ASHA American Speech-Language-Hearing Association

JSLHR

Research Article

# Characteristics of Children and Youth Referred for Language Assessment at Different Ages

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ARTICLE INFO

Article History:
Received September 5, 2023
Revision received May 14, 2024
Accepted May 14, 2024

Editor-in-Chief: Julie A. Washington
Editor: Mahchid Namazi

https://doi.org/10.1044/2024_JSLHR-23-00540

ABSTRACT

**Purpose:** Early detection of language delays is essential, as language is key for academic outcomes, well-being, and societal participation. Previous studies have focused on undetected delays in young children. Much less is known about referrals at older ages. In this study, we aimed to (a) establish how many children are referred at toddler age (2–3 years) and how many at lower elementary (4–7 years), upper elementary (8–12 years), and high school (13–16 years) age; (b) evaluate characteristics of the referred children and adolescents across age groups; and (c) assess whether the ensuing classification (no language disorder [LD], developmental LD, LD + additional problems) differed across age groups.
**Method:** We used the 2010–2014 database of the Dutch federation of speech and hearing centers, containing 18,894 cases with target ages. We established the number of referrals in each age group (Q1) and assessed the composition of the age groups in terms of speech, language, behavioral, and cognitive outcomes (Q2), as well as in terms of classification (Q3). To answer Q2 and Q3, we conducted chi-squared analyses with the toddler group as reference group.
**Results:** Late-identified LDs exist: There were new referrals in all age groups. Compared to older age groups, the toddler group contained fewer girls and multilingual children. The toddler group also contained fewer children without an LD and more children with LD + additional problems.
**Conclusions:** Reassuringly, children with multiple language problems are referred earliest. However, late-identified LDs exist, even at high school age. Girls and multilingual children tend to be missed at younger ages. More work on awareness and identification of language delays is needed, requiring awareness, knowledge, and tools for educational professionals.

Oral language is essential for making sense of the world around us. The level of children's oral language abilities affects their social–emotional development, behavior (Yew & O'Kearney, 2013), daily functioning, social participation, school success, and learning. Those with severe difficulties with oral language have an increased risk of academic difficulties (Ziegenfusz et al., 2022), such as mathematics (Kleemans et al., 2012) and particularly literacy difficulties (e.g., de Bree et al., 2022; Joye et al., 2019; Snowling et al., 2020), resulting in general poorer educational and employment outcomes (Dubois et al., 2020). Furthermore, they face challenges in peer interaction (Lloyd-Esenkaya et al., 2020).

This importance of oral language for daily functioning and well-being has two implications. First, it is essential to provide children with the opportunity to acquire language, referring to both language input and communicative experience (Hoff, 2006). These language input and interaction take place not only at home but also in other contexts, such as day care, school, and after-school care. Second, it is pivotal to identify as early as possible those children whose language abilities are (persistently) below

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the level expected for the child's age. Identification allows for providing these children with the required support. As children with unidentified language needs have a cumulative risk for academic and social problems during early and later school years (e.g., Conti-Ramsden et al., 2018; Johnson et al., 1999), early intervention is considered important.

Early identification of language difficulties is needed for all children whose language development is delayed. This includes children who have had limited opportunities to acquire (the dominant) language. It also includes those who have severe language delays that cannot be due to poor language learning opportunities. Within this group of children with language disorders (LDs), a division is generally made between children with developmental LD (DLD) and children with an LD associated with biomedical condition (Bishop et al., 2017; see also Archibald [2024] on terminology related to LDs). Ideally, language delays and disorders are identified. However, we know that language delays in general are missed, that DLD is underdiagnosed, and that not all children requiring language intervention actually receive it (e.g., Bishop & McDonald, 2009; Black et al., 2015; Davidson et al., 2022; Tomblin et al., 1997; Zhang & Tomblin, 2000). The seminal U.S. epidemiological study by Tomblin et al. (1997) on DLD in kindergartners found that of the affected children, 70% of the children had not been previously identified according to the caregivers. Similarly, in their U.K.-based study, Norbury et al. (2016) found that fewer than half of the kindergarten children identified in the study with LD were receiving extra help at school or had been referred to speech-language therapy services. Finally, a recent study by Calder et al. (2022) reported that in a cohort of 1,626 Australian 10-year-olds, 104 children met the criteria for DLD, but only two children had been identified as such.

Next to these epidemiologically based findings at kindergarten and lower elementary school age, there are studies with adolescents that show that language delays had still gone unidentified. It has, for instance, been reported that about one third of adolescents attending child and adolescent mental health clinics had previously undiagnosed LD (Cohen et al., 1989). Similarly, Hughes et al. (2017) reported that 47% of young offenders in youth justice settings showed language deficits with about a quarter of the offenders meeting clinical criteria for actual LD. Only a few of these adolescents had received treatment for their LD prior to arrest. Although it is not known whether the LD was primary or a consequence of other factors, the LD of these adolescents were severe and unidentified and had required intervention. Together, these findings indicate that not all children with language delays are identified yet or are identified late.

## Child-Related Variables Influencing Identification of Language Delays

Variables that affect whether language delays are (not) identified can broadly be divided in context and in child-based factors. Context-related variables refer to, for instance, the language screening process implemented and the instruments available for observing language abilities. Child-related variables refer to characteristics of the child, such as language profile, sex, mono/multilingualism, and severity of the language delay. In this study, the focus will be on child-related variables that might affect referral in the Dutch context.

Some children with language delays tend to be identified and referred more often and earlier than others. When language production difficulties co-occur with speech production difficulties, this is likely to lead to faster identification, referral, and intervention services than if such speech production problems are not present (Bishop & Hayiou-Thomas, 2008; Elbro et al., 2011; Young et al., 2002). Speech production difficulties often lead to unintelligibility, potentially leading to faster identification and referral. Indeed, Zhang and Tomblin (2000) found that kindergartners with speech production difficulties were 4 times more likely to receive intervention services than kindergartners with LDs without speech production difficulties. As the observability of the communication problems seems to influence identification, children with later identified language problems might not have concomitant speech production problems.

