological disorder, phonetic articulation disorder, and CAS) and are presented in Table 4. The results showed many similarities between the three disorders, except for the structure of the intervention. The SLPs reported that, for children with a phonological disorder, they start with practicing target words, whereas SLPs start the intervention with exercises on the sound level for children with phonetic articulation disorders or CAS. While children with CAS practice with two alternating sounds, children with a phonetic articulation disorder already practice sounds in words. The responses further indicated that SLPs use awareness and imitation as didactic strategies for children with phonological and phonetic articulation disorders, but not for children with CAS. For these children, an SLP uses drilling and motor learning; these techniques are not used for the other speech disorders.

When children are able to pronounce sounds in words and sentences, the SLPs reported to change the didactic strategy and allocate some time of the intervention session

Table 3. Diagnoses as reported by speech-language pathologists (SLPs) in the questionnaires (n_{ss} = 132) categorized into groups, with distinctive characters of each diagnostic category based on the interviews (n_{ss} = 33).

Speech sound disorder	No. of times reported (questionnaire)		Distinctive characters of the speech problem according to SLPs (interview)	ICF category of the distinctive character
	n	%		
Phonological disorder/delay (33 different labels)	127	96.2	Simplification processes	Body functions
			Deletion of speech sounds	Body functions
			Child can pronounce the speech sound, but not in a syllable or word	Body functions
			Language problem	Other
			Structural and consistency in speech pattern	Body functions
			Often unintelligible speech	Activity
			Frustration	Participation
			No awareness of speech problem	Participation
			Hearing problems	Body structure
				Body functions
			Sensory processing problem	Body functions
Phonetic articulation disorder (23 different labels)	113	85.6	Lisp	Body functions
			Child can pronounce the sound but does this in a wrong manner	Body functions
			Wrong tongue placement	Body functions
			Problems in muscle tone of the lips and tongue	Body functions
			Abnormal dental position	Body structure
			Short frenulum	Body structure
			Substitution of only one speech sound	Body functions
			High gag reflex	Body functions
			Jaw instability	Body structure
Childhood apraxia of speech (13 different labels)	59	44.7	Inconsistent speech pattern	Body functions
			Problems with repeatedly pronouncing a word	Body functions
			Groping	Body functions
			Frustration	Participation
			Unintelligible speech	Activity
			Difficulties with imitating a speech sound	Body functions
			Late talker	Other
			Feeding problems	Other
			Problems with coordinating of the lips, tongue, and jaw	Body functions
			More errors when pronouncing longer words or sentences	Body functions
Dysarthria (one label)	6	4.5	Difficulties in forming a sound	Body functions
			Difficulties in intelligible pronunciation of sounds	Activity
			Fluctuating muscle tone	Body functions
			Hypernasality	Body functions
Fluency disorders	11	8.3		
Combination of diagnosis	10	7.6		
Other diagnoses (not speech related)	8	6.1		

Note. ICF = International Classification of Functioning, Disability and Health.

Table 4. Didactic strategies for the three diagnoses (n_{ss} = 33).

Speech sound disorder		
Phonological disorder	Phonetic articulation disorder	CAS
Awareness of speech problem	Awareness of speech problem	
Tactile	Tactile	Tactile
Auditory exercises and bombardment	Auditory exercises	Auditory exercises
Visual	Visual	Visual
Imitation	Imitation	
Repetition	Repetition	Repetition
Playful	Playful	Playful
		Drill
		Motor learning
Structure: production of target words	Structure: (auditory discrimination), sound, word, sentence level, and spontaneous speech	Structure: start with one sound, alternate two sounds, etc. Finally pronounce words and sentences

Note. CAS = childhood apraxia of speech.

to stimulate the intelligibility in real life (activity and participation level). According to some SLPs, this is not included in the chosen intervention method. For example, P14 illustrated this by saying: "…I use longer words, memory, and story picture cards. These exercises are not included in a method…. I use these materials to stimulate natural speech." Another SLP (P31) stated: "…exercises at home, for example, a conversation with dad or mum. A child can learn to execute what he has learned." One SLP (P33) shared her uncertainty about the transition phase: "In my practice the child performs well, then the child goes home, and we are back at square one."

Factors Influencing the Effect of the Therapy

SLPs were asked how they keep their intervention period short and effective. The most important factor according to the SLPs was whether parents stimulate their child at home. As some SLPs reported, this is why they try to actively involve parents in the intervention and give parents a clear description of the homework. SLPs in the questionnaire were further asked for their perspective on the role of parents during the intervention in an open-ended question.

Another important effective intervention requirement was that the children should have fun during the intervention and practice by playing. Furthermore, the SLPs considered it important to pause the intervention when there is no visible progress. The intervention period was reported to be shorter and more effective when SMART (Specific, Measurable, Attainable, Realistic, and Timely) goals are formulated at the start of the sessions and targets are adjusted if necessary. Goals are important to be formulated together with the parents; for example, P6 said: "I always ask parents; What would you like to achieve in six months? Nine out of ten times they want to understand their child better." Other factors in choosing the goals for the therapy sessions are the capability of the child to pronounce sounds in isolation or even in a word and the normal speech development.

