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Overview

Learning Areas

- The educational and social effects of language impairment.
- The child's language environment:
  - Learning more than one language
  - Accents and dialects of English.
- Typical language development:
  - Variation in rate of language development
  - External factors influencing variation
  - Intrinsic factors influencing variation.
- Speech and language impairment:
  - Speech and language impairment associated with identifiable conditions
  - Speech and language problems whose causes remain unexplained.

1.1 The Effects of Preschool Language Impairment

The ability to speak and understand is something we take completely for granted. Conversing with friends or partners, listening to the radio, talking on the phone, or telling stories to the children at bedtime are no more remarkable or reflected on than walking or eating, for most of us. We have engaged in these various linguistic activities for a long time – a good part of the competence that underpins our linguistic ability was in place by 5 years of age. After a
Overview

few short years of childhood, at the time of school entry, each of us had a vocabulary of several thousand words. We could pronounce most of these accurately. We were able to organize words into coherent sentences, and deploy these sentences in conversations with parents, grandparents, siblings, and others, at the same time understanding what our interlocutors were saying to us. We were ready at that point to begin the long educational haul into literacy and numeracy, the skills on which full participation in our culture depends. And as we stepped outside the family unit into the wider society for the first time, we were able to use the language we had learned to make friends in school, and later in life to embark on relationships. What we learn about language in that first five years of our lives is an indispensable foundation for social well-being and educational progress. And for the vast majority it is acquired effortlessly. But if the process of language learning is constrained or restricted in any way in the preschool years, and delay or impairment results, the effects on educational advancement, and on socialization in childhood and beyond, can be severely inhibiting on life chances.

Research points to the continuing influence of slow or atypical oral language development on educational attainment, and on social facility. A long-term UK study of a group of children identified with language difficulties at the age of 4;0 years makes this clear. (The usual way of indicating age in the child population is illustrated here, by separating months from years with a semicolon.) Bishop and Edmundson (1987) identified a group of 87 4 year olds in the north-east of England who were language-impaired, and tested them on a range of linguistic abilities. The same children were retested 18 months later. At age 4, the children were classified as having impaired speech and language skills and normal nonverbal intelligence (the group with specific language impairment (SLI) – see Section 1.4) or having impaired speech and language skills, with verbal IQ at least two standard deviations below the mean (general delay group). The language impairment in 37% of the children had resolved when they were retested at age 5;6. These children were then studied again as teenagers, when 71 of the original group were contacted (Stothard et al., 1998). Children whose language problems had apparently resolved (at 5;6) did not differ from their peers on tests of vocabulary and language comprehension. Where they performed less well, however, was on tests of phonological processing and literacy skill. Those children who had continued to show significant language difficulties at the age of 5;6 in the original study had significant impairments in all aspects of spoken and written language functioning as adolescents. This was also true of children classified as having a general delay. These children fell further and further behind their peers in the development of their vocabularies over time.

It is apparent from these results that early language impairment can have serious long-term consequences educationally. Language impairment can also impact socially, with affected individuals prone to having poorer social skills and more limited peer relationships than their age-matched classmates in primary schools (Fujiki, Brinton, and Todd, 1996). Children with language impairment may also be at some risk of psychological problems: Snowling et al. (2006) reported on the rate of psychosocial difficulties in the sample identified by Bishop and Edmundson. They found that children whose language delay had resolved by 5;6 years tended to be free of problems. But for those whose language difficulties persisted through the school years, there was a raised incidence of attentional and social difficulties, associated with distinct language profiles. Attention problems were associated with a profile of expressive language
difficulties; social difficulties were found in children with receptive and expressive language difficulties; and the group of children with both attention and social difficulties had low IQ as well as global language difficulties. Similarly, a follow-up study in early adult life of 17 individuals, who had been identified with a severe receptive language disorder in childhood, showed persisting language and literacy problems along with significant social difficulties and increased risk of psychiatric disorder, compared to controls (Clegg et al., 2005; see also St. Clair et al., 2011). At the extreme, limitations in language ability may be at least part of the reason young men find themselves in court or in prison. Bryan (2004) found that there was a much higher than expected prevalence of low linguistic ability in a cohort of young offenders in the United Kingdom. In a further study, of juvenile offenders (15–17 year olds; Bryan, Freer, and Furlong, 2007), 46–67% scored within the poor or very poor categories on sub-tests of the Test of Adult and Adolescent Language (TOAL-3; Hammill et al., 1994), as compared with 9% of the typical adolescent population. And of 100 young offenders completing custodial sentences in Victoria, Australia, 46 were classified as language-impaired (Snow and Powell, 2011).

These long-term educational and psychosocial consequences of preschool language impairment enjoin us to look more closely at the process of language development in typically developing (TD) children, and at the factors that can inhibit that development in their peers with language impairment, in the important period between birth and the age of 5. The last four decades have seen a burgeoning of research interest in children's language learning and there is no shortage of material to draw on in relation to typical or atypical development. In this volume we examine preschool language impairment in the light of typical language development, from an avowedly linguistic perspective. Children's language impairment is a topic that is rightly of interest to a number of disciplines besides linguistics, but we take the view here that it is linguistic description that is crucial in providing us with the basic anatomy of children's language behavior.

Throughout this text, we use typical language development in English as the standard against which the limitations of the child with language impairment are measured. The performance of TD children is taken as the benchmark against which the performance of the child with an impairment is assessed. Given that more than 90% of the world's children learn the speech and language (or languages) of their environment successfully by the time they go to school, there are two obvious questions to ask. How different from the linguistic progress of TD young children is that of individuals who are impaired? And what is it about children with language impairment that prevents them from making a success of language acquisition in the same time frame as the vast majority of their peers? We address these issues throughout the book. We begin, however, with some general considerations: about the environment in which children learn to speak; about variation in the rate of development in TD children; and about conditions with which speech and language impairments are associated.

### 1.2 The Ambient Language

Children learn to speak in a language community in a particular location, and in a specific social milieu. These contexts impact on the child in some ways that are obvious – children growing up in England learn English, children growing up in Norway learn Norwegian.
But there can be more subtle effects of the linguistic environment. To take one example, the linguistic settings in which children find themselves may be more complex than those of us raised in monolingual environments may realize. Ireland is a country in which Irish is one of the official languages but where the majority of the population speak English – perhaps only 4% of the population use Irish regularly in daily life. As part of a government effort to maintain the Irish language, there are officially designated areas each referred to as a *Gaeltacht* in which Irish is the dominant language spoken – in these enclaves up to two-thirds of the population are Irish speakers. As well as receiving support for the maintenance of the Irish language, these areas also receive government grants for infrastructural development and employment. In most families in a *Gaeltacht* enclave, an infant will grow up speaking only Irish to begin with. However, as these areas are essentially small islands in a sea of English, the infant as she develops will learn more and more English. Evidence from a study of the development of Irish by O’Toole (2009) suggests this starts early: while up to the age of about 30 months, children raised speaking Irish in the *Gaeltacht* use predominantly Irish vocabulary, from this point on the number of English words they are able to say grows dramatically. This increasing bilingualism coincides with their growing encounters with children whose dominant language is English, in daycare settings and nurseries.

**Learning more than one language**

In Western Europe, due to the movement of workers within the European Union, along with immigration from the rest of the world, the number of young children who receive input from more than one language has increased in the recent past. De Houwer (2009) makes a distinction between monolingual first language acquisition (MFLA), bilingual first language acquisition (BFLA), and early second language acquisition (ESLA). MFLA is still the norm for the majority of children in Europe and the USA, but the experience of hearing two languages from birth or shortly after has become more common. Simultaneous bilingualism – BFLA – is the experience of the child with parents who speak two different languages to her from birth. ESLA – successive bilingualism – is the relevant term for a child who hears one language from both parents from birth to 18 months or so, but from then on until she enters school hears a second language with some regularity, in nursery or daycare contexts. This would cover the Irish situation outlined above, or that for a child of Turkish immigrants in the Netherlands. The common feature to all these language experiences is that they are *naturalistic* – no formal instruction is involved. Children learn language from the conversations they take part in and the activities that co-occur with these interactions.

