To appear in: In C. Marshall (Ed.), *Current Issues in Developmental Disorders*. Hove: Psychology Press.

Teasing apart disadvantage from disorder: The case of poor language

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When children's development is out-of-step with expectations, for example, if they lack social or language skills appropriate for their age, this may reflect factors internal to the child, external factors, or, indeed, a combination of these. While the genetic basis for autism and ADHD is clear (see Newbury, chapter 2, this volume) approximately half the children that Rutter and colleagues studied who were adopted from Romanian orphanages following 6 months or more of institutional care had autistic-like features, cognitive delay, inattention/hyperactivity, and disinhibited attachment (Kreppner et al., 2007). This is a much higher proportion than would be expected to demonstrate these traits in the general population who have not suffered such horrific early deprivation. Similar observations can be made about language impairment: while genetic sources for developmental language deficits have been demonstrated (see again Newbury chapter 2), as many as 50% of children from socially disadvantaged backgrounds do not have language skills appropriate to their age (Locke, Ginsborg, & Peers, 2002). Again, this greatly exceeds expected rates of impairment arising from child-internal factors. We would obviously expect some of those Romanian orphans to have had autism or ADHD, and some children with low SES to have language impairment; we might also expect that effects of external factors will be intertwined with internal factors (see Thomas, chapter 4, this volume). But if children have impaired language skills, does it matter what lies behind these? Teasing apart the contribution of external and internal factors, we argue, is important if we are to understand the developmental pathways that lead to poorer-than-expected performance, and if we are to offer appropriate intervention. Addressing the distinction between poor language due to disadvantage and intrinsic language disorder is therefore important in theory and practice.

In this chapter, we review studies of speech and language in preschool children and primary school aged children from low socioeconomic backgrounds. We will draw on evidence from the UK, US and our own studies of preschoolers. We begin by considering what factors comprise SES classifications, discuss the non-linear relationship between language performance and SES, and evaluate the extent to which SES-related differences are due to differences in care-giving. This is followed by a more detailed discussion of what is meant by language impairment and the nature of SES-related poor language performance, including the knotty issue of whether and how, theoretically and empirically, we can tease apart language delay due to

'disadvantage' as opposed to 'disorder', and the kind of measures that are required to do this. We highlight social and cultural biases of standard measures used to assess children's language, and make a case for measures proposed to be less affected by differences in environment and experience, drawing on evidence from others' studies. We then present unexpected findings from our own studies using these measures, and discuss the implications for language delay in children from low SES backgrounds, including the role of attention, executive function, and self-regulation. The conclusions we draw have implications for the types of intervention needed to promote language skills in children in socially disadvantaged communities.

Classification of SES

'Socioeconomic disadvantage' and 'low SES' are relative, not absolute, terms that vary according to which reference factors and cut-offs are adopted. Classifications are derived from single or combined measures (Hollingshead, 1975) of factors thought to relate to families' 'living conditions' including occupational, educational and income levels of main carers (see Hernandez & Blazer, 2006, Chapter 2 for full discussion of these social environmental variables and their relation to health). Primary and secondary caregivers, either singly or combined, may be targeted, and information gained either directly or through self-completed questionnaires. SES levels may refer to individual factors (e.g. occupational status (Hart & Risley, 1995) or parental education level (Fenson et al., 2000)). Separate SES measures are significantly interrelated (Hart & Risley, 1995; Roy & Chiat, submitted). Broader classifications of SES are often adopted (e.g. low, middle and high) based on either composite measures or single factors. Although income has been found to be more predictive of cognitive development and vocabulary (Duncan, Brooks-Gunn, & Klebanov, 1994; Marulis & Neuman, 2010), education level has probably been more widely used in research on early language acquisition. Parents are often more willing to provide education and occupation data than income data (Noble, McCandliss, & Farah, 2007). Measures may extend beyond individual families to the wider community such measures have been adopted in studies of SES and early language development (e.g. free school meals (Locke et al., 2002); ACORN (A Classification of Residential Neighbourhood, Dodd et al., 2003); the Index of Multiple Deprivation (Roy, Chiat, & Dodd, 2010). Whatever measures are adopted, SES indices influence outcomes through the quality of the physical and psychological environments that children experience. Significant factors associated with SES and poverty in the pre-, peri- and post-natal periods include, for example, exposure to toxins and psychological stress, nutritional levels, parenting styles, cognitive stimulation and educational experiences.