The last question of the interview was what SLPs would like to change or add to their options regarding intervention (n_{ss} = 21). The majority of the SLPs (n_{ss} = 14) responded that they would like to have one complete/combined method that they could use for all children. As one SLP pointed out: "I would like to talk with influencers on SSD to create an ideal articulation intervention which represents all existing methods" (P9). In addition, four SLPs reported the need for variable and challenging materials to motivate the children to practice, and three SLPs expressed the wish for a computer-based intervention. For example, "There are probably so many apps, but a homework app focused on speech might be a good idea?" (P11).

Study 2: Questionnaire Survey

Method
Participants

SLPs with experience in the field of children with SSD were recruited via newsletters from professional associations and a Facebook group for SLPs in the Netherlands. After 3 weeks, the call was repeated. The questionnaire was available on a website between May and September 2014, during which it was filled out by 137 SLPs who did not participate in the interview. The SLPs filled out the questionnaire anonymously and gave their consent when they submitted the filled-out questionnaire. Most participants (n_{rt} = 130) completed the questions about both diagnosis and intervention, while seven SLPs indicated that their work does not comprise therapy and only answered the questions about diagnosis. The distribution of gender (see Table 1), region (North, n_{rt} = 10 [7.3%]; West, n_{rt} = 64 [46.7%]; East, n_{rt} = 36 [25.5%]; South, n_{rt} = 27 [20.5%]), and workplace (see Table 1) was representative for SLPs in the Netherlands (Kwaliteitsregister, 2017).

Data Collection

The questionnaire survey was administered online to make it easily accessible for all SLPs in the Netherlands and to enable the participants to respond at a self-chosen moment. The questionnaire was developed by the first two authors, taking into account the comments of six professionals in the field of SSD on a pilot version. The questionnaire (see Appendix B) consisted of 27 questions distributed over three sections: background (eight questions), assessment process (10 questions), and intervention approaches and additional aspects of the intervention (nine questions). Information was elicited via either closed multiple-choice questions (12), closed rating questions (5-point Likert scales ranging from "strongly agree" to "strongly disagree"; 11), or open-ended questions (13). The questionnaire was administered using Limesurvey software (Schmitz, 2012) and took approximately 20 min to complete.

Data Analysis

The open-ended questions were analyzed thematically by the first author and checked by the second author, while the closed questions and multiple-choice questions were analyzed by means of descriptive frequencies. There were some missing data toward the end of the questionnaire from some of the participants, particularly the open-ended questions that were not filled out by everyone (55.5% completed every question). Reported percentages are for valid data only, excluding the missing responses for the questions with missing values.

Results
Diagnostic Process

The results of the questionnaire about the diagnostic process are presented in the following sections.

Case History: Manner of Conducting and Themes

The respondents were asked to select the five items that they considered the most important for a case history. The results indicated that most of the SLPs consider it important to ask the parent whether the child has hearing problems ($n_{rt} = 103$), how the speech and language of the child developed ($n_{rt} = 94$), and about the course of the speech disorder ($n_{rt} = 71$; see Table 2).

Observation: Manner of Conducting and Themes

To get an impression of what SLPs attend to during case history and assessment, an open-ended question was included in the questionnaire inquiring what SLPs consider important to observe in a child with SSD, in general and in the speech-language domain specifically. The responses were clustered into 21 topics (see Table 5). The SLPs mentioned that they observe the communication strategy of the child the most ($n_{rt} = 62$), for example, pointing and making gestures, followed by the nonspeech oral movements of the child ($n_{rt} = 56$). SLPs mentioned observation of the speech characteristics (e.g., phonological processes, speech sound distortions) 45 times.

Assessments Used by SLPs

In the questionnaire, the SLPs were asked which assessments they use for a suspected diagnosis. The responses of the SLPs who participated in the questionnaire are presented in Table 6. The SLPs mentioned, on average, three assessments, with a range of one to six. Most of the selected assessments are on the level of body functions (ICF). SLPs named the NAO (Baarda et al., 2014) the most, followed by Metaphon (Leijdekker-Brinkman, 2005) and the HAPP (Hodson & Paden, 1983). However, when asked which assessment SLPs use the most, the most frequent answer was the NAO, but HAPP was answered more often than Metaphon. Six other speech production assessments were preferred more than 6 times. An assessment named less than 6 times was placed in a single category, named "other speech assessment." Forty SLPs reported to use a speech sample, but only six SLPs use this assessment often. Furthermore, some of the SLPs (questionnaire, $n_{ss} = 30$) mentioned the use of a language assessment or the use of a language sample to investigate speech problems (e.g., the Frog story).

Furthermore, the results on the questionnaire indicated that 37.6% of the SLPs ($n_{ss} = 132$) always use the same assessment when assessing a child with SSD and that 40.8% choose an assessment that fits the child's speech

Table 5. What speech-language pathologists (SLPs) observe in a child with speech sound disorder (SSD) as reported in the questionnaire ($n_{ss} = 132$).