Furthermore, the language delays of boys tend to be identified earlier than those of girls (e.g., Bishop & McDonald, 2009; Morgan et al., 2017; Uilenburg et al., 2018; Zhang & Tomblin, 2000). Next to sex, other cognitive or behavioral problems or a minority background influences identification and time of referral. Language delays of children with a minority background (referring to issues of race and or ethnicity and/or language) are identified less often/later (Morgan et al., 2017; Wiefferink et al., 2020). Additionally, language delays of children without behavioral problems and better self-regulation and executive functions are identified less often or later (Morgan et al., 2017). These findings suggest that there might be a referral bias for boys, that more disruptive behavior and less self-regulation seems to lead to earlier identification of language delays, and that multilingualism delays the identification (e.g., McGregor, 2020; Morgan et al., 2017).

## Early and Later Identification of Language Disorders

The findings so far indicate that for a sizeable group of children, language delays are not identified or are

identified late. The literature on this matter has tended to focus on identification of young children with language delays at preschool and/or kindergarten age (Keegstra et al., 2007; Morgan et al., 2017; Norbury et al., 2016; Tomblin et al., 1997). A relatively unexplored question is, thus, how many children's language delays are identified early (toddler ages, 2–3 years) and how many later (lower and upper elementary school age and high school age)? A related question is whether there are differences in the characteristics of the children referred early and later, to shed light on the variables that might play a role in early and later identification.

Another related question is, how many youngsters are referred across age groups but have no actual LD? Screening for LDs is necessarily different from actual diagnostic outcomes. Full overlap between those identified and having a diagnosed LD is undesirable, as this implies that children are being missed in identification. Given the large heterogeneity in language abilities at preschool age (Bates et al., 1995), noticing language delays might be more difficult than at older ages. At older ages, identification of language delays and disorders might be more precise as language outcomes are more stable (McGregor, 2020; McKean et al., 2017). This might mean that the percentage of false-positives is higher at toddler age than at older ages.

Finally, it is important to establish how many of the youth referred have language delays that can be classified as DLD-only and how many have a language delay that can be classified as diagnosis of LD associated with a biomedical condition (e.g., Bishop et al., 2017). For children who are referred for language delays, the associated biomedical condition might not have been recognized or formally assessed or might not have been severe enough to constitute a disorder. In the referral process, there is, thus, a broader category of LD with additional problems. One area of additional problems is behavioral problems, for instance, autism spectrum symptoms, concentration, attention or hyperactivity problems, or emotional problems.

Given the reported co-occurrence of DLD and behavioral problems (Yew & O'Kearney, 2013), it is of interest to establish whether there are differences between children referred early and later for language delays in a division between DLD-only and LD + additional problems. As younger children with a combination of language and behavioral problems are noticed and referred faster than those without language delays (Morgan et al., 2017), there might be more co-occurring behavioral problems in the younger age group. However, the epidemiological sample of Norbury et al. (2016) showed that the majority (2/3) of the 4- to 5-year-old children with LDs could not be attributed to any specific condition or environmental factor, meaning that DLD-only was most prevalent. The percentage of children with LD + additional problems is, thus, not necessarily high. Additionally, there are reasons to suggest that there might not be differences in terms of DLD-only and LD + additional problems across age groups. One is that there are reciprocal relations between language ability and behavior (e.g., Girard et al., 2016; Wang et al., 2018). As a consequence, unidentified language delays might lead to behavioral problems, (also) at older ages. Vice versa, identified emotional and behavioral problems can lead to misinterpretation or neglect of co-occurring language delays (Hollo et al., 2014). It is, therefore, an open question whether there are differences between the distributions of referred samples in terms of DLD-only and LD + additional problems.

### *Present Study: Early and Later Identification of Language Delays*

It is important to identify language delays as early as possible and preferably before the start of kindergarten. However, previous research has shown that not all children are identified early and that specific variables affect this identification. In order to further understand which children are identified early and which are identified later, we evaluate the characteristics of four age brackets of children being referred to speech and hearing centers, toddler children (ages 2–3 years), kindergarten and lower elementary school–age children (4–7 years), upper elementary school–age children (8–12 years), and high school–age children (13–16 years). We use the database of the Federation of Dutch Speech and Hearing Centers (FENAC), which contains almost all data from children with suspected LDs who visited speech and hearing centers in the period of 2010–2014. We use the data of the toddler group as reference group to gain insight in the way children identified early differ from those identified later.

The first aim was to establish how many children were referred early, at toddler age, and how many late(r). We expected a decrease of children being referred across age brackets. The Netherlands has a system in which development and health of infants and toddlers are monitored through frequent visits to public child well-being centers for infants and toddlers. The assumption is, therefore, that the majority of children will be referred before the age of 4 years. This assumption is partly congruent with Broomfield and Dodd's (2004) U.K.-based finding that referrals of children for speech and language therapy occurred most frequently between the ages of 2 and 5 years (67% of referrals).

The second aim was to evaluate characteristics of the referred children and adolescents across age groups, using the toddler group as our primary reference group.

On the basis of the literature, the expectation for the younger age groups was that more boys would be referred than girls and that more monolingual children would be referred than multilingual children. We do not know whether this will also be the case for the older group(s). If there is low identification of girls and multilingual children at younger ages, this could mean that the percentage of girls and multilingual children would increase across age groups, pointing to later referral.

Furthermore, the literature renders the expectation that presence of overt language difficulties will accelerate referral. Thus, the toddler group might contain a larger percentage of children with speech production difficulties compared to the older groups. At the same time, it could also be the case that children with across-the-board language problems, thus speech production, language comprehension, and language production, are referred earlier and that this percentage will be higher in the preschool group than in the other age groups.

Additionally, given that more disruptive behavior and less self-regulation lead to faster identification, the toddler group might consist of children who show behavioral problems. This could also mean that the percentage of behavioral problems might be higher in the younger group than the older groups. At the same time, behavioral problems often co-occur with DLD, which might imply that such problems will be present equally across the age groups.

General cognitive development is the final child-related characteristic evaluated. We did not have any a priori expectations about differences between the toddler and older age groups. Children for whom there are concerns about general development might be referred for language concerns sooner. This could mean that the toddler group could contain a larger percentage of children with lower general cognitive abilities than the other age groups. However, as norm-based scores of nonverbal IQ of children with language delays tend to decrease over time (Gallinat & Spaulding, 2014; Snowling et al., 2016), the older age groups in our sample could contain a similar or higher percentage of children/participants with lower general cognitive abilities compared to the toddler group.