De Houwer (2009), on the basis of a survey of 1,800 families conducted in Flanders, Belgium, estimates that children born to around 10% of families in Western and Northern Europe, which has a population of around 400 million, hear two languages spoken at home from birth. However around 30% of children who have the benefit of input from two languages end up speaking only the majority language. In the United States, judging by figures from the 2011 American Community Survey report (Ryan, 2013), it is possible that a larger proportion of children are hearing more than one language as they grow up than is the case in Europe. In the United States, close to 80% of the population over 5 years of age assert that English is the only language they speak at home. But around 20% report the use of
another language. Spanish, with over 12% of US residents reporting its domestic use, is the most widely used language after English. And there are half a dozen other languages that have over a million speakers, and are used in US homes. They are Chinese, French, German, Korean, Tagalog, and Vietnamese. So close to one in five children will, while growing up as American citizens, have some experience of languages other than English as they develop. For those interested in language development and language impairment, the existence of substantial minorities of young children being exposed to more than one language, either from birth or shortly afterward, raises the question of how young children cope with input from more than one language. We can consider this first of all in relation to TD children.

The fact that some children have to deal with input from more than one language is thought of by some as an obstacle to learning one language well. As De Houwer (2009, p. 309) puts it, “many parents, schoolteachers and child health professionals believe that bilingual language development could be a threat to children’s language development.” De Houwer considers this view to be a myth. She marshals evidence to demonstrate that monolingual and bilingual children learn languages in “extraordinarily similar ways.” But she also argues that to ask if monolingual children do better than bilinguals, or if bilinguals are equally proficient in both their languages, is to ask the wrong questions. Bilingualism is not a choice, but an inevitable fact of life for many children. Children learn more than one language for specific communicative reasons – they need to be able to talk to peers, parents, grandparents, or other members of the extended family. The Irish-speaking child in the Gaeltacht will learn English to communicate with some of the other children she meets in the nursery. The child growing up in Flanders who has an American father and a Dutch-speaking mother, who have decided to speak their own mother tongues exclusively to the child, will probably need both languages to understand and speak to her parents. She will certainly require both if she wants to talk on Skype to her English-speaking grandparents in the United States, as well as in person to her Dutch-speaking grandparents who live in the same village. The child growing up in Florida in a Hispanic family will eventually require a competent command of English to converse with her monolingual peers and to advance educationally. The extent to which a child is competent in each language, or indeed chooses to use the languages she knows, will vary considerably from situation to situation. De Houwer (2009, p. 310ff.) reviews a number of examples which illustrate the complex influences on language choice and language identity in children exposed to more than one language as they grow up.

It is important to remember that the environmental and social factors influencing language identity and language choice will be similar for both TD children and those who are language-impaired. What do we know about the effects of growing up bilingually on children who are finding language learning difficult? This is a research area that is in its early stages, but we do have some information on children with language impairment learning Spanish and English in the USA, French and English in Canada, Swedish and Arabic in Sweden, and Turkish and Dutch in the Netherlands. We will consider bilingual language impairment at various points in the book. But it does appear that learning more than one language inside or outside the home, in early childhood, does not further reduce the level of ability attained in either language for children with language-learning difficulties. Most of the evidence
available to date indicates that these children can achieve the same (diminished) level of competence in both the languages they hear (e.g. Paradis 2010, p. 247; Blom et al., 2013).

Adapting to a speech community

If labeling a child as a Dutch-English bilingual gives limited practical guidance about her language dominance, language use, or preferred language identity, a lack of predictability also attends the phrase “monolingual English speaker.” The sounds of English especially, and the words and grammatical structures to a lesser extent, vary according to locality, social grouping, and ethnicity. From the clinician’s perspective, knowing which variety of English the child speaks is crucial for decisions about assessment and intervention. Conventionally, a particular variety of English is viewed as made up of accent, referring to the sound system, and dialect, indicating vocabulary and grammar. Accents differ across the English-speaking world, most obviously in the vowel sounds that the child will be used to hearing and using. Knowledge of local accent is clearly a necessary part of a clinician’s awareness. Whether a child grows up in New Zealand, Ireland, Yorkshire, or Virginia will make a considerable difference to how she sounds when speaking English. Assessment and intervention has to be tailored to the sound system that underpins the accent in her particular speech community.

Accents of English

Table 1.1 illustrates the differences in pronunciation between the vowels in Received Pronunciation (RP), the “standard” accent of English in England, and the vowels in General American English (GenAm). The vowel symbols in the table are from the International Phonetic Alphabet (IPA – see Appendix 1). There are only five symbols for vowels in written English – i, e, a, o, u – but 24 different vowels in spoken English. So we need to use the more extensive symbolic resources of the IPA to represent them. The vowels are linked to key words which stand for what Wells (1982) terms “lexical sets”: each word in the list stands for a group of words which are all pronounced with the same vowel. (For some discussion of the lexical sets by Wells see: http://phonetic-blog.blogspot.co.uk/2010/02/lexical-sets.html

For an extension of the lexical sets to a wide range of accents of English around the world see: http://en.wikipedia.org/wiki/Lexical_set

In some cases in Table 1.1, the vowels are the same in both accents – for example the vowel /ʌ/ in the STRUT set. For another set they diverge, for example BATH, where the RP words use /ɑː/, while GenAm uses /æ/. As well as illustrating similarities and differences between RP and GenAm, the items in the list of words also serve as a standard against which we can compare regional accents of the US, the British Isles, and other English-speaking countries. For instance, the vowel /æ/, which is used for the BATH set in GenAm, is also the one used for this lexical set in most of the accents of speakers from the north of England. The variations in spelling in a number of the example sets – where all the words by definition sound the same – alert us to some of the mismatches between the spelling of English and its pronunciation.1
Dialects of English

Differences in dialect are also relevant to clinical practice, and the place where a child grows up will influence some of the words learned, and some grammatical structures. Grammatical differences across the dialects of English, while often subtle, are not trivial. Dialects do not just vary according to geography. In any specific location, especially one with a large population, there will be a number of different dialects which are associated with particular social or ethnic groupings. An extensive survey of these differences is beyond the scope of this text, but Table 1.2 provides one specific example of how verb endings differ in a number of English-speaking varieties (Cheshire, 1991, p. 55). The standard version of the present tense, in the fourth column, has a suffix only on the third person singular. Other versions of the paradigm either have no suffixes (in African American English (AAE) or in East Anglia in the United Kingdom) or use the suffix throughout (south-west Britain). Therefore speakers of the standard version of English would say “I go” and “he goes,” while those speaking AAE would say “I go” but also “he go,” and those in the south-west of Britain “I goes” and “he goes.” And finally, in Appalachian English the suffix appears on both third person forms, singular and plural. (See Trudgill and Chambers, 1991, for further examples of how verb forms can differ across various dialects of English.) This example confirms for