Observation topics	n	Observation topics	n
Communication strategy of the child	62	Feeding development	12
Oral skills	56	Child awareness of the SSD	12
Speech characteristics	45	Groping	9
Interaction with the parent/caretakers/SLP	40	Cognitive skills	8
Coping with the speech problems	33	Auditory processing	8
Intelligibility	28	Pragmatic skills	5
Language development	25	Imitation	3
Hearing	22	Reading/writing development	3
Sensory and motor development	19	Motivation	2
Attention/focus	19	Rate of speech of the parents/caretakers	1
Reaction of the parents when they do not understand the child	14		

Table 6. Speech assessments used by speech-language pathologists (SLPs; n_{ss} = 132) to examine speech sound disorder (SSD).

Speech assessment	Mentioned (questionnaire)		Most used (questionnaire)		Mentioned (interview)		Suspicion of a specific diagnosis (interview)	ICF category addressed by the assessment
	n	%	*n*	%	*n*	%		
Nederlands Articulatie Onderzoek (picture naming, two-way scoring)	100	75.8	61	46.2	27	81.8	Phonetic articulation disorder (mostly) Phonological disorder	Body functions
Metaphon	66	50.0	17	12.9	17	51.5	Phonetic articulation disorder Phonological disorder (mostly)	Body functions
Hodson Assessment of Phonological Patterns	41	31.1	29	22.0	18	54.5	Phonetic articulation disorder Phonological disorder (mostly)	Body functions
Speech sample	40	30.3	6	4.5	2	6.1	Phonetic articulation disorder (mostly) Phonological disorder Childhood apraxia of speech	Body functions Activity
Dyspraxieprogramma	30	22.7	1	0.8	12	36.4	Childhood apraxia of speech	Body functions
Schlichtingtest (language assessment)	19	14.4	0	0.0	3	9.1	Phonetic articulation disorder Phonological disorder Childhood apraxia of speech	Body functions
Oral motor assessments	18	13.6	0	0.0	4	12.1	Phonetic articulation disorder (mostly) Phonological disorder	Body functions
PROMPT	13	9.8	1	0.8	2	6.1	Phonetic articulation disorder (mostly) Phonological disorder Childhood apraxia of speech	Body functions
Taaltest Alle Kinderen: Klankarticulatie (picture naming, two-way scoring)	11	8.3	1	0.8	4	12.1	Phonetic articulation disorder (mostly) Phonological disorder	Body functions
Self-made speech assessment	6	4.5	7	5.3	7	21.1	Phonetic articulation disorder (mostly) Phonological disorder	Body functions
Other speech assessments	13	9.8	2	1.5	3	9.1		Mostly body function, one assessment: participation (Intelligibility in Context Scale)
Other language assessments	11	8.3	1	0.8	0	0.0		Body functions
Hearing	3	2.3	0	0.0	1	3.0		Body functions
Sensory Profile	1	0.8	0	0.0	0	0.0		Body functions Activity

Note. Questionnaire outcomes are presented in the second and third column, comprising all the mentioned assessments (n_{ss} = 133) and only the most used assessment (n_{ss} = 126), respectively. Outcomes of the interviews (n_{ss} = 33) are presented in Columns 4 and 5. In the interviews, the SLPs were only asked to mention which assessment they use and for which suspicions of SSD. The last column presents the addressed level of the International Classification of Functioning, Disability and Health (ICF; body structure, body functions, activity, or participation).

problem based on information gained from the case history and/or observation.

Differential Diagnosis

In an open-ended question, the SLPs were asked to mention the diagnosis they formulate for children with SSD in order of frequency. SLPs mentioned a total number of 85 different diagnoses with an average of three per SLP. Many similarities were observed among the different diagnoses, for example, "dyspraxia," "verbal dyspraxia," and "CAS." Therefore, the 85 mentioned labels were combined into seven categories (see Table 3), and these were used in the further analysis. In some cases, the SLP mentioned two different labels that were eventually combined in the same category, for example, within the category "phonological disorder/delay"; one SLP gave two different diagnoses, namely, "phonological delay" and "phonological disorder," and this was counted only once. The category "combination of diagnoses" contains diagnoses in combination with each other (e.g., phonological disorder with CAS). The most mentioned diagnosis is a phonological disorder/delay, followed by a phonetic articulation disorder (see Table 3).

Intervention

The results indicated that predominantly child-related factors are important for an SLP when they choose an intervention method or material. Especially, the extent to which an intervention is appealing to the child was reported to play a role in the choice of a specific intervention (49.3%). Furthermore, SLPs also take into account age (37.3%) and specific diagnosis and severity of the disorder (31.3%) as two of the main reasons.

The SLPs were also asked which intervention method or material they would choose given a specific SSD. Table 7 presents the outcomes for the three diagnoses that were mentioned the most often: phonological disorder, phonetic articulation disorder, and CAS. SLPs report to use almost every intervention for all three diagnoses; the differences lie in the frequencies. For example, the Cycles approach (Hodson & Paden, 1983) is commonly used with phonological disorder ($n_{rt} = 69$), but not often with phonetic articulation disorder ($n_{rt} = 4$) or CAS ($n_{rt} = 3$). With respect to the diagnosis dysarthria (which was mentioned only 4 times), SLPs reported to use PROMPT (Hayden, 2008; 75.0%) or neurodevelopmental treatment (Howle, 2002; 25.0%).