The third main aim of this study is to establish whether the distributions of classifications will be equal across the age groups. The database information allowed us to classify cases as children/adolescents without actual LD, with DLD-only, and LD + additional problems (see also Wiefferink et al., 2020). The percentage of referred cases without an LD is expected to be higher in the toddler group than in the other age groups. The low-threshold referral system in the Netherlands for toddlers might lead to more false-positives than in older age groups. Expectations concerning the distribution of DLD-only and LD + additional problems across the age groups are not clear-cut, as different patterns are possible for the presence of additional problems. As indicated above, for both behavioral and cognitive development, there are reasons not only to expect higher percentages of LD + additional disorder in the toddler groups compared to the other age groups but also expectations in the reverse direction.

This study is meant to compare characteristics of children and adolescents referred to speech and hearing centers across age groups. The focus of the study is complementary to the study by Wiefferink et al. (2020). They used the FENAC database of 2010–2013 to study predictors of referral of the 2- to 7-year-olds. In the present study, we look into a much larger age bracket and compare the distributions between these age brackets of the data from 2010 to 2014. Furthermore, we make a distinction between the lower age bracket of 2 and 7 years, as we distinguish between toddler age, children for whom general screening is present, and school-going age. Thus, the data used are (only) partly the same and the research approach is different.

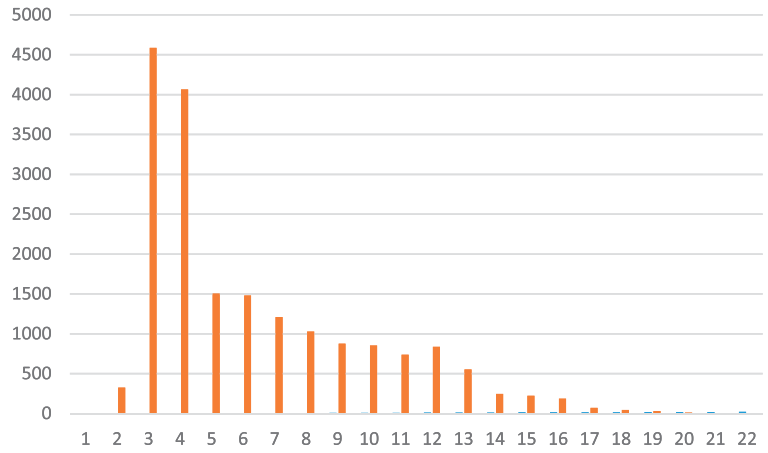
## Method

### *Design and Participants*

The database of the FENAC (2005, 2013) was used to address the research questions. This database contains information on children, adolescents, and adults who visited speech and hearing centers between January 1, 2010, to December 31, 2014. These people were referred because of suspected language delays ($N$ = 18,894 cases). The main purpose of the database was to get a better understanding of the underlying problems of children with language delays who are referred to a speech and hearing center in the Netherlands. The obtained knowledge could be used for quality improvement of the diagnostic process and for accountability to health insurance companies. Data were available of 16 of the 19 Dutch centers. The three centers of which no data were available used different a client system that did not allow for data entry in the FENAC database. The referrals are plotted for age in Figure 1.

The present study targeted the subset of children in the age range from 2 up to 16 years, containing 18,474 cases of the case selection steps. Of these 18,474 cases, 5,810 were girls (32%; 68% boys) and 11,733 were monolingual children (63%; 37% multilingual). For the purposes of our study, these 18,474 cases were divided into four age groups, toddlers (2–3 years of age, $n$ = 8,652), kindergarten and lower elementary school age (4–7 years, $n$ =

**Figure 1.** Number of referrals to the speech and hearing centers across ages.




5,229), upper elementary school age (8–12 years, $n$ = 3,861), and high school age (13–16 years, $n$ = 732).

Referrals can be made by different professionals. All children referred to the speech and hearing centers receive a full speech-language assessment. Referrals can be made by general practitioners, public child well-being centers, pediatricians, and ear–nose–throat specialists. There are different reasons why a general practitioners can refer a child, as this could be done after the advice of a different professional, such as an (early) educational professional, a speech-language therapist, or even a public child well-being centers' professional, or on the basis of parent's/caretaker's concerns regarding their child's language development. Public child well-being centers monitor infants' and toddlers' development and typically screen their general development twice at elementary school age (4–12 years). Across the age groups, referrals were most frequently made by general practitioners (59% for toddlers, 78% for kindergarten and lower elementary school age, 90% upper elementary school age, and 92% high school age).

## *Instruments*

In Dutch speech and hearing centers, the assessment of children with (a suspicion of) LD consists of an evaluation of speech and language skills, cognition, behavior, hearing (and other physical aspects), and family characteristics. A speech-language therapist, developmental psychologist, and audiologist are involved in this assessment. For each child, clinical and assessment scores are registered as dichotomous scores, divided in performance within the normal range or below the normal range (FENAC, 2013; Wiefferink et al., 2020) in the FENAC digital database. These outcomes are based on designated standardized tests when possible (FENAC, 2005, 2013). The interrater reliability of the registration has been found to be satisfactory (> 80%; Perdok, 2005), except for speech sound/phonological production (69%). This lower reliability is probably due to the absence of a standardized test for assessment of phonology in Dutch at the time the database was created (Wiefferink et al., 2020).

### Demographics

Demographic information refers to age, sex (girl/boy), and mono/multilingualism. A child was considered monolingual when the home language was Dutch, the majority language. A child was taken to be multilingual when a child was systematically exposed to (an) other language(s) than Dutch at home, or when Dutch was spoken in combination with one or more other languages. The other language also included Frisian, an indigenous language, and the Dutch dialect Limburgian. Information on multilingualism was limited and did not, for instance, contain information on the age of onset of multilingualism and balance between the different languages spoken.