<table>
<thead>
<tr>
<th>Key word</th>
<th>RP</th>
<th>GenAm</th>
<th>Examples in lexical set</th>
</tr>
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<tbody>
<tr>
<td>KIT</td>
<td>i</td>
<td>i</td>
<td>ship, milk, build</td>
</tr>
<tr>
<td>DRESS</td>
<td>e</td>
<td>e</td>
<td>step, desk, pest, bread</td>
</tr>
<tr>
<td>TRAP</td>
<td>æ</td>
<td>æ</td>
<td>sad, back, rap, tram</td>
</tr>
<tr>
<td>LOT</td>
<td>o</td>
<td>æ</td>
<td>stop, rob, swab</td>
</tr>
<tr>
<td>STRUT</td>
<td>ø</td>
<td>ø</td>
<td>hut, sum, cut</td>
</tr>
<tr>
<td>FOOT</td>
<td>u</td>
<td>u</td>
<td>pull, bush, could</td>
</tr>
<tr>
<td>BATH</td>
<td>øː</td>
<td>æ</td>
<td>path, clasp, lance</td>
</tr>
<tr>
<td>CLOTH</td>
<td>o</td>
<td>ø</td>
<td>loft, long, soft</td>
</tr>
<tr>
<td>NURSE</td>
<td>øː</td>
<td>øː</td>
<td>surf, term, shirt</td>
</tr>
<tr>
<td>FLEECE</td>
<td>iː</td>
<td>iː</td>
<td>reed, see, please</td>
</tr>
<tr>
<td>FACE</td>
<td>eɪ</td>
<td>eɪ</td>
<td>play, pain, steak</td>
</tr>
<tr>
<td>PALM</td>
<td>øː</td>
<td>øː</td>
<td>drama, bra, father</td>
</tr>
<tr>
<td>THOUGHT</td>
<td>øː</td>
<td>øː</td>
<td>ought, hawk, autumn</td>
</tr>
<tr>
<td>GOAT</td>
<td>øː</td>
<td>o</td>
<td>rope, soul, roam</td>
</tr>
<tr>
<td>GOOSE</td>
<td>uː</td>
<td>uː</td>
<td>move, tomb, flu</td>
</tr>
<tr>
<td>PRICE</td>
<td>øː</td>
<td>øː</td>
<td>ripe, tripe, smile</td>
</tr>
<tr>
<td>CHOICE</td>
<td>øː</td>
<td>øː</td>
<td>boy, noise, groin</td>
</tr>
<tr>
<td>MOUTH</td>
<td>øː</td>
<td>øː</td>
<td>couch, loud, out</td>
</tr>
<tr>
<td>NEAR</td>
<td>øː</td>
<td>øː</td>
<td>beer, fear, pierce</td>
</tr>
<tr>
<td>SQUARE</td>
<td>øː</td>
<td>øː</td>
<td>fair, pair, hair</td>
</tr>
<tr>
<td>START</td>
<td>øː</td>
<td>øː</td>
<td>part, sharp, arm</td>
</tr>
<tr>
<td>NORTH</td>
<td>øː</td>
<td>øː</td>
<td>war, mourn, tor</td>
</tr>
<tr>
<td>FORCE</td>
<td>øː</td>
<td>øː</td>
<td>court, porch, sore</td>
</tr>
<tr>
<td>CURE</td>
<td>øː</td>
<td>øː</td>
<td>poor, tour, lure</td>
</tr>
</tbody>
</table>
us two significant points about English. The first is that there is not just one monolithic form of the spoken language, but many distinct varieties, which sound different and also may have alternative structures to the “standard.” These are very important for their speakers’ sense of belonging to a particular social network or community (Chambers, 1995, p. 250). Secondly, while all of these varieties present equivalent communicative options to their speakers (Labov, 1970), they do not all have the same societal value. The use of the term “standard” for one form of the present tense paradigm in Table 1.2 reflects its status as the dialect reflected in the written version of the language, and its use in spoken media, education, the law, and government. Varieties which are “non-standard,” especially if they are linked to particular ethnicities, or to lower status social groups, may be stigmatized.

Awareness of sociolinguistic difference is important for the clinician, who needs to be alert to the geographic, social, and ethnic variation that exists in the language, and to the specific features of the variety of English spoken by her clients. An approach to evaluating the child’s language that is too prescriptive, tied to the features of the standard variety, and not sensitive to the sounds and structures operative in the child's environment could skew assessment and undermine intervention strategies. McGregor et al. (1997) outline a procedure which would assist a clinician to decide whether a child’s language is simply different from the standard dialect or is impaired. This involves a systematic comparison of the child’s structures, as revealed in a language sample, and those in both the standard dialect and her own dialect. The examples McGregor et al. (1997) provide are all taken from AAE, but this contrastive approach could be generalized to any language variety – ethnic, social, or geographic in origin. It would also avoid the problem enshrined in most language tests – that they are based on the grammatical features of the standard dialect. Accordingly, they run the risk of identifying as impaired a child who is merely linguistically different by virtue of his dialect (Bland-Stewart, 2005; see also Washington, 2009). A language assessment that does take account of children in the United States who are speakers of dialects other than General American English is available to clinicians – the Diagnostic Evaluation of Language Variation (DELV) (Seymour, Roeper, and de Villiers, 2003). In seeking to identify features of children’s language that result from ethnic, regional, and cultural differences, and differentiate them from features that would imply language delay, this test is a rare exception among standardized assessment procedures.

Location, ethnicity, and social grouping are factors that play a formative role in the emergence of the particular accent and dialect of English spoken by an individual. This is

<table>
<thead>
<tr>
<th></th>
<th>AAE &amp; East Anglia</th>
<th>South-west Britain</th>
<th>Standard</th>
<th>Appalachia</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st singular</td>
<td>go</td>
<td>goes</td>
<td>go</td>
<td>go</td>
</tr>
<tr>
<td>2nd singular</td>
<td>go</td>
<td>goes</td>
<td>go</td>
<td>go</td>
</tr>
<tr>
<td>3rd singular</td>
<td>go</td>
<td>goes</td>
<td>goes</td>
<td>goes</td>
</tr>
<tr>
<td>1st plural</td>
<td>go</td>
<td>goes</td>
<td>go</td>
<td>go</td>
</tr>
<tr>
<td>2nd plural</td>
<td>go</td>
<td>goes</td>
<td>go</td>
<td>go</td>
</tr>
<tr>
<td>3rd plural</td>
<td>go</td>
<td>goes</td>
<td>go</td>
<td>goes</td>
</tr>
</tbody>
</table>

Table 1.2 Variation in present tense marking in some dialects of English.
something to always bear in mind when making an assessment of a child’s language status. We now turn to examine the range of language ability within typical language development, and to factors that are relevant to the variability we find.

1.3 Typical Language Development

Variation in language development

The vast majority of children proceed effortlessly through the various stages of language development in the preschool years. They do not, however, all proceed at the same pace – some are precocious learners, and then there is a minority for whom progress is slow and difficult. To identify and characterize the minority, we need to have a full awareness of the range of ability among the majority. In this section we look at studies which reveal the spread of ability across preschool children, and also at some of the ways in which we explore the developing language of children.

A research project in the late 1960s, headed by Roger Brown at Harvard and summarized in Brown (1973), involved three children in a longitudinal study based on recordings of their conversations over time. This study, the first of the modern era of child language studies, has been highly influential. One of its bequests to the field has been a summary measure – the average length of the child’s utterances, in morphemes – MLU(m). Usually calculated over a minimum of 50 or 100 consecutive utterances, this measure has been widely used as a yardstick both of progress and of comparison. The term morpheme refers to a “minimal meaningful unit” in the language, which can be a word, such as the, girl, walk, or a suffix on a word, such as the past tense marker –ed in walked. Other suffixes – in bold here – include plural (girls), possessive (Stan's teddy), and third person singular (walks). MLU(m) is calculated by counting all the words and any grammatical suffixes in a sample of utterances, and then summing and averaging the total. MLU(m) is seen as a useful general index of grammatical development, as Brown (1973, p. 53) points out, “because almost every new kind of knowledge increases length.”

The pseudonyms of the children in Brown’s study were Adam, Eve, and Sarah. As it turns out there was a considerable difference between Eve and the other two children in the pace of change in her utterance length. All three children show an increase in this measure over time. But if we look at their starting points (Brown, 1973, p. 55) and at the time it takes to get from an MLU(m) of 2.0 to an MLU(m) of 4.0, the difference is dramatic. Eve is at the lower bound at 20 months and attains the upper bound just six months later. But Adam and Sarah do not reach an MLU(m) of 2.0 until about 29 months, and an MLU(m) of 4.0 until just over a year later, at about 41 months. The other two children take twice as long as Eve to cover the same linguistic ground.

Because only three children were involved, it was not possible at the time this study was completed to know whether Eve was a linguistic prodigy or if she was truly representative of a proportion of the population. Because Brown’s study only involved three children, it could not provide definitive information about the range of individual differences in the population. For clinicians it is crucial to be aware of the limits to individual variation in TD...
children, particularly at the lower end of the distribution, in order to identify individuals at risk of language impairment. A decade after Brown's research came a project in the United Kingdom which involved a much larger group of children across the age range 15–60 months. The Bristol study (Wells, 1985) involved a representative sample of 128 TD children. The sample was “representative of the urban child population in terms of sex, month of birth and class of family background” (Wells, 1986, p. 117). It confirmed the variation in rate of development implied in the difference between Eve and the other two children seen in Brown's data. In the Bristol study, at 42 months, “the difference between the most and least advanced children was equivalent to 30 to 36 months” (Wells, 1986, p. 117).