Differences in reported language outcomes across studies are likely to be a function of the nature and heterogeneity of the sample, the range in SES variables and the stringency of cut-offs for defining low SES groups (Arriaga et al., 1998). There is increasing evidence that the relation between SES and language outcomes is non-linear: poorest outcomes are disproportionately associated with the most socially and

economically disadvantaged groups (Duncan et al., 1998; Hart & Risley, 1995; Roy, Kersley, & Law, 2004; Washbrook & Waldfogel, 2010). For example, in their nationally representative sample of 12,644 British 5 year olds in the UK Millenium Cohort Survey, Washbrook and Waldfogel found that their poorest income group had vocabulary scores nearly a year below the middle income group, more than twice the gap between middle and high earners, although the income gap between middle and high earners was twice that between middle and bottom earners. Further, SES measures such as education that are highly discriminating for language outcomes in large, representative samples may not be discriminating in samples where the range in key SES variables is more limited (Roy et al., 2010; Hurtado, Marchman, & Fernald, 2008). Contrary to previous studies, we found that parent educational level within a low SES group was not significant for preschoolers' language outcomes (see section 'The Barking and Dagenham study' below for full description of the study). In contrast maternal occupation, favouring the employed, was significant. It is likely the unemployed mothers were not only worse off financially, but were also more socially isolated than those at work. Social isolation is related to individuals' well-being, which in turn is likely to impact on the quality of interaction with their children Broad measures of SES, although useful in identifying gaps in performance at a group level, tell us little about individual children's language experiences and how these impact on their language.

Low SES, language delay and associated problems

Across the last two decades, there has been increasing evidence of poor language performance in young children from socioeconomically disadvantaged backgrounds. Their performance on a range of language measures has been found to be significantly lower than that of their more advantaged peers (Hart & Risley, 1995; Fish & Pinkerman, 2003; King et al., 2005; Locke et al., 2002; Locke & Ginsborg, 2003; Nelson et al., 2011; Qi et al., 2003; and see Ginsborg, 2006). Average scores of children from low SES groups are reported to be three-quarters to one standard deviation below average scores for the general population. According to some studies, as many as 50% have scores in the low range (1SD or more below average) and about 10% have very low scores (2SDs or more below average) which is about four times the proportion in the general population. Furthermore, the distribution of standard scores is skewed towards the low end: not only do a disproportionate number of children have below average scores, but relatively few perform in the above average range.

Most of these studies used standardised language measures. An exception is Hart and Risley's study of 42 US families from three SES groups ('professional, working class, and welfare'). Their measures of parents' language and children's vocabulary were based on direct observations and transcriptions of audio recording, starting when the children were 10 months old and finishing when they were 3. Arguably, these measures are less subject to the inherent SES bias found in standard assessments that

we discuss in more detail later. Yet marked discrepancies in children's vocabulary use and growth were evident by 3, with SES accounting for 40% of the variance in scores.

Although our main focus is on language delay, this may not be the only problem that children from low SES backgrounds face. They are also known to be at risk of literacy problems (Flus et al., 2009), poor academic achievement (Snow et al., 2007) and socioemotional problems (Washbrook, 2010), but we know less about the nature of the relationships between these co-occurring problems and SES-related language delay. Nelson et al. (2011) addressed these questions in a large sample of socioeconomically disadvantaged 4-year-old US preschoolers attending Head Start programmes. A high proportion of children had language problems and there was a step-wise relationship between language delay and the measures of academic and socioemotional skills. Children with Strong Language Delay (2/3 language variables at least 1SD below norms and one variable at least 1.5 below norms) had the poorest outcomes and those with High Language status (at least average scores) the best. It is not known to what extent reported associations between language delay and co-occurring problems in the general population are carried by the more socioeconomically deprived children.