### Speech and Language

Speech and language information refers to speech perception, speech production, grammar (morphosyntax) comprehension and production, and lexical comprehension and production. Speech perception (phoneme discrimination/perception, phoneme analysis/synthesis, memory) and language abilities were assessed through standardized tests available between 2010 and 2014 (see Wiefferink et al., 2020). This was the case for receptive and expressive grammar and lexicon. Results were coded as within the normal range (problem absent) or below (> 1 *SD* lower, problem present). Standardized tests were not available for speech-sound production/phonology. Furthermore, standardized assessment could not take place in languages other than Dutch. Also, sometimes the child was not (yet) capable

of participating in testing. In all these instances, the speech-language therapist used spontaneous language analysis, observation, clinical expertise, and information from parents and/or a translator to judge the presence of a language problem. Finally, presence or absence of pragmatic problems was based on the judgment of the clinician, as no standardized tests were available. The information was based on using spontaneous language analysis, observation, clinical expertise, and information from parents.

#### Behavior

Behavioral problems were coded as present (yes/no) and as general behavioral problem (yes/no). Behavioral problems included autism spectrum symptoms, concentration, attention or hyperactivity problems, or emotional problems. These were registered as present when they had been formally diagnosed by a psychiatrist. If there were strong indications for behavioral or emotional problems, but there was no psychiatric diagnosis, this was registered by a psychologist as a "general" behavioral problem. Children for whom concerns were present were referred to a psychiatrist for further psychiatric assessment. Strong indications rather than diagnosed behavioral problems could exist for youth referred to specialized professionals for the first time. The outcomes of behavioral problems and general behavioral problems were combined in this study.

#### General Cognitive Abilities

The database contains information on general cognitive abilities. Nonverbal intelligence was measured through available standardized tests and coded as being within the normal range or lower (> 1 *SD* lower; see Wiefferink et al., 2020). If standardized test outcomes could not be obtained, the psychologist used observation, clinical expertise, and information from parents to judge the intellectual abilities of the child. If there was a suspicion of low nonverbal IQ, this was categorized as a general cognitive problem. For the analysis, the categories "lower than one standard deviation" and "general cognitive problem" were combined.

#### Classification

On the basis of the clinician-based database, we classified the cases as no LD, DLD-only, or LD + additional based on the criteria applied between 2010 and 2014 (Wiefferink et al., 2020). Following Wiefferink et al. (2020), youth with DLD were those with limitations in at least one of the language domains, normal cognitive development, and no behavioral problems. We used the term "DLD" for all these cases, even though we cannot predict whether the toddlers will have long-term language problems. Youth with LD and additional problems were those with weak language skills and additional behavioral and/or cognitive problems.

### Procedure

Each speech and hearing center entered the data of all clients in the database according to the guidelines (Buekers & Degens, 2007). Data were entered without characteristics that could identify the clients. Consent for participation was thus not required, according to Dutch law.

### Analyses

The aim of the study was to compare distributions across age groups in an almost complete data set of the population of children referred to speech and hearing centers. Given the categorical outcomes in the database (presence/absence), group comparisons within this data set were made through chi-squared analyses on the distributions of the variables for the four groups. $\alpha$ levels were set at .05. In case of significant effects, follow-up chi-square analyses were conducted between the toddler group (reference group) and the other three groups (lower elementary age, upper elementary age, and high school age). For these follow-up analyses, the chi-values were adjusted to account for the multiple comparisons. As there were three follow-up comparisons (toddler versus [a] lower elementary, [b] upper elementary, and [c] high school), the $\alpha$ level was divided by 3, yielding $p < .0167$ as threshold for significance.

## Results

### Referrals per Age Bracket/Group

Participant information for the four age groups is provided in Table 1. The top row presents the number of youth referred in each age group. Across age brackets, there is a decrease of number of referrals (toddlers: $n$ = 8,652, lower elementary: $n$ = 5,229, upper elementary: $n$ = 3,861, high school: $n$ = 732). Almost half of the referrals are made at toddler age (8,652/18,474 = 47%). A considerable percentage of the sample (21%) is referred between 8 and 12 years (upper elementary). Referrals between 13 and 16 years (high school) constitute only 4% of the sample. Although this is a low percentage, the number of 732 youth being referred at this older age is still considerable.

### Composition of the Age Groups

#### Demographics

The first block of information in Table 1 refers to demographic information (left-hand and middle columns) and statistical outcomes on these data (righthand columns). The distribution of girls/boys is significantly lower

**Table 1.** Participant information and distributions on different domains for the referred youth in four age groups.

| Variable | Toddler: 2–3 years *n* = 8,652 | Lower elementary: 4–7 *n* = 5,229 | Upper elementary: 8–12 *n* = 3,861 | High school: 13–16 *n* = 732 | $\chi^2$ 4 groups | $\chi^2$ Tod-LowerE | $\chi^2$ Tod-UpperE | $\chi^2$ Tod-High school |
|---|---|---|---|---|---|---|---|---|
| **Demographics** | | | | | | | | |
| Mean age (months) | 35.2 | 69.3 | 123.3 | 174.4 | | | | |
| Nr girls | 2,176 (25%) | 1,880 (36%) | 1,463 (38%) | 291 (40%) | 306.189*** | 183.917*** | 210.144*** | 74.278*** |
| Nr multilingual | 2,953 (34%) | 2,074 (40%) | 1,421 (37%) | 292 (40%) | 47.618*** | 43.188*** | 8.390* | 10.371*** |
| **Axial classification** | | | | | | | | |
| **Speech-language components** | | | | | | | | |
| Speech perc difficulties | 324 (3%) | 1,276 (24%) | 1,641 (43%) | 335 (46%) | 3,088.228*** | 1,363.832*** | 3,029.344*** | 1,825.079*** |
| Speech prod difficulties | 5,140 (60%) | 2,115 (40%) | 512 (13%) | 151 (21%) | 2,508.830*** | 469.653*** | 2,295.530*** | 412.712*** |
| Grammatical comp difficulties | 4,449 (52%) | 2,202 (42%) | 931 (24%) | 92 (13%) | 1,121.275*** | 127.623*** | 845.186*** | 417.026*** |
| Grammatical prod difficulties | 6,032 (70%) | 2,890 (55%) | 1,366 (35%) | 210 (29%) | 1,551.350*** | 296.342*** | 1,302.512*** | 510.126*** |
| Lexical comp difficulties | 4,230 (49%) | 2,032 (39%) | 1,138 (29%) | 198 (27%) | 502.905*** | 132.424*** | 410.858*** | 129.191*** |
| Lexical prod difficulties | 5,915 (68%) | 2,594 (50%) | 1,412 (37%) | 246 (34%) | 1,351.284*** | 483.395*** | 1,112.072*** | 361.611*** |
| Pragmatic difficulties | 962 (11%) | 851 (16%) | 674 (17%) | 157 (21%) | 149.887*** | 76.298*** | 94.354*** | 68.562*** |
| **Speech-language profile** | | | | | | | | |
| Speech perc, speech prod, language comp, language prod | 234 (3%) | 302 (6%) | 126 (3%) | 34 (5%) | 89.375*** | 82.795*** | n.s. | 9.158** |
| Speech prod, language comp, language prod | 2,549 (30%) | 803 (15%) | 84 (2%) | 12 (2%) | 1,533.353*** | 353.993*** | 1,196.308*** | 263.275*** |
| Speech perc, speech prod, language prod | 37 (0.4%) | 126 (2%) | 33 (1%) | 7 (1%) | 120.791*** | 110.327*** | 8.752** | 4.041* |
| Speech perc, speech prod, language comp | 1 (0%) | 18 (0.3%) | 12 (0.3%) | 1 (0.1%) | Too few cases | — | — | — |
| Speech perc, language comp, language prod | 38 (0.4%) | 288 (6%) | 440 (11%) | 70 (10%) | 810.886*** | 365.094*** | 872.312*** | 493.818*** |
| Speech prod, language comp | 118 (1%) | 47 (1%) | 3 (0.1%) | 2 (0.3%) | Too few cases | — | — | — |
| Speech prod, language prod | 1,491 (17%) | 371 (7%) | 34 (1%) | 3 (0.4%) | 958.230*** | 288.409*** | 667.041*** | 142.693*** |
| Language comp, language prod | 1,702 (20%) | 922 (18%) | 545 (14%) | 80 (11%) | 80.443*** | 8.842** | 55.942*** | 33.534*** |
| Language prod only | 567 (7%) | 337 (6%) | 246 (6%) | 38 (5%) | n.s. | | | |