The Brown and Wells studies found out about children's language by sampling the children's conversations with adults or peers. This is not the only evidential source for language development, as we shall see. But language sampling is perhaps the primary basis for our knowledge of TD children, and will be a tool used by the clinician also. Spontaneous language samples are seen to have several advantages. The material is plentiful, and it is readily obtained. And it is generally considered that in reflecting as they do the daily situations – interactions with familiars in the home – in which the child learns and uses language, such samples afford us the most direct insight into the preschool child's expressive language ability. There are, however, drawbacks. The recording of conversations with children over time, and the transcription and analysis of these conversations, is a time-consuming task. And there is an inevitable trade-off between the amount of data that can be accumulated on a particular child and the number of children that it is feasible to include in a study. Brown and colleagues chose to collect very detailed longitudinal information on just a few children, making recordings for two hours each month. Wells's approach was also longitudinal, but he reduced the amount of language data on each child – recordings were made every three months – while considerably increasing the number of children in the sample. An alternative approach to the investigation of language development, which facilitates very large samples of children, involves parent report. In this approach, parents (or sometimes other caregivers who spend a lot of time with the child) are questioned in detail about a child's language, using a systematic protocol.

The MacArthur-Bates Communicative Development Inventories (CDI – Fenson et al., 2007) was first developed in the United States in the 1990s, and since has been adapted to many other languages (for details see http://mb-cdi.stanford.edu/). In contrast to the recording of conversations with children, the CDI relies for its information on parents (or other caregivers) completing standard checklists of vocabulary and grammatical features. The checklists, while extensive, can be completed in less than an hour. This means that it is much easier to collect detailed information on large samples of children, and so reliably identify individual differences and the range of abilities across children at particular ages. The norming study for the CDI involved 1,803 US children from 8 to 30 months. Parents made information available via two checklists. One covers the age range 8–16 months, and asks about pre-verbal communication, and the comprehension and production of vocabulary. This is referred to as the "Words and Gestures" scale. The second form, known as the “Words and Sentences” scale, provides information on the production of vocabulary and grammar from children aged 16–30 months. As well as the development of short forms of the original CDIs, there has also been an extension of the assessment up to children aged 37 months (the MBCDI-III), which addresses productive vocabulary,
syntactic maturity, and language use (Fenson et al., 2007). On every measure and at each point of development the variation in language ability reported is extensive.

Figure 1.1 shows the total number of words reported as produced on the CDI Words and Sentences scale. This provides parents with a checklist of 680 words, organized into 22 semantic categories. (Ten of these involve different types of nouns, and there are categories which include verbs, adjectives, pronouns, and auxiliaries.) The lowest line on the graph is at the 10th centile, and the topmost line at the 90th centile. If we just consider 24 month olds, we can see that the mean for children of this age is close to 300 words. The range from the 10th to 90th centile is from about 75 to 525 words. This sizeable variation, across 80% of the population, is also apparent when we look at other measures on the same group of children – comprehension on the Words and Gestures scale, or grammatical complexity scores, or the onset of word combinations on the Words and Sentences scale. The grammatical complexity scale, for example, has a maximum score of 40. At 24 months the 10th–90th centile range is from 0 to 20. The CDI data also allow us to see where the three children from the study overseen by Brown fit into the overall picture. An estimate of MLU(m) derived from the Brown data by Bates et al. (1995, pp. 109–110) sees Adam and Sarah at 30 months performing like children in the middle of the CDI distribution. Eve, however, at 24 months, is well above the 90th centile on this estimate. So she is, statistically speaking, an unusual child.

The picture of individual variation seen through the lens of the CDI is reinforced by the results from a large-sample UK study. Like the CDI, this has the advantage that it provides information on comprehension as well as production. The data comes from the Avon Longitudinal Study of Parents and Children (ALSPAC; Roulstone et al., 2002; Roulstone
et al., 2011), and involves 1,127 children at 25 months of age. They were tested on a standardized test – the receptive part of the Reynell Developmental Language Scales (RDLS-R; Reynell, 1977), and their parents provided information on their expressive language via a questionnaire. Roulstone et al. (2002) found that for the RDLS-R, the range of raw scores found in this sample was from 0 to 51 (the upper bound of scores on the test is 67). From parent report it emerged that 54.5% of the children were using sentences of three to four words; 27.1% were using two-word sentences; and 18.5% were at or below a single-word level. As Roulstone et al. (2002, p. 265) observe:

These data serve to highlight once again the enormous differences in rate of speech and language acquisition that exists within the general toddler population, with large numbers of children already achieving 3-4 word sentences at 25 months, whilst some of their peers are still only babbling or at a single word level.

The data in Figure 1.1 have an upper age limit of 30 months, and we might ask whether the differences seen there and in the ALSPAC study of 25 month olds continue through early childhood. The findings from the Wells study confirm that they do persist throughout the pre-school period. Wells (1985) uses a slightly different MLU measure, which counts morphemes in "structured utterances," that is, children's utterances which have grammatical content. Utterances like yeah, no, hi, which are included in the calculation of Brown's MLU(m) measure, are excluded from “mean length of structured utterances” (MLUS). These values will therefore generally be higher and perhaps more reliable, as the minimum “structured utterance” will consist of at least two morphemes (e.g. mummy hat, want juice). Wells's data show that at 5;0 years, the mean MLUS(m) score is approximately 4.5. The range for two standard deviations below the mean to two standard deviations above the mean (i.e. for about 97% of the sample) is 3.5 to 6.0. So the variation in language ability seen in the other studies in the third year of life – at least as measured by length of utterance – persists to the point at which the child enters school. Indeed, the ALSPAC study finds a strong association between a child's expressive language ability at 2 years of age and performance on assessments at school entry (Roulstone et al., 2011, p. 29).

Why is there such variation in the rate of development among children in this critical period of language learning? And what are we to make of the children in the bottom 10% of the distribution, those who tend at the age of 2 years to have 50 words or fewer, and minimal scores on the CDI grammatical complexity scale? These children are often referred to as “late talkers,” and we would like to know which of these children will catch up with their peers, and which of them will have persisting language-learning difficulties, and why. We begin by reviewing factors that have been involved in attempts to explain variation in rate of development in TD children.

Accounting for individual differences: child-external factors

Language development is the product of the cognitive capacities children bring to the learning task, and the environment which shapes them as they grow up. Both cognitive and environmental factors will be relevant to the individual differences in rate and course of
development that we see. We do not have anything like a complete account for the variance in language development profiles in the preschool years. We will review here what seem to be some of the important influences. We begin with external factors, and then consider the intrinsic capacities of the child.

Spoken language is in the main a social activity, and the child learns to converse in a social milieu. The dominant feature of that milieu for the young child – at least in Western societies – is linguistic interaction and experience within the family. However, that family is situated, economically and culturally, within a wider society – primarily a network of relatives, and of friends and acquaintances within a particular neighborhood – while the network is itself part of a larger community. Here we concentrate on social background, its relationship with child-directed speech (CDS) – the speech the child hears within the family circle – and the effect of CDS itself on children’s language development.

Social background

We have already seen, in Figure 1.1, the wide range of MLU(m) and vocabulary scores over time to be seen in children. Figure 1.2, from Wells, 1985, p. 348, gives a complementary perspective on variation by providing a language development score for each of the 128 children in the project. This score is designed to reflect more precisely the particular grammatical

![Figure 1.2](image-url)

*Figure 1.2* Language development scale scores by family background for children at 42 months (Wells, 1985). Reproduced with permission from Cambridge University Press.
structures and functions that a child controls. Each structure and function identified in a child's language sample is assigned a score, and a child who uses later-developing forms and functions will achieve a higher total score. Figure 1.2 is first of all a very clear illustration of individual differences in language development. Each small cross on the diagram represents one of the children in the study, seen at the age of 42 months. The vertical axis shows the score on the language development scale. The horizontal axis shows the child's score on an index which reflects parental occupation and education – the family background scale. This scale is a continuous variable that takes into account parental employment and education. The scale score is arrived at using a formula that combines the father's occupation, the mother's present or former occupation, and the highest educational level that each has achieved (Wells, 1985, p. 22). It is apparent that for around 97% of the children – those between -2SD (minus two standard deviations) and +2SD (plus two standard deviations) – the range of language development scale scores at 3;6 is from 200 at the low end to 500 at the top end, with just about every possibility in between.