Likewise, we know there are negative long-term implications of early speech and language problems on educational achievement, social inclusion and employment opportunities (Johnson et al., 1999; Johnson, Beitchman, & Brownlie, 2010; Law et al., 2009; Snow et al., 2007; Schoon et al., 2010; Snowling et al., 2006; Stothard et al., 1998). Once again we do not know if low SES groups are at greater risk of negative outcomes, nor if the developmental trajectories for children with early language delay differ across SES groups. A key question we address in this chapter is the extent to which early language delays are comparable across SES groups. Apparently similar speech and language profiles may be underpinned by different mechanisms and have different histories that may have implications for their long term sequelae.

Caregiving variables and language

Although it is parents' status that decides children's SES membership, for young children it is their first hand, day-to-day experience of parenting and care that shapes their worlds. Beyond the individual, research at group level has shown there are systematic SES-related differences in the ways parents communicate with their infants that impact on early language development.

Hart and Risley (1995) found a huge disparity between their SES groups in the quantity of words the children were exposed to. 1-2-year-olds in their 'welfare' group experienced about a quarter of the number of words heard by the children from professional families, an estimated difference of about 153,000 words per week. These 'meaningful differences' in early language exposure were related to later language development. The Matthew principle operated at many levels. How much

parents talked to their children as infants was strongly related to the amount they talked to them at 3 years. Moreover, there was a close association between quantity and quality. The more words the children heard, the greater the richness and diversity of the language the children were exposed to and the lower the proportion of imperatives and prohibitions they received. The preschoolers' language mirrored that of their parents not only in terms of the size and make-up of their vocabulary, but also in interaction styles, which reflected the amount of positive and negative feedback they had received as infants. Although, as noted above, SES was highly predictive of children's vocabulary use and growth at 3 and language at 9, proximal measures of parenting language and style (based on analyses of their language output) did better, accounting for an additional fifth of the variance in children's scores. There was a huge disparity between their two extreme SES groups, the welfare group and the professional group, with little or no overlap of scores on any parenting variables or any of the children's outcome measures. However, there was much more variability and spread of scores in a middle 'working class' group comprised of low and middle class families. SES measures of this group were not predictive of language and cognitive scores at 3 and 9, but proximal parenting variables were.

Subsequent research has consistently shown that the quantity, diversity and complexity of parents' child-directed speech in daily interactions with their children affects the nature and speed of early language acquisition. Children from middle to high SES backgrounds compared with those from low SES families are more likely to experience opportunities such as shared book reading which is known to elicit more complex and lexically rich language in parents' conversations with their children. However, as Washbrook & Waldfogel (2010) showed, although parenting style may account for a significant amount of variance, it is far from the whole story. Amongst other factors they found that material deprivation and child-related health factors accounted for nearly a third of the income related vocabulary gap. Other studies have found that the association with SES holds even after controlling for parenting style and how talkative the children are themselves (Hoff, 2003; Huttenlocher et al., 2010).

The older the child gets the more the SES-related vocabulary exposure gap widens (Hart & Risley, 2003) and by school entry, the vocabularies of the most disadvantaged children are substantially smaller than their more advantaged peers. They continue to build their vocabularies at a slower rate, so the gap widens year-on-year (Anderson & Nagy, 1992). As Marulis and Neuman (2010) point out 'interventions will have to accelerate – not simply improve – children's vocabulary to narrow the achievement gap' (p.301). Their careful meta-analysis of the effects of preschool interventions to enhance vocabulary cast doubt on how feasible this is to achieve in practice. Indeed, their findings suggested that intervention may even exacerbate the income gap in performance, in that middle- and upper-income children were much more likely to benefit from vocabulary intervention than children from low-income backgrouns. Likewise, in a follow-up study of clinically referred

preschoolers (Roy & Chiat, submitted), we found that the children from middle- and high-income groups showed significantly greater gains in expressive and receptive language than those from the low-income group. Even at this very young age, interventions known otherwise to be effective are not sufficiently powerful to reduce, never mind close, the income gap.
A series of studies with low SES and high SES children by Fernald, Hurtado and Marchman (see Hurtado et al., 2008) shed some light on the possible underlying mechanisms. In a longitudinal study they established links between infants' early language input, the speed and efficiency of their online speech processing skills and word comprehension, and their capacity to acquire and expand their vocabularies. Fernald (2010) concluded that 'child-directed talk not only enables faster learning of new vocabulary – it also sharpens the processing skills used in real-time interpretation of familiar words in unfamiliar contexts, with cascading advantages for subsequent learning' (p. 91). In our own studies of preschoolers (Roy et al., 2010; Roy & Chiat,submitted), we found evidence that low SES heightened the risk of having less efficient lexical processing skills, poorer speech and language abilities and reduced capacity to respond positively to intervention.