(*table continues*)

**Table 1.** *(Continued).*

| Variable | Toddler: 2–3 years *n* = 8,652 | Lower elementary: 4–7 *n* = 5,229 | Upper elementary: 8–12 *n* = 3,861 | High school: 13–16 *n* = 732 | $\chi^2$ 4 groups | $\chi^2$ Tod-LowerE | $\chi^2$ Tod-UpperE | $\chi^2$ Tod-High school |
|---|---|---|---|---|---|---|---|---|
| **Behavior and cognition** | | | | | | | | |
| Behavioral problems | 1,544 (18%) | 861 (16%) | 728 (19%) | 177 (24%) | 29.354** | 4.331* | 1.831 | 18.084*** |
| General cognitive development: no problems | 5,381 (63%) | 3,134 (60%) | 2,332 (61%) | 507 (69%) | 27.748*** | 7.012** | 3.637 | 14.426*** |
| **Classification** | | | | | | | | |
| No language disorder (vs. LD) | 1,091 (13%) | 1,016 (19%) | 1,172 (30%) | 220 (30%) | 613.218*** | 117.754*** | 567.444*** | 170.888*** |
| DLD-only | 2,839 (33%) | 1,810 (35%) | 1,499 (39%) | 292 (40%) | 50.978*** | 4.748* | 42.587*** | 15.206*** |
| LD + additional problems | 4,722 (54%) | 2,403 (46%) | 1,190 (31%) | 220 (30%) | 688.555*** | 96.977*** | 604.775*** | 162.801*** |

*Note.* Because of multiple testing, adjusted *p* values are used, meaning that $p < .05$ is not taken to be significant. Em dashes indicate data not tested, as no main effect was observed. Tod-LowerE = toddler–lower elementary; Tod-UpperE = toddler–upper elementary; Tod-High school = toddler–high school; perc = perception; prod = production; comp = comprehension; n.s. = not significant; DLD = developmental language disorder; LD = language disorder.

*$p < .05$. **$p < .01$. ***$p < .001$.

in the toddler group (25%) than in the other groups (lower elementary: 36%, upper elementary: 38%, high school: 40%). The distribution of monolingual/multilingual children is significantly lower in the toddler group (34%) than in the lower elementary and high school groups (both 40%), but not from the upper elementary group (37%).

### Speech-Language Outcomes: Speech-Language Components

The second block of Table 1 contains information on the percentage of youth with difficulties in the different speech-language areas for each age bracket, with descriptive information followed by results of statistical tests. For speech production, grammatical comprehension, grammatical production, lexical comprehension, and lexical production, the toddler group consists of a significantly higher percentage of children with difficulties present than the older age groups. The reverse pattern is attested for speech perception and pragmatic difficulties, with a lower percentage of toddlers displaying difficulties in these areas than in the older age groups. A third pattern of findings is that the toddler group consists of a higher percentage of children with production difficulties than with comprehension difficulties. This distinction is less pronounced for the older groups.

Next to these comparisons between early-referred (toddler) and later-referred groups, one other finding stands out: There is a decrease in the percentage of speech production difficulties across the age groups (toddlers = 60% difficulties, lower elementary = 40%, upper elementary = 13%). However, the high school group contains a higher percentage of youth with speech production difficulties (21%) than the upper elementary group. We return to this finding in the Discussion section.