The second contribution of the diagram is to reveal the relationship of the language development scale scores to the children's socioeconomic status (SES), via the family background score. This continuous scale is divided into four groups, indicated at the top of the graph. Class A has the highest family background score and Class D the lowest. There are an equal number of children in each of these groups. (Wells, 1985, p. 22, suggests that these groupings "clearly correspond to what are often referred to as the middle, lower middle, working and lower working classes." ) This distribution was arrived at by a stratified random sampling design used for selecting the children who were to take part in the project. Wells (1985, p. 130) reports that there are no significant between-groups differences in the distribution of language scores across the four classes. However, there is a moderate but significant correlation (r = 0.40) between family background and rate of development. A glance at Figure 1.2 will reveal how this comes about. For the majority of the children – those between -2SD and +2SD – language development scores seem to be relatively equally distributed across Classes A to D. But at the extremes, there are some very low language development scale scores in Class D, and some very high scores in Class A. A small number of very slow developers seem to be concentrated in Class D, while Class A contains a few extra fast developers. It seems reasonable to agree with Wells that there is no consistent relationship between family background and preschool language development, at least so far as this data is concerned.

The Bristol study retains its significance because of the number of children involved, and the care taken in the design of the study to ensure that the sample of children was representative of the population from which it was drawn. But the conclusion that Wells comes to is not the last word on the relationship between SES and language development. There is an extensive body of subsequent work which affirms that a relationship does exist, most markedly but not exclusively in the area of vocabulary. (A summary and review of these studies is provided by Hoff, 2006, p. 60ff.) One study in particular is often quoted in support of an effect of SES on children's language learning. Hart and Risley (1995) studied three groups of children. One group had parents who were university professors, a second group had working-class parents, and a third group had parents on welfare. At the age of 3, the average vocabulary of the professors' children was 1,000 words, while for the children with the parents on welfare it was 500. How do we reconcile the claim by Wells of no consistent
relationship between SES and language development, and the data that Hart and Risley provide, which suggest the opposite conclusion?

One possible explanation lies in the different measures used: Hart and Risley (1995) looked primarily at vocabulary, whereas Wells (1985) derived the language development score in Figure 1.2 from the grammatical structures that he found to be under the child’s control. An alternative account, if we assume that vocabulary and grammar scores are likely to be correlated, would draw attention to the very high and very low scores in small numbers of the children in Wells’s Classes A and D, seen in Figure 1.2. If the high-scoring Class A children correspond to the 12 individuals in Hart and Risley’s group with academic parents, and the very low-scoring children in Class D to the Hart and Risley group of 11 children whose parents were on welfare, then there is no necessary contradiction between the findings of the two studies. Hart and Risley (1995) selected small groups of children, with two of them at the extremes of the distribution: “we had deliberately recruited a demographic range of families, from highly educated upper-SES families living in affluent suburbs, to welfare families living in deteriorating neighbourhoods” (Hart and Risley 1995, p. 53). The outcome they find, of large differences in vocabulary between small numbers of individuals at opposite ends of the socioeconomic scale, is precisely what we would expect from the data that Wells uncovered about the outliers of his sample.

If this expectation is correct, we might also ask a second question: how exactly would SES impact on a child’s language learning? What is it about the occupational and educational levels of the child’s parent or parents that translates into conditions within the family that influence the child during a critical period for language learning? The answer provided by Hart and Risley has to do with child-directed speech, specifically the number of words children hear. They found a clear association between the SES of parents and the amount of talk their children received. For example, on a measure of average utterances per hour spoken to the children, the maximum a child in the Welfare group received was about 250, while for children in the professional group it was 700. At 3 years of age, the average number of words heard in an hour by the children of professional parents was over 2,000, while for the Welfare group it was 500. And the differences between the groups in number of words addressed to children were consistent across the children’s early years.

Child-directed speech

*Characteristics of child-directed speech*

It is worth reminding ourselves that for language learning in the preschool years the child has to rely solely on auditory input from conversations taken part in or overheard. However, there is no shortage of material to listen to. Indeed, the child would seem to be bathed in language, even in the early stages. One study of the amount of speech either directed to an infant or available in her immediate vicinity established that on average the child heard 2.33 hours of speech per day (van de Weijer, 2002). Of this, 14% was from the adult direct to the infant. Another 60% was between an adult and the infant’s older sister. The rest was speech between adults. The total number of utterances that the child would have heard over the three months of the study, when she was between 6 and 9 months, was over 80,000, with about a fifth of
these spoken directly to the child. The total number of all words (that is all words the child
could hear in all the conversation around her) was estimated at over a quarter of a million. Of
these, the total in speech directed at the child was over 40,000. However, the number of dif-
f erent words in speech directed at the child was just over 2,000, indicating that a small number
of words are heard over and over again in speech to the child – on average 20 times each,
according to this data. As Clark (2003, p. 31) emphasizes, familiar adults accompany common
activities in the child’s life with repetitive utterances: “[d]aily routines during the first two
years of life, and the stereotypical adult verbal routines that accompany them are both highly
repetitive … and very frequent” (Clark, 2003, p. 31). These routines involve nappy changing,
meals, bath times, bedtimes and games/books. For example, mealtimes in the second year
occur three times per day, 365 days a year, resulting in considerable repetition of utterances
such as “here we go”; “clever boy”; “lovely food”; “don’t throw”; “in we go”; “another spoon”;
and “do you want to get down.” A study of the language of 12 mothers and children between
21 and 30 months (Cameron-Faulkner, Lieven, and Tomasello, 2003) estimates that by this
age children could be hearing around 7,000 utterances per day. The study underlines the
repetitive nature of utterances to children and their restricted grammatical content.

The form of CDS has been found to have specific features which set it off from adult-to-
adult speech and which suggest it cannot be regarded as deficient as a language model
(Snow, 1995; Gathercole and Hoff, 2007). Depending on the age of the child, CDS can have
phonetic features which set it off from inter-adult speech – e.g. it is slower, with pauses at
the end of utterances around 90% of the time (as opposed to 50% in adult speech), has more
precise pronunciation, and has exaggerated intonational contours resulting from rises and
falls in pitch that are steeper and over a larger range (Clark, 2003; Vosoughi and Roy, 2012a).
Adult utterances are shorter (but still grammatical) and linked to the child’s attentional
focus. Adult responses to what the child says are appropriately matched to the child’s topic.
Parents organize their responses to what children say, in conversation, in ways which could
make structural information salient for their child:

(a) They repeat and also extend the prior utterance by the child, in a format referred to as
an expansion (e.g. Hoff-Ginsberg, 1985): the mother might expand an early two-word
combination by the child, ball table, by responding with the ball is on the table.

(b) They provide a topically relevant succession of utterances, in a lexically and/or struc-
turally related sequence; such sequences have been termed “variation sets” (Küntay
and Slobin, 1996, who studied children learning Turkish). These are short sequences
of utterances to a child which involve repetitive elements. Such sequences can form up
to 20% of input to children. In a study on English-speaking children, Waterfall et al.
(2010) provide an example of such a repetition sequence. A mother is talking to her
14-month-old child who is pushing her dolls in a stroller:

M: you got to push them to school
    push them
    push them to school
    take them to school
    you got to take them to school
It seems plausible that sequences such as this could alert the child to particular verbs and the noun phrases that typically accompany them. The example first presents the child with a maximal set of possibilities for the structure that can follow push: *push them to school*, embedded within a Subject-Verb-Object-Adverbial sequence. The verb is then repeated with the object only – *push them*, indicating that the Adverbial is omissible, and then again with the Object plus Adverbial – *push them to school*. The next utterance demonstrates that another verb, *take*, can fit into the same structure as *push*. Waterfall et al. (2010, p. 686) report that adult use of verbs in variation sets like the example above predicted children’s later production of verbs.

CDS appears to be an instinctive choice of language variety on the part of parents. It helps the children to know that adults are listening and attending to them, provides relevant information for the child in terms of the labels that are applied to the objects and events in their immediate interest, and helps them to figure out their role in the conversation and when and how they should take a turn in the conversation. Clark (2003) points out that adults do not talk to children to teach them language (in contrast to the “behavioral” view of language development in the past); rather, they are attempting to make themselves understood to the infants. Adults tend to monitor the child’s level of understanding and modify their language accordingly, all the time keeping pace with their child’s growing level of comprehension.