An alternative interpretation of these findings is that the poor language outcomes of socioeconomically disadvantaged children are due to heritable rather than environmental factors. There has been a body of evidence and arguments against this view (see e.g. Hoff, 2003, 2006; Huttenlocher et al., 2002). A full discussion of gene x environment interaction is beyond the scope of this chapter (but see chapter 2 this volume; Hernandez & Blazer, 2006; Rutter, 2008). However, it is noteworthy that the receptive subscale that most discriminated the language performance of the low and mid-high SES groups in our Barking and Dagenham study was very similar to a task known to be largely environmentally determined (see below). In this context, recent findings from the Bucharest Early Intervention Program (BIEP), a randomised control study, are of interest (Windsor et al., 2011). The paper reported on the language outcomes at 30 and 42 months of a sample of institutionalised children who had either been randomly assigned to foster care (FC) or remained in institutional care (IC). Overall the FC group had substantially better expressive and receptive language outcomes than the IC group, but timing of placement was crucial. The language skills of children placed early (under 15 months) did not differ from a community sample from intact families. In contrast, those placed after two years had severe language delays, comparable to children in the IC group. In other words, for the randomly placed FC children who shared the same genetic risks as the IC group, very early enriched verbal input and responsive parenting were effective in preventing a language delay associated with early, albeit severe, deprivation. Interestingly though, both groups made few grammatical errors and did not differ in this respect. The more impoverished linguistic input of the IC group had not affected their syntactic development, at least not at this age. The authors concluded that the language deficits

seemed to be due to severe delay rather than disorder, and their language skills were aligned with their broader cognitive abilities.

Likewise, a longitudinal study of syntactic skills found no differences between SES groups in mastery of basic syntactic rules of simple sentences (Vasilyeva, Waterfall & Huttenlocher, 2008). By 2;6, however, clear SES related differences emerged in the production of more complex multi-clausal sentences, favouring those children whose mothers' educational qualifications exceeded the level of high school diploma. The authors suggested that task-related differences in performance may reflect different mechanisms involved in their production, with simple syntax relying on mechanisms that are available to all typically developing individuals. On the other hand, the amount and the nature of verbal input may be critical for the acquisition of complex structures.

Low SES and language impairment

The higher rates of low language performance found in children from low SES backgrounds are in line with the disproportionately high rates of specific language impairment (SLI) found in disadvantaged groups within the general population. Tomblin et al. (1997)'s landmark investigation of the prevalence of SLI in the US reported an overall prevalence figure of 7%. This was based on a large sample of kindergarten children attending public schools, stratified according to urban, suburban and rural residential settings, but not by SES background. The overall prevalence figure collapses across residential and SES strata, masking the possible occurrence and extent of differences in prevalence for different socioeconomic groups. This becomes apparent in the more detailed breakdown of results which reveals variations in the prevalence rate observed in different ethnic groups, with higher rates in Native American and Afro-American children, followed by Hispanic children, then White children, and not one case of SLI amongst the Asian participants. Pointing out that 'these data are not adjusted for the socioeconomic background of the children participating', the authors comment that 'The confounding of race/ethnicity with the socioeconomic variables of parental education and income within the U.S. society is widely documented…. Thus, the fact that SLI occurred at a greater rate among African Americans, Native Americans , and Hispanics than among Whites was very likely due, at least in part, to the lower levels of parental education and income within these groups' (Tomblin et al., 1997: 1258).

At face value, the results of this prevalence study as well as results from studies of low SES groups lead to the conclusion that language impairment is relatively frequent in low SES groups and relatively rare in high SES groups. However, this conclusion begs questions about what is meant by language impairment, and whether all children who perform in the low range on tests of language are properly diagnosed as having a language impairment.