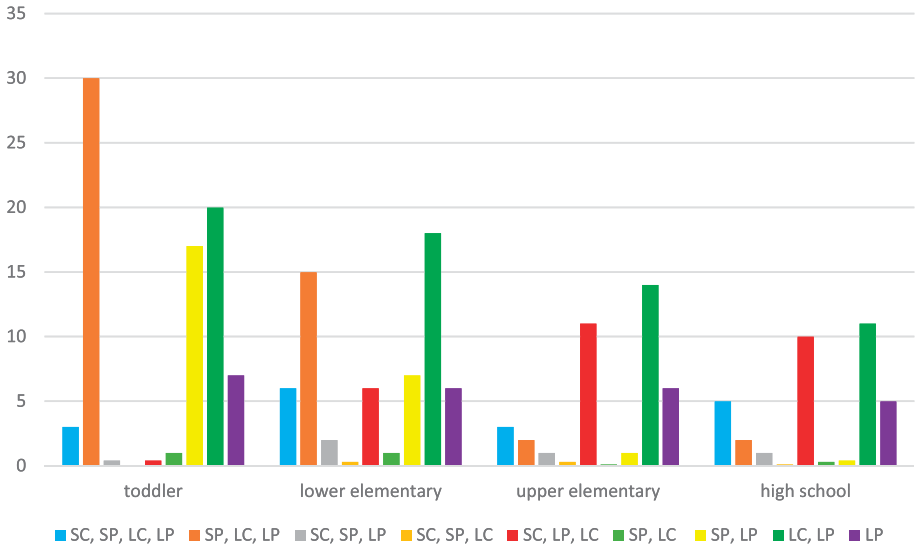
### Speech-Language Outcomes: Speech-Language Profiles

The previous section reported the distribution of difficulties for each speech-language component separately. The distribution of speech-language profiles across age groups is presented in the third block of Table 1. The distribution of different combinations of speech/language and comprehension/production difficulties in each age group is presented. Combinations of language production difficulties occur most frequently across age groups and with speech production difficulties in the younger age groups. To facilitate processing this information, the information is also presented in Figure 2.

Statistical tests on these data (right-hand columns in Table 1) show that the toddler group consists of a significantly higher percentage of (a) children with a combination of speech production, language production, and language comprehension difficulties; (b) children with language production and comprehension difficulties; and (c) children with speech production + language difficulties than the other age groups. This means that at toddler age, generally, children with a wide scope of speech-language difficulties are referred, as are those with clear overt speech-language difficulties.

One exception to this pattern of findings is that the percentage of children with speech comprehension, language comprehension, and language production difficulties

**Figure 2.** Speech-language difficulty profiles across age groups. SC = speech comprehension/perception; SP = speech production; LC = language comprehension; LP = language production.



is significantly lower in the toddler group (3%) compared to the lower elementary (6%) and high school (5%) groups. However, this combination of difficulties does not occur frequently (range: 3%–6%). A second exception to this pattern of findings is that the toddler group consists of a significantly lower percentage of children with speech comprehension, language comprehension, and language production difficulties (0.4%) than the older age groups (lower elementary = 6%, upper elementary = 11%, and high school = 10%).

### Behavioral and Cognitive Outcomes

Outcomes related to behavior and cognitive abilities are presented in the lower part of Table 1. Behavioral problems are only present in a subset of the referred group, with a range of 16%–24%. The percentage of behavioral problems is significantly lower in the toddler group (18%) than in the high school age group (24%), and the percentage of toddlers with behavioral problems does not differ from the lower (16%) and upper elementary (19%) groups.

Regarding general cognitive abilities, the majority of children show no problems (range: 60%–69%). Compared to the toddler group (63% no problems), the percentage of children with no cognitive problems is lower in lower elementary school age (60% no problems) and higher in the high school age group (69% no problems).

### *Classifications of DLD, LD + Additional Disorder, and No-Language Disorder in the Age Groups*

The classification based on the clinical assessment of the speech and hearing centers is presented at the bottom of Table 1. The first outcome refers to the percentage of children referred for assessment but not having an LD. This percentage is only 13% for the toddler group, pointing to a limited percentage of false positives. The percentage of children not classified as having an LD is significantly higher for the older groups (lower elementary = 19%, upper elementary = 30%, and high school = 30%).

The two other classification outcomes are the percentages of children in the total sample having a DLD-only or an LD + additional problems. These distributions show opposite patterns. The percentage in the sample having DLD-only is significantly lower in the toddler group (33%) than in the older age groups (lower elementary = 35%, upper elementary = 39%, and high school = 40%), whereas the percentage of LD + additional problems is significantly higher in the toddler group (54%) than the older groups (lower elementary = 45%, upper elementary = 31%, and high school = 30%). Thus, in the toddler group, the majority of children has LD + additional problems. In the older groups, a lower percentage of the referred children have an LD, but a larger percentage turn out to have DLD-only.

## Discussion

In the present study, we used an existing database to explore early- and late(r)-diagnosed LDs. We aimed to establish how many young people are referred early and late(r) for assessment of LDs and to assess whether the composition of these groups of referred children and adolescents differed in some respects. We compared the groups divided in four age brackets, toddlers (2–3 years), kindergarten and lower elementary school age (4–7 years), upper elementary school age (8–12 years), and high school age (13–16 years).

### *Referrals Across Age Groups*

The majority of children referred to speech language centers were toddlers. This indicates that many children are referred at younger ages, agreeing with previous findings that the majority of referrals for speech and language therapy occurs between 2 and 5 years (Broomfield & Dodd, 2004). At the same time, one fifth of the referrals were children at upper elementary age and 4% of the referrals were youth at high school age. These findings are unfavorable and seem to agree with those of missed language problems (e.g., Bishop & McDonald, 2009; Black et al., 2015; Davidson et al., 2022; Norbury et al., 2016; Tomblin et al., 1997; Zhang & Tomblin, 2000) and recognition of later language problems and disorders (Calder et al., 2022; Cohen et al., 1989; Hughes et al., 2017).

Importantly, however, we cannot establish whether the later-referred groups consisted of young people with unidentified LDs-only or whether they also consisted of young people with later emerging LDs. Longitudinal studies have established that late-emerging language problems exist (e.g., Farnia & Geva, 2019; McKean et al., 2017; Snowling et al., 2016; Zambrana et al., 2014). This might be due to the fluctuating language performance at younger ages (e.g., Ukoummune et al., 2012). On the basis of these studies, however, it seems unlikely that all later-referred young people had late-emerging LDs. Additionally, it might be unexpected for late-emerging LDs to consist of a broad range of difficulties. The finding that between 3% and 6% of the children in the older age groups were children with problems in all relevant areas, referring to speech perception/comprehension, language comprehension, and language production difficulties, therefore does not seem to sit easily with late-emerging problems. Furthermore, referrals at older ages, in which language development is stable, such as our upper elementary and high

school age groups, would not be anticipated. A cautious interpretation is therefore that the young people being referred late are not likely to consist only of those with late-emerging language problems.