**Effects of child-directed speech**

We have already seen that Hart and Risley (1995) claim an association between the number of words children hear and their vocabulary development. This is not the only study to demonstrate this link. Huttenlocher et al. (1991), examining language samples of 31 middle-class children and their mothers, found a strong relationship between mothers’ input and growth in vocabulary size over 14–26 months. However, in a report which asked the question “Does frequency count?” by exploring the relation between words used by parents in the CHILDES (Child Data Exchange System) database (MacWhinney, 2000) and the age of acquisition of categories of words in the CDI data, Goodman, Dale, and Li (2008) found a negative correlation between frequency in the CHILDES data and age of acquisition in the data reported by parents for their children – the more frequently a word is used in the adult data, the later it is learned by the children (in the period between 16 and 30 months). This is because of the overwhelming frequency in the adult data of tokens of function words – articles, prepositions, auxiliaries, and particles – compared to tokens of content words – nouns, verbs, adjectives, and adverbs. Goodman et al. report that each individual function word occurred in their data over 16,000 times, while the average frequency for individual nouns was just over 300. However, when content words – verbs, nouns, adjectives – are looked at as separate categories, there are positive correlations between frequencies in the input and their age of acquisition, particularly for nouns.

A number of studies have examined relationships between frequencies of particular structures in CDS and the emergence of these in children’s speech. Rowland et al. (2003), in a study of 12 mother-child pairs over a year when the children were between 2 and 3, found that the frequency of wh-word + verb sequences in the mother’s input is a better predictor
of the emergence of wh-words (e.g. what, where) in her child’s speech than the semantic complexity of these words. In a study of complex sentence use in adults and children, differences in the proportions of multi-clause structures (complex sentences) in adult speech are correlated with individual differences in the proportion of the same structures in the speech of their children whose average age is 54 months (Huttenlocher et al., 2002). And the character of CDS changes as children grow. Huttenlocher et al. (2007), in a study involving 50 families, assessed the speech addressed to children in five recording sessions from when they were 14 months to when they were 30 months. Over that period the quantity of speech (number of words, number of sentences) did not change, but the nature of the input did alter. Over the 16-month period of the research, the diversity of vocabulary used to the children increased linearly, as did the number of noun phrases per sentence, and the proportion of complex sentences.

There is then a body of evidence that demonstrates (a) that speech to children differs from speech to adults, and (b) that there are frequency relationships between specific structures in CDS and those same structures in children’s output. This is true for vocabulary and for selected areas of morphology and syntax. But do the characteristics of the speech the child hears from adults have a causal influence on how or at what rate the child’s language develops? As Huttenlocher et al. (2002) point out, their results are consistent with the notion that “processes sensitive to patterning in the input are central to the acquisition of syntax” – CDS does play an important role. This would seem also to be the lesson to be drawn from the work on variation sets. But as Huttenlocher et al. (2002) also caution, the biological link between the adults and children in their studies means that it is possible that the variability in children’s control of multi-clause structures may not be due to differences in input from parents, but to the genetic links between the adult-child pairs. Alternatively, the causal relation may be from children to parents – some parents use more words because of their (correct) impression that their children can understand them. It is also worth reminding ourselves that the correlation and regression values in these studies leave plenty of room for other factors to influence language development. For example, the correlation between the proportion of complex clauses produced by parents and the proportion produced by children in Huttenlocher et al. (2002, p. 356) is +0.41. This value, while statistically significant, indicates only a moderate relationship. So factors other than input frequency clearly play a role in establishing these structures in emerging grammars.

Accounting for individual differences: child-internal factors

The language that children hear, via its quality, quantity, and structure, presents them with the raw material for constructing their own grammars. What do we know about factors specific to the child that influence how well they make use of what they hear? We are now well aware, from the studies reviewed earlier in this section, of the variability across children seen in language development. While differences in input frequency or structure will play a role in this, capacity differences – differences in children’s ability to process that input – must also be relevant. When a child hears a new word, for example, he has to, in real time, (a) remember what it sounds like so he can recognize it next time he hears it, (b) understand something of what it means, and (c) determine its syntactic role – is it a noun, or a verb, or
an adjective, or does it belong to some other syntactic category? Repeated instances of a
word in input, in relevant contexts, will help the child to determine its phonological,
semantic, and syntactic features, as will the existence of variation sets such as those seen
above for *push* and *take*. But it is the child’s own perceptual and analytical abilities, and his
memory, which must come into play, to build up from input the representations which will
underpin language understanding and use. Researchers have in recent years begun to
explore these abilities via the investigation of the role of memory in language development,
and the processing of language by children in real time, using so-called *online* methods.

**Memory**

Most research interest has been centered on that part of memory which corresponds to the
phonological short-term store in the model elaborated by Baddeley (1986). Spoken inputs
are stored here for a short time but decay rapidly. The integrity of what is also referred to
as phonological working memory is assessed in practice by means of non-word repetition
(NWR) tasks (Dollaghan and Campbell, 1998; Gathercole, 2006; Roy and Chiat, 2004).
The reasoning is that listening to a non-word (such as *neit, dafi, wugelamic, fenéraisek* –
examples from Stokes and Klee, 2009a) mimics the task that a child faces when he hears
a new word and has to hold it in temporary store long enough to facilitate its transfer to a
longer term memory location. As in the Stokes and Klee examples, in NWR tasks the
child’s short-term working memory is probed with items of increasing syllabic length.
Stokes and Klee (2009a) investigated a number of demographic, cognitive, and processing
factors that might be thought to influence vocabulary development, in 178 TD children in
the United Kingdom. They found that the only really strong predictor of vocabulary
performance at 2 years of age, as reported by the children’s parents via the CDI, was the
non-word repetition task. One possible implication of this is that individual differences we
see in TD children in their language ability are influenced in part by varying phonological
working memory abilities.

**Processing efficiency**

Procedures that involve analyzing transcripts of spontaneous speech samples, or collecting
reports from parents, in the investigation of children’s language development, are called
*offline* methods. They operate on the *output* of the unobservable mental processes of com­
prehending and speaking – transcripts of the sentences children produce, or the words that
parents report that their offspring understand and say. Recently, techniques have been de­
veloped which provide a window into language processing as it happens. These are referred to
as *online* methods – procedures which permit inferences about children’s performance in real
time, as they are actually processing the auditory stimuli they hear. One of them involves
recording children’s eye movements as they listen to speech stimuli and look at pictures. This
method relies on our propensity to examine visual images when listening to the speech that
describes them. Orientation to an image that is named is automatic, and so tracking eye
movements in synchrony with auditory stimuli is assumed to reveal comprehension processes
series of studies which analyzed video recordings of children's eye movements as they listen to speech stimuli and look at pictures. The reaction time taken for the child to switch gaze from a distracter picture to a target picture is measured as the child hears a spoken stimulus. In an early study, Fernald et al. (1998) used this procedure with groups of infants aged 15, 18, and 24 months. Using stimuli such as *where's the baby?* or *see the doggie*, they looked at changes in gaze latency over the age range. They found that latencies reduced as the children got older. By 24 months the children were shifting their gaze to the target picture even before the end of the spoken word. Fernald et al. conclude from these results that “by 2 years of age children are rapidly progressing towards the highly efficient performance of adults, making decisions about words based on incomplete acoustic information” (1998, p. 230).

The same procedure was used to examine changes in processing efficiency longitudinally, over a similar age range (12–25 months), and the relation between these changes and two offline measures of language development – the CDI and the Peabody Picture Vocabulary Test (PPVT-R – Dunn and Dunn, 2007), a standardized receptive measure (Fernald, Perfors, and Marchman, 2006). Children were tested at 12, 15, 18, 21, and 25 months, and CDI reports filled in by parents. The results of this study indicated once again that efficiency in understanding spoken language improved over this age range. But it also demonstrated, via associations between the measures monitoring gaze-shifting and the offline measures, that children who were more efficient (faster and more accurate) in the real-time recognition of words showed a greater acceleration in vocabulary growth over the second year of life.

The Fernald et al. (2006) study links individual differences in processing efficiency to growth in language knowledge over the first two years of life. A further study (Marchman and Fernald, 2008) looks at the long-term predictive power of this early variation in processing. A subset of the children in the Fernald et al. (2006) study were then tested at 8 years of age on a number of assessments of cognitive and language skills. Twenty-eight of the original cohort (of 59 children) were tested on the Expressive Language Index (ELI) from the Clinical Evaluation of Language Fundamentals (CELF-4; Semel, Wiig, and Secord, 2003). They were also assessed on the Mental Processing Index from the Kaufman Assessment Battery for Children (KABC-II; Kaufman and Kaufman, 2004) which provided an index of IQ. And finally their working memory was tested using the sequential processing sub-scale of the KABC-II, which involves digit span recall, and pointing to pictures in the same order as they are read by the examiner. The children's vocabulary size at 25 months, as well as their word recognition reaction times at that age, correlated with language measures and cognitive skills at 8 years.