In reply to follow-up questions about the chosen intervention, 62.9% of the SLPs reported to follow the instructions of the method/material as described in the manual or handbook. Furthermore, the SLPs ($n_{ss} = 89$) reported to be uncertain about their choice of intervention for children with CAS (34.8%), followed by children with a phonological disorder (28.2%).

Factors Influencing the Effect of the Therapy

Most SLPs consider parents as a co-therapist (89.5%). As one SLP (P14) wrote: "Parents are co-therapist. It is not beneficial to only practice during a therapy session." Furthermore, 88.7% of the SLPs (data from statements, Likert scales) reported that they provide homework and specific exercises for parents and child to work on together. The responses further indicated that the provision of homework is mainly dependent on the work setting. Homework was reported to be more or less standard in private practices but less common in specialist day care centers and schools. SLPs find it is also important to have a collaboration with the school or nursery of the child.

Additionally, the questionnaire contained an open-ended question about the steps the SLPs take when the intervention does not have any or just a little effect. This question was answered by 68 SLPs, and the responses were combined into seven categories. The results showed that, when the intervention has no or little effect, most SLPs (86.7%) consult parents, teachers, or a colleague and/or change the intervention method (58.8). Other practices reported were to refer the child to another SLP or another discipline (48.5%), to conduct an additional assessment in order to find a cause (36.8%), and to temporarily pause the intervention (35.5%). Nine SLPs (13.2%) stated that they would stop the intervention sessions altogether.

Discussion

The purpose of this study was to get a complete overview of the entire process SLPs go through in their practice as a professional, from the registration of a child with (suspected) SSD until dismissal. In a mixed-method design combining interviews and questionnaires, we surveyed the practices and opinions of a total number of 170 SLPs in several professional settings in the Netherlands. The results showed a strong congruence between the quantitative and qualitative data. Before attending the outcomes regarding the intervention process, first, the process of how SLPs come to establish a diagnosis is discussed.

Diagnostic Process

First of all, the results revealed a number of differences in the diagnostic process dependent on work setting. SLPs in private practices always conduct a case history to determine which topics are important for the specific child, whereas SLPs working in education, special day care centers, or hospitals do not always conduct a case history. The absence of parents during school hours is a problem for SLPs in education or special day care centers, and an extensive case history is often considered too time consuming in hospitals. A recent study by Harrison et al. (2017) found that the judgment of parents is a valid and important tool in diagnosing speech problems. This stresses the need for all SLPs to conduct a case history, because it helps in establishing a diagnosis. In addition, we believe that conducting a (detailed) case history with a parent can actually save time on the longer run, because a better fitting assessment plan can be conducted if parents provide a detailed description of the child's (speech) problems. It also could provide

Table 7. Methods/materials used per diagnosis as reported in the questionnaire (n_{ss} = 91).

Method/material	Phonological disorder		Phonetic disorder		CAS		ICF category addressed by the assessment
	n	%	*n*	%	*n*	%	
Cycles approach	69	75.8	4	4.4	3	3.3	Body functions Activity
Metaphon(box)	70	76.9	7	7.7	4	4.4	Body functions
Dyspraxieprogramma	22	24.2	15	16.5	41	45.1	Body functions
Logo-art/Widget Inprint (picture database)	42	46.2	53	58.2	12	13.2	Body functions
Oral myofunctional therapy/Garliner	2	2.2	31	34.1	1	1.1	Body functions Body structure
Van Riper	4	4.4	12	13.2			Body functions
PROMPT	12	13.2	14	15.4	7	7.7	Body functions Body structure
Self-made material	8	8.8	14	15.4			
Minimale parenspel (minimal pairs game)	10	11.0					Body functions
Transparant/TenT (program to practice sentences with 3D materials or pictures)	2	2.2	3	3.3	1	1.1	Body functions
Story card/card sequence	1	1.1	1	1.1			Body functions
3D material/games	18	19.8	13	14.3	4	4.4	Body functions Activity
Phonological awareness	1	1.1					Body functions
Core vocabulary	1	1.1					Body functions
Sound gestures	3	3.3	3	3.3			Body functions
ToP Taalprogramma (program with themes, e.g., farm animals [pictures/story cards])	1	1.1	1	1.1	1	1.1	Body functions
Psycholinguistic Orientated Phonological Therapy	1	1.1					Body functions
Mirror	2	2.2	4	4.4	2	2.2	Body functions
Tongbrekers (cards with tongue twisters)			1	1.1	1	1.1	Body functions
Therapy according to Golding-Kushner	1	1.1	3	3.3			Body functions Body structure
Oral motor exercises	1	1.1	12	13.2	2	2.2	Body functions
Drost			1	1.1			Body functions
Sensory integration			1	1.1	1	1.1	Body functions

Note. CAS = childhood apraxia of speech; ICF = International Classification of Functioning, Disability and Health; 3D = three-dimensional.

important information to set the goals later in the intervention sessions.