Regardless of the LDs being late identified or late emerging, the findings point to both the need for awareness of language development delays of (caretakers and) professionals and the existence of language screening tools. This will require more work, as research has shown that teachers find it difficult to recognize language delays (e.g., Antoniazzi et al., 2010; Christopulos & Kean, 2020) and that there are gaps in the availability of screening tools (review by So & To, 2022). At the same time, there are promising developments in terms of screening tools, especially at preschool and lower elementary age (e.g., Spicer-Cain et al., 2023; West et al., 2021).

### Composition of Age Groups: Demographics, Speech-Language, Behavior, and Cognition

In the database, the percentage of girls and multilingual children being referred at toddler age is lower than in the older age groups, agreeing with the literature (Bishop & McDonald, 2009; Morgan et al., 2017; Uilenburg et al., 2018; Wiefferink et al., 2020; Zhang & Tomblin, 2000). This implies that within the school context, attention should be paid to speech-language delays, also especially for girls and multilingual children. The literature contains two suggestions for later identification of girls' language delays (Uilenburg et al., 2018; Zhang & Tomblin, 2000). The first is that girls might be better able to compensate for language delays than boys, for instance through social and communicative skills. The second is that societal expectations influence recognition of language delays: Girls who do not speak often might be taken to be shy or modest, which might fit with perceptions of femininity. On the basis of our data, no conclusions can be drawn about this matter. The later identification of girls speaks to understanding later emerging language delays, as well as advanced investigation of mechanisms of compensation and protective factors (e.g., Slomowitz et al., 2020).

Regarding referral of young people with multilingual language development, the database information on the nature of multilingualism is very limited. There is no information on the age of onset of multilingualism, the specific languages spoken (i.e., Polish and Dutch or Limburgian and Dutch), the dominance of one of the languages, the role of ethnicity, and the age at which the child arrived in the Netherlands, for instance. Nevertheless, in general, it might be difficult for health care and educational professionals to evaluate the language development and language ability of multilingual children, especially when the non-Dutch language is dominant. This finding calls for screening and assessment tools that are free from cultural and linguistic biases (see, e.g., Boerma & Blom, in press; Spicer-Cain et al., 2023; see also Wiefferink et al., 2020).

There were higher percentages of multilingual children being referred at lower elementary and high school age compared to toddler age. One very tentative interpretation is that a transition to a new context leads to different professionals working with the children as well as informal screening of the child's development. The transition from home or preschool to school consists of such a new gaze, as does the transition from elementary to high school. Our findings point to the importance of (gaining) information on children's development during transitions. They also indicate that throughout elementary school, attention should be devoted to language development and abilities. Such attention is often much more limited than attention to literacy and math (e.g., Snowling et al., 2022).

The information on speech and language difficulties and the language profiles across the age groups indicates that the toddler group generally contains children with the widest scope of language difficulties, consisting of both speech, language production and comprehension. This is reassuring, as it suggests that those who need speech and language support the most are also the ones who receive it from an earlier age onwards. The toddler group contained a higher percentage of children with (speech, grammatical, lexical) production difficulties as well as comprehension problems than the other groups. These production difficulties might lead to faster identification, in line with the literature (Bishop & Hayiou-Thomas, 2008; Elbro et al., 2011; Young et al., 2002; Zhang & Tomblin, 2000). The finding that the toddler group shows a more pronounced difference in percentages of children with (speech, grammatical, lexical) comprehension and production difficulties than the other age groups is in line with this interpretation.

The results on speech show two remarkable findings, which are likely to be related. The first is that the high school age group shows a relatively high percentage of speech production difficulties (21%), especially as the percentage decreased across age groups. It is unlikely that high school youth will have severe earlier unidentified phonological or speech difficulties. The second is that, across age groups, the percentage of youth with speech perception difficulties increases and that the profile of speech perception, language production, and language comprehension is more frequent than at toddler age, and one of the most frequent profiles. Our interpretation of these findings, also after consultation with the speech and hearing centers, is that the referral of these older children was likely due to the existence of learning problems without a clear cause. The database was constructed between 2010 and 2014. At that time, protocols for (reimbursed)

diagnosis and health care in the Netherlands did not allow a diagnosis of dyslexia next to a diagnosis of LD. This means that there were probably broader concerns regarding language and literacy of the child, leading to a referral to a speech and hearing center, and that the speech difficulties are likely to refer to speech and phonological processing, as well as metaphonological synthesis and analysis.

The interpretation concerning the speech problems agrees with the reported co-existence of oral LDs with literacy delays and disorders (e.g., de Bree et al., 2022; Snowling et al., 2020; Ziegenfusz et al., 2022). It also aligns with the difficulties and challenges that have been found to exist in labeling DLD, LD, language impairment, specific learning disorders such as dyslexia, and specific learning disabilities (e.g., Archibald, 2024; Georgan et al., 2023). The implication is that clarity is needed regarding terminology and regarding the underlying problems of the children (see also Archibald, 2024). Such clarity is needed to tailor the support they need. In light of these matters, it is hopeful that changes have been made in the Dutch context to structuring the paths toward referral for poor literacy (e.g., Tijms et al., 2021). Specifically, comorbidity between DLD and dyslexia is recognized and children with DLD can be eligible for a dyslexia diagnosis and treatment under specified circumstances. This should hopefully have a positive effect both on identification of language as well as literacy difficulties.

The information on behavioral problems in the different age groups does not exactly agree with the literature so far. Behavioral problems have been reported to lead to earlier referral (e.g., Morgan et al., 2017), but in our data set, the percentage of children in the toddler group with behavioral problems did not differ from the lower and upper elementary groups. Furthermore, the percentage of referred youth with behavioral problems was significantly higher in the high school group (24%) than in the toddler group (18%). We cannot draw any further conclusions about this pattern of findings. The design of the database precludes further evaluation of the type (e.g., internalizing or externalizing) and severity of the behavior problems, and the possible (time of) formal diagnosis of behavioral problems. Very hypothetically, undetected language difficulties could lead to either the onset or increase of behavioral problems. This very tentative interpretation can be aligned with the literature that reports reciprocal relations between language ability and behavior (e.g., Girard et al., 2016; Wang et al., 2018). Alternatively, it could be the case that, compared to toddler age, more precises assessments can be made of behavioral problems at older ages.