These correlations between early processing efficiency and later language performance are suggestive, and would seem to be supported by studies using another procedure that taps online processing, the recording of event-related potentials (ERPs; for a survey of recent research see Conboy, Rivera-Gaxiola et al., 2008). ERPs “reflect electrical activity … that is timelocked to the presentation of a sensory stimulus” (Kuhl and Rivera-Gaxiola, 2008, p. 513). Via a series of electrodes in a cap that the child wears, the activity of neural networks is monitored as they fire in response to the stimulus presented. The method is non-invasive and, like eye-tracking, provides a real-time window onto the child's processing. Kuhl (2010) summarizes a series of studies that relate early speech perception and discrimination abilities to later language performance. For example, the better infants at
7.5 months of age were at the perception of a sound contrast that occurs in English (that between /p/ and /t/ as in syllables /pa/ and /ta/), the more advanced their language abilities were between 18 and 30 months of age.

Studies of children’s processing abilities using recently developed techniques are relatively few and at an early stage. Where prospective studies do exist they tend to involve small numbers of children. The linguistic behaviors investigated are highly restricted: the examples we have seen involve identifying a single word, and discriminating a pair of consonant sounds. And the correlations or regression values found are not always impressive. Nevertheless, this line of research is important in its potential for linking the two areas that we have reviewed – the linguistic environment in which the child learns language, and the processing capacities the child brings to the task. And we can see, as yet perhaps only dimly, some of the factors that may eventually explain how individual differences in language development might arise.

1.4 Atypical Language Development

For most children, monolingual or bilingual, language development proceeds without difficulties. For a minority, mastering the sound system, or the grammar, or the conventions of conversation in their language can present considerable difficulties. Before moving on to a consideration of language impairment generally, we begin by considering the children at the low end of the distribution – those in the lowest 10%. Is this group at risk for language-learning problems?

Late talkers

Children with very low language scores early in development have been extensively studied. It might be supposed that children who seem to have the most problems getting started on language acquisition would be those most at risk of having a clinically significant language impairment as they get older. A significant amount of research effort has been expended in determining whether or not this is the case. If it were possible to reliably identify children with language impairment at a very early stage, intervention could begin at this point, and potentially improve their language status and their life chances. It seems, however, that a prediction of the child’s ultimate language status from early performance is not straightforward. Some children who start slowly do indeed continue to struggle to catch up with their peers, while others do eventually succeed. From the point of view of the clinician, faced with trying to decide whether a child referred to her requires intervention or not, it is important that her diagnosis is as accurate as possible. She does not want to enroll a child for intervention if his delay is transient and he is likely to develop normally – so wasting scarce resources. But nor does she want to withhold intervention from a child who really needs it – possibly denying him an opportunity to improve his educational and social prospects. What guidance does the literature provide?

Ellis and Thal (2008) note that it is a limited expressive vocabulary at around the age of 2 years that will often provoke parents to concern, and it is this which researchers have used
as a starting point. Rice, Taylor, and Zubrick (2008), for example, identified a representative sample of 128 late talking (LT) children at 24 months, on the basis of either an expressive vocabulary of fewer than 70 words, or an inability to combine words. They looked at these children again, in comparison to a control group, when they reached the age of 7. While as a group the LT children were within the normal range on a general measure of language ability (Test of Language Development (TOLD; Newcomer and Hammill, 1997), a higher proportion of them performed below minus one standard deviation both on this measure and on specific syntactic and morphosyntactic measures. For the syntax measure, 18% of the LTs were below the cut-off, compared with 8% of controls. Ellis and Thal (2008) extend the characterization of early language delay by distinguishing between late producers – those defined solely via their expressive language level – and late comprehenders – children whose receptive vocabulary is below criterion. The outcomes for these children are different. Late comprehenders identified at 16 months have a significantly lower expressive vocabulary at 28 months than late producers.

What do these findings mean for clinical intervention? Ellis and Thal (2008, p. 97) sum up the implications as follows:

It is clear that we cannot pinpoint specific individuals who have clinically significant language delay during the early stages of language development. The normal variability in this period of development is too large.

Large sample studies demonstrate that there is a link between early language delay and later language difficulties, but it is not possible to predict the outcome for any particular child. Nevertheless, the research on early language delay does indicate that some children who turn out at school age to be language-impaired were late talkers; that early receptive difficulties appear to be more difficult to resolve than expressive ones; and that children whose parents have had language or literacy problems are at more risk than others (Bishop et al., 2012). In the absence of certainty, Ellis and Thal (2008) propose a risk factor model of decision making for the clinician, in which a family history of language impairment or delay, delay in the comprehension and production of vocabulary, and a limited use of communicative gestures, are given the most weight.

**Speech and language impairment**

Up to now we have used the term “language impairment” as a neutral label for any identified deficit in a child’s linguistic system. From now on, we will need to be more precise. It is possible for an individual to have a speech impairment but for his language (vocabulary and grammar) not to be affected. It is also the case that a deficit in language can exist without a concomitant speech impairment. And it seems that there are children whose utterances are grammatically well formed, implying intact vocabulary and grammar, but not appropriate or relevant for the point in the conversation in which they occur (Bishop, 2000, p. 100). Symptoms of this kind are referred to as “pragmatic impairments.” Speech, language, and pragmatic impairments can arise from identifiable syndromes. Conditions such as hearing impairment, cleft palate, Down syndrome, or autism have varying effects on children’s
speech and language development. But in the majority of instances where a speech or language problem is diagnosed, it is not possible yet to identify the neurodevelopmental basis for the communication difficulty. We will deal first with some of the impairments that do have an organic base, before turning to those whose etiology is still to be determined. Table 1.3 provides prevalence values for all the impairments we consider. (Prevalence refers to the proportion of individuals in a specific population with a particular condition, at a point in time or over a specified period of time.)

**Hearing impairment**

The prevalence value quoted for hearing impairment in Table 1.3 is 1–6 per 1,000 live births. The sixfold variation in prevalence estimates is not discussed by Bachmann and Arvedson (1998), nor is the basis for the estimate. Other estimates, for example in the United Kingdom, put the occurrence of hearing impairments at the low end of this range. Fortnum *et al.* (2001) put the prevalence for 3 year olds at 1.07 per 1,000, and for children aged 9–16 at 2.05 per 1,000. Bachmann and Arvedson say that the estimate they report is based on children whose hearing impairment is designated “profound” – that is, their hearing loss is 90dB or greater. (The degree of loss is established by playing pure tones at frequencies of 500, 1,000, and 2,000 Hz through headphones to an individual, and noting the intensity (measured in decibels – dB) at which the tone is detected.) The estimates provided by Fortnum *et al.* relate to children with permanent hearing impairment whose hearing loss in the better ear is greater than 40dB, a level classified as “moderately severe” (Cleary, 2009). The time in life at which the impairment starts, the nature and degree of the impairment, and the timeliness of intervention, are all factors which influence the effect of the impairment on speech and language. Children can be born with a hearing loss, or acquire it in the course of childhood. Hearing losses vary in their severity. If a hearing loss is detected early, for example via newborn screening, hearing aids or a cochlear implant can be provided in the first year of life. Absent early detection, intervention will be delayed. Against this background it is inevitable that there is heterogeneity in the effects of hearing impairment on children’s spoken language. That there are consequences, however, in the sound system, in vocabulary acquisition, and in the development of sentence structure is undeniable. A detailed review of the effects of hearing deficits on the spoken-language development of children with hearing loss is provided by Cleary (2009).
Cleft lip and palate

Clefts of the lip and/or palate occur in 1 in 700 live births, with some variation according to location. Scandinavia, for example, has a higher prevalence of cleft lip and palate than England and Wales (Mossey et al., 2009, p. 1776). In the developed world surgical repairs to clefts are usually completed before the child’s first birthday (Chapman et al., 2008, p. 298). For most children this is prior to the development of meaningful speech. Despite the early surgical intervention, speech problems with these children can often persist. Two issues commonly found are “hypernasality” and “compensatory articulations” (Chapman et al., 2008; Zajac, 2013). Often the surgical repair can leave the child with a velum (soft palate) which is unable to perform its function adequately. This is known as “velopharyngeal insufficiency” (VPI). The soft palate (for its position in the oral cavity, see Figure 2.4) is in constant motion during speech. For most of the sounds of English it blocks off the nasal cavity to outgoing air. For a few nasal sounds, for example m, n, the velum is lowered, allowing air to go through the nasal cavity. If after surgical repair the velum is too short to make contact with the back of the pharynx, and so cannot completely cut off the airflow into the nasal cavity, then many more vowel and continuant sounds will have a nasal emission, which may make the child difficult to understand. A compensatory articulation that may be related to VPI, and a consequent inability to maintain an adequate intraoral air pressure, is a substitution of a glottal stop for a p sound. This sound, as at the beginning of the word pat, is made by a brief, complete closure of the lips on the outgoing airstream. For the glottal stop substitute the child makes this brief closure at the vocal cords instead (Zajac, 2013).