With respect to the speech assessments that are used for diagnosis, the results first and foremost showed a large variety between individual SLPs, independent of work setting. SLPs in the Netherlands are known to use a variety of assessment tools (Priester et al., 2009), similar to assessment tool usage in other countries and languages (Baker & McLeod, 2004; Joffe & Pring, 2008; McLeod & Baker, 2014; Skahan et al., 2007). By far, the most popular assessment among the SLPs was a naming task with pictures or three-dimensional materials to help evaluate the children's speech sound inventory. A spontaneous speech sample was often mentioned as well but was not often selected as the most frequent assessment option. With respect to the use of spontaneous speech samples, it is often questioned whether these contain enough information about all the different speech sounds (Eisenberg & Hitchcock, 2010). For a complete phonological analysis, a speech assessment should contain at least two opportunities for a child to utter each consonant in each word position, including two- and three-element consonant clusters, and SLPs may need to consider additional spontaneous speech samples (Macrae, 2017).

Several reasons were reported as to why SLPs choose a specific assessment. A frequently mentioned criterion was that the tool should be quick and easy to use. Joffe and Pring (2008) argued that SLPs have little interest in a more detailed assessment, possibly because of the time it involves. A naming task, which is used often, is fast and easy. However, Terband et al. (2019) state that an SLP needs to assess a child with several assessment instruments to differentiate between phonological and speech motor deficits, since this is not possible based on one single assessment. Malmenholt et al. (2017) found that SLPs usually administer self-assembled assessment batteries for diagnosing a child with a suspicion of CAS. Our data show that most SLPs use parts of the Dyspraxieprogramma (Erlings-van Deurse et al., 1993) to diagnose speech motor problems such as CAS, but in the interviews, several SLPs reported to find differentiating CAS from other speech problems particularly difficult. Like Terband et al. (2019) argue, this is probably the reason why some SLPs use more than one assessment to differentiate between the different SSDs. Another reason why it is important to administer more than just a naming task is the need of additional information about the child's functioning in social situations (McLeod et al., 2012). Most SLPs use observation to get information about the activity and participation level of the ICF ("communication strategy of the child," "interaction with the parent/caretakers/SLP," "coping with the speech problems," "intelligibility"), and only a few SLPs use an assessment (ICS-NL; McLeod et al., 2013) to assess the impact of intelligibility in everyday life.

In summary, three problems occur in diagnosing children with SSD in practice: (a) Not every SLP conducts a case history; (b) SLPs rarely collect information at all the levels of the ICF, especially on participation in everyday life determined by parents/caregivers; and (c) SLPs often only use a picture-naming task. The SLPs in this study reported that their main motives are time and ease of use. The relevant research literature clearly shows that the assessment process contains a diversity of tasks containing all levels of the ICF (including a questionnaire for the parents/caregivers of a child, e.g., the ICS) and a comprehensive analysis of the speech sample. Therefore, we suggest the use of a fast and easy-to-administer comprehensive differential diagnostic instrument in combination with the ICS (McLeod et al., 2013), a thorough case history, and observation. The ICS is easy to administer; it adds the view of a parent/caregiver, and it is an instrument to get information about the participation in everyday life of the child. In the questionnaire are questions about the comprehension of the speech not only by strangers but also by a teacher. Parents reported children to be less intelligible for less familiar communication partners (Van Doornik et al., 2018).

Labeling a Diagnosis

In the questionnaire, the 137 SLPs reported a total number of 85 different labels in response to the question which diagnoses they formulate. This number is a factor 10–20 larger than the number of different disorders in current classification systems such as the MDD (Dodd, 2014) and the SDCS (Shriberg et al., 2010, 2017). However, only an average of three different diagnostic labels were mentioned per SLP. The 85 different labels mainly reflected naming idiosyncrasies of individual SLPs and are combined into seven categories. There are similarities and differences between the labels used by the SLPs in this study and the two classification systems. If we compare our data with the MDD, all the diagnoses in this model appear in our data, although some disorders are under different names. For example, the MDD label "phonetic articulation disorder" was named by the SLPs, but the term "articulation" was also named frequently. A second example is the use of one label for the group phonological disorder where the MDD uses the three labels "phonological delay," "consistent atypical phonological disorder," and "inconsistent phonological disorder." Although all these were also mentioned by the SLPs, in the Dutch version of the International Classification of Impairments, Disabilities, and Handicaps (Raaijmakers & Dekker, 1993), these labels are not common to use, and only a phonological disorder is mentioned.

One diagnosis that appeared in our study, dysarthria, is not mentioned in the MDD (Dodd, 2014), and this is also where the MDD and the SDCS (Shriberg et al., 2010, 2017) differ. The SDCS also differentiates between typology and etiology, unlike most classification systems (Shriberg et al., 2017). In this survey, a distinction based on typology in the sense that the SDCS does was not made, for example, by comparing the persistence of the speech problems resulting in different age groups (3–9 years or older than 9 years). The typology used in our study was more of a characterization of the disorder. The SLPs in our survey also did not mention the etiology in the descriptions of the different diagnostic labels, although etiology is covered in the case history (e.g., "hearing").

Although the diagnostic labels of the MDD and SDCS, as well as the five groups that were presented in this study, are widely used in the literature, the International Classification of Impairments, Disabilities, and Handicaps, and the education of SLPs, this apparently does not mean SLPs use these exact labels or groupings in daily practice. Our findings show that there is no consensus on terminology of the different SSDs and that there are a lot of idiosyncrasies in the diagnostic labels that are used. This makes it difficult to communicate among SLPs, let alone communicate well with other disciplines and parents. Although some agreement in the descriptions of the different SSD labels was found, some of the features named by the SLPs were not specific for just one diagnostic label. For example, simplification processes were mentioned as a distinctive character of phonological disorder but can also indicate CAS (Terband et al., 2019). How such specific errors are interpreted is highly dependent on the individual SLP and his or her personal background.