In terms of general cognitive ability, approximately one third of children in the different age groups showed problems in general cognitive development. The toddler group showed a significantly higher percentage of such children with problems than the lower elementary age group, but a significantly lower percentage than in the high school age group. Again, the database does not provide much information to facilitate interpretation of these findings. It is not clear whether both the cognitive difficulty and language delays constituted causes for referral and whether this is similar for the different age groups. It is also not possible to draw any conclusions about the role that cognitive ability could play in masking language problems in the different age groups. Very tentatively, the findings could indicate that earlier referral takes place for children for whom there are concerns about their general development, accounting for the larger percentage of toddlers with lower general cognitive abilities than the lower elementary group. For the high school age group, the number of adolescents being referred is much smaller than the toddler group. We do not know whether the cognitive problems in the subset of adolescents constituted a reason for referral next to their language delay. We also do not know whether these cognitive problems had been present all along or were the consequence of (undetected) language delay, or vice versa. The database containing only one measurement of the abilities of those referred does not allow any interpretations of previous development and relationships between language and cognitive outcomes.

### Classification of DLD and LD + Additional Problems in Age Groups

In terms of the final research question, concerning diagnostic outcomes, it was found that the percentage of children being assessed and not having an LD was lowest at toddler age (13%), followed by lower elementary age (18%) and upper elementary and high school age (both 30%). The finding that a considerable percentage of upper elementary and high school youth has no LD could indicate that reasons for referral were poorly understood learning difficulties, as suggested earlier. The finding that only 13% of children in the toddler group did not turn out to have an LD refers to a low percentages of false-positives. This makes it likely that LDs are missed at this age. This finding is in line with the existence of later-referred children at older ages in our current sample. It also agrees with our interpretation that the late-referred children at least partly consist of late-identified children and are not likely to constitute of children with late-emerging LDs.

There were differences between the toddler group and other age groups in the distributions of youth with DLD-only, as well as LD + additional problems. The percentage of children in the sample being diagnosed with

DLD-only was significantly lower in the toddler group (33%) than in the upper elementary (39%) and high school (31%) age groups. The toddler group and lower elementary school group (35%) did not differ from each other in percentage of DLD-only. Note that the lower elementary referral findings in our study differ slightly from epidemiological findings: Norbury et al. (2016) found that DLD-only was most prevalent in their sample of kindergartners (two thirds of the sample). Regarding the percentage of children with LD + additional problems, this percentage was significantly higher in the toddler group (54%) compared to the older groups (lower elementary 46%, upper elementary 40%, and high school 30%).

Our findings indicate that referrals in the Dutch context seem to at least partly be made on the basis of language difficulties, which is reassuring. We also take the referrals of toddlers with broader problems to be reassuring: In our (clinical) experience, low threshold referral for language difficulties is less stressful for parents and caretakers than referral for behavioral and cognitive problems. The outcomes of the full evaluation allow health care specialists to determine, which steps need to be taken for the children to receive the services they need. Furthermore, the referral at toddler age also suggests that services will become available both for the LD as well as the additional problems. The classification outcomes confirm the need of recognizing that LDs can be associated with or co-occur with other disorders or medical conditions (Bishop et al., 2017). Furthermore, the findings show the added value of a multidisciplinary assessment approach, particularly at an early age.

### *Limitations and Further Research*

This study is an exploration into the composition of age groups referred to speech language assessment and diagnosis. Although it looks into referral at different age groups, the data set only includes dichotomous data (problems present/absent). This data set, therefore, precludes any interpretations regarding severity of language delays across the age groups. There are indications that the children whose language difficulties were identified early do not differ in severity of language problems compared to children whose language difficulties had not been identified or had been identified late (Bishop & Hayiou-Thomas, 2008). At the same time, Tomblin et al. (1997) established that it was more likely that caregivers had been informed of children's speech/language difficulties if these difficulties were severe (39% of caregivers informed) than if these difficulties were milder (27% of caregivers informed). Future studies should therefore not only take the areas of speech-language difficulties and profiles of speech-language difficulties into account for different age groups, but also the severity.

The data set does not contain information on (theoretically) relevant variables, such as information on caregivers' educational level, language ability, and perception of their child's language abilities. There is also no information on the reasons for referral. Relatedly, we do not know which trajectories the children and adolescents have had in terms of health care and education and which route they had taken before referral to the speech and hearing center. We only know that this was the young people's first referral to the speech and hearing clinics. As the nature of the data is restricted, it is difficult to draw any strong conclusions about reasons for early and late(r) referral. As indicated, we, therefore, also do not know whether the language delays are late identified or late emerging. More in-depth investigation needs to be made of the DLD of children who received a late(r) diagnosis. On the basis of diagnostic case files, containing information about the time of diagnosis and retrospective information, on youth public health care information and school data, for instance, it can be established whether the late-diagnosed children were identified late or whether the language delays might have developed late, as well as which child and contextual factors affect this late identification.

Together, the findings suggest that young people with the widest scope of language delays are referred earliest. At the same time, late-identified LDs exist, confirming previous findings on late identification and extending them to different age groups. Such late identification is undesirable. More work on awareness and identification of language development, delays, and DLD is needed (McGregor, 2020; Thordardottir et al., 2021). Particular attention should be devoted to detecting language delays in girls and in multilingual children. Reliable and easy-to-administer screening tools across age groups are needed. Furthermore, as there are unidentified language delays across the school age, educational professionals need to target and foster language development at school (e.g., Ebbels et al., 2019; West et al., 2021), as well as be able to recognize language delays.

## Author Contributions

**Elise de Bree:** Conceptualization (Lead), Formal analysis (Equal), Writing – original draft (Lead), Writing – review & editing (Lead). **Karin Wiefferink:** Resources (Lead), Formal analysis (Equal), Writing – original draft (Supporting), Writing – review & editing (Supporting). **Ellen Gerrits:** Resources (Equal), Writing – original draft (Supporting), Writing – review & editing (Supporting).

## Data Availability Statement

The Federation of Dutch Speech and Hearing Centers (FENAC) database is not publicly available. Information concerning the data can be obtained through the FENAC.

## Acknowledgments

The authors are grateful to the Federation of Dutch Speech and Hearing Centers for allowing them to use the anonymized database. They would also like to thank Brigitta Keij for her feedback on an initial version of the manuscript.

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