Down syndrome

Down syndrome (DS) is a genetically based disorder, resulting from a third copy of chromosome 21. The prevalence quoted in Table 1.3 is similar to that for cleft lip/palate. The prevalence value obtained by Shin et al. (2009) relates to the period 1979–2003 in the United States. During this time the prevalence of DS in the population centers they surveyed increased from 0.9 to 1.8 per 1,000 live births. Language is the area of development in individuals with DS that may be most affected (McDuffie and Abbeduto, 2009). Problems also extend to speech. Children with DS are slow to acquire the sound system of their mother tongue, and intelligibility issues persist into adolescence (Stoel-Gammon, 2001). While receptive vocabulary is an area of strength, syntax has been identified as an area of deficit in individuals with DS. The deficit is more marked in production than comprehension, “until late adolescence, when losses in syntax comprehension are encountered” (Abbeduto and Chapman, 2005, p. 59). Children with DS evidence very slow expressive development. Throughout childhood, delays in expressive language, relative to receptive language and to nonverbal cognition, are identified, in vocabulary, and in utterance length and complexity (Abbeduto and Chapman, 2005; Price et al., 2008). Syntactic competence has also been noted to be poorer than that predicted by their nonverbal cognitive ability. Price et al. (2008) analyzed conversational language samples from a group of 31 boys with DS, between 4;3 and 16 years. The individuals with DS produced less complex structures generally than younger TD boys of a similar nonverbal age. While syntactic deficits persist into
adolescence, syntactic progress does continue to be made. Elin Thordardottir, Chapman, and Wagner (2002) compared a group of 24 adolescents with DS, mean age 16.5, to a control group of TD children who were equivalent in terms of mean MLU (though much younger – average age 3;1 years). All the individuals involved produced a 12-minute narrative sample, which was scrutinized for the use of complex sentences. There were no significant differences between the groups for proportion of complex sentences, or for diversity of complex sentence types. Elin Thordardottir et al. (2002) draw attention, however, to the high degree of variability in the group with DS.

**Autism**

The prevalence value quoted in Table 1.3 relates to children aged 9–10 years in South Thames in the United Kingdom (Baird et al., 2006). These individuals display a triad of impairments, involving social interaction, communication, and stereotyped behaviors and interests. The issue of individual variability in linguistic ability, apparent in Down syndrome, arises again in relation to individuals with autism, but more dramatically: the linguistic abilities of individuals with autism span a considerable range,

from a delay in the development of expressive language to a total lack of expressive language, from problems with initiating or sustaining a conversation to use of stereotyped, repetitive and idiosyncratic language. (Gerstbacher, Geye, and Ellis Weismer, 2005, p. 73; see also Luyster and Lord, 2009)

Most attention has been focused on pragmatic problems in these children, especially conversational and narrative limitations (e.g. Tager-Flusberg and Sullivan, 1995). But Boucher (2012, p. 219), in a wide-ranging review, concludes that there is a substantial sub-group of children with Autism Spectrum Disorder (ASD) who, in addition to their pragmatic and discourse difficulties, have impairments of grammatical structure. Studies investigating grammatical difficulties in language-impaired groups can be divided into those concerned with preschool children and those dealing with children of school age. Studies of preschool groups indicate that up to the age of approximately 6 years, most children with ASD have significantly delayed language development, including grammatical deficiencies. Eigsti, Benetto, and Dadlani (2007) carried out a detailed investigation of the syntactic abilities of children diagnosed with autism aged between 3 and 6 years, compared to children with non-specific developmental delays (DD) matched on nonverbal IQ, gender, and chronological age, and younger TD children matched on nonverbal IQ and gender. Language samples were collected from all children and analyzed using the Inventory for Productive Syntax (IPSyn; Scarborough, 1990). The children with ASD were significantly impaired on this measure, relative to the DD and TD groups. Kjelgaard and Tager-Flusberg (2001) used a battery of standardized tests to explore phonological, lexical, and grammatical abilities. They found that while more than 90% of children were able to complete the phonological and vocabulary tests, only about half were able to complete the Clinical Evaluation of Language Fundamentals (CELF; Semel et al., 2003). The CELF explores receptive and expressive language skills in the areas of morphology, syntax, semantics, and working memory for language.
Specific language impairment

The most prevalent condition in Table 1.3 is specific language impairment (SLI). Unlike the speech and language impairments we have looked at so far, which are associated with identifiable conditions, the neurodevelopmental basis for the language problems evinced by SLI is currently unexplained. The figure of 7% of children falling into this category stems from the only population study we have, conducted in the USA in the mid-1990s (Tomblin et al., 1997). The study initially involved over 7,000 kindergarten (5- to 6-year-old) children who were screened for language problems. Children who failed the screening, and a similar number who passed (a total of 2,000) were administered a battery of language tests. The overall prevalence rate for SLI was 7.4%. The prevalence rate for boys was 8% and that for girls 6%. The term “specific” here indicates that for these children a language-learning disability is their primary developmental problem, but it does not exclude the possibility that such children may have other subtle weaknesses, for example in memory, attention, and executive function. The SLI label is not uncontroversial (Bishop, 2014; Reilly et al., 2014).

What puts children into this diagnostic category? Children with SLI will first of all display a language deficit, most often poor performance on a language test or range of tests, where “poor performance” means a score or scores that fall between minus one and minus two standard deviations or more below the mean. The assessment will also need to eliminate a range of factors that could cause this language problem, such as those we have reviewed above. Children designated SLI should display nonverbal intelligence within normal limits. They should not display autistic spectrum symptoms, and should have intact neurological status, along with normal oral structure and oral motor function. Specific language impairment is sometimes referred to as a “hidden disability,” because of the absence of obvious physical or behavioral characteristics which would alert parents or caregivers. In an attempt to enhance the public profile of this linguistic disability, the Raise Awareness of Language Learning Impairments (RALLI) campaign has put together a number of informative short films on YouTube: https://www.youtube.com/user/RALLIcampaign

There does appear to be a genetic component to SLI – familial studies indicate a higher proportion of language or literacy problems among family members of children with SLI than among family members of TD children (see Schwartz, 2009, and Leonard, 2014, for detailed discussion of SLI).

Speech delay

The final entry in Table 1.3 concerns speech delay, an impairment which, in common with SLI, is unexplained by any identifiable condition in the children who manifest it. This prevalence estimate comes from part of the same population that provided the estimate for SLI. According to Shriberg et al. (1999), the prevalence of speech delay in children who were 6 years old at the time of testing is 38 per 1,000. The data that is the basis for the estimate comes from the application of the Word Articulation sub-test of the TOLD to each of 1,328 children, and from conversational samples on a subset of these children. Speech delay was 1.5 times more prevalent in boys than in girls (4.5% vs 3.1%). When the overlap between speech delay and SLI is addressed, Shriberg et al. report that 11–15% of children with
speech delay also fell into the SLI category, and that 5–8% of the children identified as SLI had speech delay. These findings demonstrate clearly that while speech impairment and language impairment can be co-morbid, they are separate impairments.

Notes

1. The lexical set “goat” is represented here and elsewhere in the text by the symbol [əʊ]. This may be regarded as an overly conservative representation for this vowel as these words are now pronounced by many English speakers of English. Many would now substitute [ou] for the symbol Wells uses. However, since he does use it, and as Smith (1973, 2010), who we quote extensively in Chapter 3, also does, we retain it. Similarly, we retain poor, tour in the lexical set for [ʊə], even though for many British English speakers now the [ɔː] vowel is a more likely realization.

References


study of behavioral, emotional and social difficulties in individuals with a history of specific language impairment.” *Journal of Communication Disorders* 44:186–199.