Intervention Process

Our results indicate that most SLPs choose the intervention based on availability and own experience, rather than scientific evidence regarding treatment of the diagnosed deficit. Almost all the interventions mentioned by the SLPs are used for all three disorders (phonological disorder, phonetic articulation disorder, and CAS); the differences reside in how many SLPs use a specific intervention for the different disorders. There is no common ground in choosing an intervention.

Also, SLPs often combine interventions or adapt the intervention themselves, while there is little scientific ground for this. For example, for children with CAS, the Dyspraxieprogramma is often paired with the Cycles approach or Metaphon. There is some evidence of efficacy for an intervention based on speech motor and linguistics skills. Unfortunately, there is not much evidence about establishing maintenance and generalization of this combination in intervention (Murray et al., 2014).

These results suggest there is a no consensus on which intervention to use for a particular child with a specific SSD among SLPs. The fact that SLPs combine interventions does not in itself have to be a problem. The SLPs have their reasons, and they see children progress during the sessions. We recommend gathering information about these combinations and to investigate the effectiveness of these combinations further.

Nonspeech Oral Motor Movements

About 10% of the SLPs reported nonspeech oral motor movements (NSOMs) as part of the diagnostic process (observation, case history, and assessment) and the intervention process. The reason to discuss NSOMs here separately is their controversial status in the field of speech disorders. For example, Ziegler (2003) claimed that impaired speech and nonspeech movements should be kept separate, and recently, also Maas (2016) argued that speech is only speech when all components involved in speech are present. NSOMs thus might not be relevant to observe or examine and to address as part of an SSD intervention.

Our present findings indicate that SLPs use nonspeech oral motor exercises (NSOMEs) in the intervention process for all diagnostic groups, similar to what has been observed in other countries (Brumbaugh & Smit, 2013; Joffe & Pring, 2008; Rumbach et al., 2016; Ruscello, 2008; Watson & Lof, 2009). In their recent review, Lee and Gibbon (2015) concluded that there is no strong evidence that NSOMEs are an effective treatment or addition to the intervention of children with phonological speech disorder. Similarly, Pennington et al. (2016) found only three studies in which nonspeech exercises were examined for children with dysarthria, and none of these showed any improvement. The lack of strong evidence for the effectiveness of NSOMEs should have implications for professionals in making decisions in relation to the intervention plan.

Parent Involvement

Every SLP in our survey involves parents at a given moment during the guidance of children with SSD. How and how often, however, is dependent on the work setting. SLPs in schools or day care facilities have less opportunity to work with parents closely. Similarly, an Australian survey found that SLPs working in a school setting were less likely to have a parent present in their intervention sessions (Pappas et al., 2008). Working with parents is a necessity for all SLPs at some point. For example, it is not possible to conduct a case history without the help of a parent (or caregiver), and every SLP in our study conducts a case history somewhere in the process.

After the case history, the amount of involvement of the parent is variable; for example, during the assessments, the parents are more in the background. However, SLPs involve parents in choosing the goals and type of intervention, which is also reported in other surveys regarding clinical reasoning in the United Kingdom, Portugal, Australia, and China (Joffe & Pring, 2008; Oliveira et al., 2015; Sugden et al., 2018; To et al., 2012). Similar to what Sugden et al. (2018) concluded in their survey among Australian SLPs, the SLPs in our survey further reported that parents were also involved in stimulating the child during the intervention period. More than half of the SLPs indicated to involve the parents in the home practice exercises as part of the intervention. Parents are expected and invited to be co-therapists and to aid in improving their child's speech by correcting and modeling. The reason the SLPs gave for involving parents during the intervention was to ensure an effective and short intervention period.

Even though the scope of our survey was broader than most of the previous studies (Joffe & Pring, 2008; Oliveira et al., 2015; Sugden et al., 2018; To et al., 2012), which describe only involvement of parents for children with phonological disorders, the results are comparable. Nevertheless, it would be interesting to ask SLPs more specifically

about the involvement of parents in intervention for different diagnostic groups. Like what Sugden et al. (2018) argue, an insight into the view of parents would also be interesting, so that SLPs could better match the wishes and possibilities of parents to the intervention involvement.

Limitations

In this study, the participating SLPs were recruited through an advertisement on social media and a newsletter from the professional association of the Netherlands. The sample of SLPs included in the questionnaire survey who responded to the advertisement included a somewhat high percentage of SLPs with a master's degree (25.5 %), which might not be representative for the whole profession. However, we found a great deal of similarities between the data of the questionnaire with the data of the interviews. The latter had a smaller percentage of SLPs with a master's degree (3.0%). During the interview process, we reached a point of saturation. It is possible that there is a bias and that the SLPs who participated all happened to have a particular style in diagnosing and treating children with SSD, but the variance in the answers showed this cannot be the case. Additionally, the results of the questionnaire and the interviews were similar. This means the results are likely to be reliable for this sample of SLPs.

Future Research

In contrast to most recent surveys, this study featured not only a questionnaire but also an interview, as suggested by McLeod and Baker (2014). This combination enabled us to get a clear idea of the clinical reasoning of SLPs, why they choose a particular assessment, a diagnosis, and an intervention for an individual child. However, this type of study does not provide insight into the quality of those decisions. Possibilities for future studies would be to observe SLPs in their clinical decision making as proposed by McLeod and Baker or to survey the dossiers of children with SSD.

The data in this study showed a variety of diagnostic labels (n_{rt} = 85) that are used by SLPs in daily practice, indicating a lack of clear common ground for differential diagnosis and a lack of agreement about identifying and the terminology. A terminological debate about SSD in the Netherlands or maybe even worldwide thus seems to be warranted. The CATALISE study of Bishop et al. (2016), designed to address similar problems in the field of developmental language disorders, could serve as both an inspiration and an example for such an exercise.

Conclusions

Overall, the results of this study indicate that there is no consensus on terminology in the field of SSD clinical practice. This can influence access to services and hinder practice and research (Bishop et al., 2017). It also seems that most of the SLPs choose an assessment and intervention based on the availability of materials or their own experience.

Unfortunately, this might not be the best option for that particular child. At the present, however, this might be difficult because a universally agreed-upon classification system with diagnostic markers for every SSD is lacking (Waring & Knight, 2013). In addition, our findings indicate that there is a need among SLPs for a fast and easy-to-administer comprehensive differential diagnostic instrument, to enable SLPs to further save time and collect the necessary information even if direct contact with parents/caregivers is not possible (e.g., school setting).

Our findings further revealed that there are no clear directions for adopting the intervention based on the characteristics of individual children. SLPs rely on their own clinical experience and, at the present, simply have no other option. There is a pressing need for research to establish which intervention (or combinations of interventions) is most effective for particular diagnoses, as well as for specific groups of children.

It will take a while before we have a solution for these problems. In the short term, the authors advise to improve education for SLP students and SLPs, so that SLPs are well equipped to consider all different aspects of choosing a diagnostic instrument and intervention.

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Appendix A

Description of the Interview Guide that was Used in the Interviews of the SLPs

Interview Guide that was Used in the Interviews of the SLPs. "I" in this Context is the Interviewer; "you" is the Interviewed SLP.

Background questions

Questions about background, work, career	I would like to get an impression of your work and experience as a speech and language therapist.
	When did you graduate as a speech and language therapist?
	Can you tell us something about your career?
	Can you briefly tell us about this practice/school/institution?
	Do you have multiple workplaces?
	Have you ever worked in a different setting or settings?
Work experience and courses for children with speech sound disorders	How long have you been working with children with a speech sound disorder?
	How many children with a speech sound disorder do you treat on average per week?
	What kind of speech problems do the children have?
	Did you follow a course on speech sound disorders? Which?
Age of the children	How old are the children? (age minimum to maximum)

Diagnostic process

Introduction	I am curious about the way of making choices when diagnosing a child with a speech sound disorder.
Process	Suppose you are being called by a mother who says her child does not speak well. OR Imagine, a new child is registered who does not speak well.
	What are the steps you take until the child leaves your practice again?
	Is this process the same for every speech sound disorder?
Differentiation	Which speech sound disorders do you diagnose?
(try to elicit that the speech and language therapist tells something about the several speech disorders, but rather not name the disorders yourself)	How do you differentiate between the different speech sound disorders?
	Does it ever happen that you have doubts between certain speech sound disorders? How do you handle this?
	Does it happen that children have multiple speech problems? How do you determine the diagnosis?
	What information parents give you, gives you an idea of a certain speech problem?
	Do you use assessments during the diagnostic process? If yes, which one and why?
	You have already told about .... and .... disorders.
	Do you see children with other speech sound disorders? Do you really see no other children than those with .... and ...... disorders?
Factors	Which factors play a role in diagnosing a speech sound disorder?
	- For example: personal factors, external factors, participation level, activities level, etc.
Dream question	What should be the ideal situation when diagnosing a child with a speech sound disorder? What is your dream?

Intervention process

Introduction	Now I am curious about which choices you make when a child with a speech sound disorder receives an intervention.
Process	Suppose you have a diagnosis. What do you do next?
	- What do you think about before you start the intervention?
	- If you set goals, what do you take into account?
	If children have multiple speech sound disorders, which disorder will you first set goals for? Which choices do you make?
	- Why? Can you give an example?
	How do you decide which intervention or approach is best for a child?
Methodology	Could you indicate for each speech sound disorder what kind of intervention / approach you use?
(try to elicit that the speech and language therapist tells something about the intervention, but rather not name the intervention yourself)	(name here which speech sound problems the speech and language therapist has already mentioned)
	What plays a role in the choice of the intervention?
	Are there certain interventions that you use the most and why?
	Do you ever use multiple methods or different ways?
	- How do you use these different methods during the intervention?
Didactics	How do you use an intervention? (ask about every intervention that is mentioned)
(try to elicit that the speech and language therapist tells something about the approaches, but rather not name the approaches yourself)	Which didactic approach do you use with the intervention? (ask about every method that is mentioned)
	Do you give homework? Which homework do you give to children with speech sound disorders?
	What instructions do you give the parents/guardians about the homework?
Factors	Which factors play a role in the intervention of children with speech sound disorders?
Dream question	What should be the ideal situation for the intervention process? What is your dream?

Closing

Closing the interview	Would you like to add something to this conversation?

The questions were published via Limesurvey. Some questions arose from earlier answers given by the SLP. This is indicated in the questions below.

Background (8 questions)

1. What is your gender?
    a. Female
    b. Male

2. In which province do you work?
    a. Drenthe
    b. Gelderland
    c. Groningen
    d. Flevoland
    e. Friesland
    f. Limburg
    g. Noord-Brabant
    h. Noord-Holland
    i. Overijssel
    j. Utrecht
    k. Zeeland
    l. Zuid-Holland

3. When did you graduate as an SLT?
    a. 0–5 years ago
    b. 5–10 years ago
    c. 10–15 years ago
    d. 15–25 years ago
    e. More than 25 years ago

4. Did you complete another education course as well?
    a. No
    b. Yes, namely:

5. Did you take a postgraduate course on speech sound disorders for children?
    a. No
    b. Yes, namely:

6. In which setting do you work with children with speech problems? Multiple answers possible.
    a. Private practice
    b. Primary school
    c. Primary school (special education)
    d. Secondary school (special education)
    e. Hospital
    f. Specialist day care centre: young children

7. How many hours per week do you work as an SLT?
    a. 0–8
    b. 9–16
    c. 17–24
    d. 25–32
    e. 33–40
    f. More than 40

8. What is your role in guiding children with speech problems?
    a. Only diagnostics
    b. Only therapy
    c. Diagnostics and therapy

Assessment process (10)

9. What is usually the course of the diagnostic process? (example first a case history, then …) *(open-ended question)*

10. Which components do you find important to be discussed in the case history in children with speech problems?
    a. Pregnancy and child birth
    b. Babbling
    c. Speech and language development
    d. Multilingualism
    e. Course of the speech disorder
    f. Child's awareness of intelligibility
    g. Reactions of the environment on intelligibility
    h. Reactions of the child when misunderstood
    i. Compensatory behaviour
    j. Speech and language disorders in the family
    k. Feeding development
    l. Oral habits
    m. Sensory perception
    n. Cognitive development
    o. Psychosocial development
    p. Hearing
    q. Diseases
    r. Medication

11. What do you find important to observe in a child with a speech problem, both in general functioning as in speech-language? *(open-ended question)*

12. Which assessment(s) do you use to diagnose a speech sound disorder in children? (multiple answers possible) *(open-ended question)*

13. Which assessment do you use most often? *(open-ended question)*

14. Why do you use this assessment most often? *(open ended question)*

15. Which speech problems in children do you diagnose? Name them in the order in which you most often state them. (multiple answers possible) *(open-ended question, the answers of this question will be used in Questions 16, 18, 19, 22, and 23)*

16. What characteristics or combination of characteristics (from assessment data) make that you choose the following diagnosis (s)? (more than one characteristic per diagnosis is possible) *(open-ended question)*

17. Here are a number of statements. Do you want to indicate to what extent you agree with the statement? (scale: strongly agree, agree, disagree / disagree, disagree, strongly disagree)
    a. I always use the same assessment with every child with a suspicion of a speech sound disorder.
    b. I have sufficient possibilities (eg assessment material) to diagnose a child with a speech sound disorder.
    c. I use the ICF during the diagnostic process.
    d. I have sufficient knowledge to diagnose a child with a speech sound disorder.
    e. When I have diagnosed a speech sound disorder the diagnoses does not change during the intervention process.
    f. A child with a speech sound disorder can have multiple speech diagnoses.
    g. I sometimes delay the diagnosis until I have given a number of intervention sessions. This is mainly in children with….

18. Would you like to complete the following statement?
    a. I feel confident when diagnosing children with…. (multiple answers possible)
    b. I am insecure when diagnosing children with…. (multiple answers possible)

Description of the Questions Asked in the Online Survey.

Intervention approaches and additional aspects of the intervention (9)

19. Which interventions or methods do you use with children with the following speech sound disorder? *(open-ended question)*

20. What are important reasons for your choice of a specific intervention for a certain child? *(open-ended question)*

21. Here are a number of statements. Do you want to indicate to what extent you agree with the statement? (scale: strongly agree, agree, disagree / disagree, disagree, strongly disagree)
    a. I exactly follow the description/instruction of the intervention.
    b. The environmental factors of the child play a part in the choice of the intervention.
    c. The personal factors of the child play a part in the choice of the intervention.
    d. I always give homework.

22. Would you like to complete the following statement?
    a. I feel confident when choosing an intervention for children with…. (multiple answers possible)
    b. I am insecure when choosing an intervention for children with…. (multiple answers possible)

23. Can you briefly characterize the structure of the intervention for children with a ….? *(open-ended question)*

24. What is the role of parents during the intervention? *(open-ended question)*

25. How do you ensure that the child also applies what he has learned during the intervention in daily life? *(open-ended question)*

26. What do you do if no progress is visible? (multiple answers possible) *(open-ended question)*

27. Do you think there is enough material on the market for the intervention of children with speech sound disorders?
    a. Yes
    b. No, what do you wish?