According to Tomblin et al.'s study, all children meeting their criteria for SLI have an impairment by dint of their language performance, whatever their social background and whatever the reasons for their poor performance. But if we take SLI to refer to poor language performance that cannot be explained by limitations in a child's language experience, reflecting an intrinsic difficulty in acquiring language (Bishop, 1997; Leonard, 1998), the picture is less clear. As pointed out above, children living in disadvantaged communities are at particular risk of reduced input and experience, and this may account in part or in full for limited language in at least some of these children. In the case of vocabulary acquisition, this is more than plausible: since each lexical item in a language is an arbitrary connection between a phonological form and a meaning, we can only acquire vocabulary items to which we are exposed. Given SES differences in children's vocabulary input, it is unsurprising that children from different socioeconomic backgrounds attain low levels of vocabulary.

What about other aspects of language? Diagnosis of SLI typically relies on omnibus measures of receptive and expressive language such as the Preschool Language Scales (PLS; Boucher & Lewis, 1997), the Test of Language Development (TOLD; Newcomer & Hammill, 1988) and the Clinical Evaluation of Language Fundamentals (CELF; Semel, Wiig, & Secord, 2006). For example, in Tomblin et al.'s study of prevalence, children were assessed on five subtests of the TOLD-2:P (Newcomer & Hammill, 1988) and a narrative comprehension and production task (Culatta, Page, & Ellis, 1983). The TOLD subtests were Picture Vocabulary, Oral Vocabulary, Grammatic Understanding, Sentence Imitation, and Grammatic Completion. To be diagnosed with language impairment, children had to score at least 1.25 SD below the mean for their age on two out of five composite scores derived from these tests (Comprehension, Expression, Vocabulary, Grammar, Narrative). For diagnosis with SLI, their Performance IQ score had to exceed 85. These criteria invite several observations. First, performance below -1.25 SD on vocabulary and narrative would be sufficient for diagnosis of language impairment. As pointed out above, vocabulary knowledge is indisputably influenced by exposure. The role of exposure in the development of narrative is less clear-cut. Nevertheless, it is highly likely that experience of story-telling and books, as well as rich and varied social discourse, will influence children's understanding and production of narrative. As pointed out above, input to children from low SES backgrounds is relatively limited in all these respects (Tough, 1977, 2000; Tizard & Hughes, 1984). On these criteria, it is unsurprising that children from less advantaged backgrounds are disproportionately represented in the SLI group.

While the case is most obvious with vocabulary and narrative, closer consideration of the clinical instruments used to assess receptive and expressive language demonstrates that they too go beyond the basic language skills entailed in spontaneous language production, requiring skills that are better nurtured and developed in more socially advantaged groups. To appreciate why children from socially disadvantaged

backgrounds may be at greater risk of poor performance on language tests even if they do not have a language impairment, we need to compare the demands of receptive and expressive language tests with the demands of everyday language comprehension and production.

To understand a sentence, children must recognise the constituent word forms and their order (in English, where meanings are encoded by word order), and must map these onto word meanings and meaning relations to arrive at a mental representation of the situation conveyed by the sentence (Chiat, 2001). Consider now what is entailed in tests of sentence comprehension. Most typically, such tests employ a picture selection or picture pointing task. In the TOLD, for example, the child is presented with three pictures, including the target and related distractors. To select the correct picture (at above chance level), the successful mapping of sound onto meaning is necessary. But this is not sufficient. The child must also scan and interpret the pictures, must not be deflected by partial overlaps between distractor pictures and word/relation meanings in the sentence, and must select the picture that matches the sentence in *all* key respects (i.e. consistent with words and their syntactic relations). This requires sustained and selective attention to verbal and visual input, comparison between these, and inhibition of partial interpretations. Where targets encode more complex meanings, correct interpretation relies on inferences about relations in pictures based on previous experience as well as verbal comprehension, and matching between information from these two modalities (see Silveira (2010) for detailed argumentation and examples). The 'Concepts and Directions' subtest of the Preschool CELF (Semel, Wiig & Secord, 2006) poses similar challenges. For example, presented with a picture showing big and small dogs, fish and monkeys, and the instruction 'Point to the big dog then point to the little monkey', the child must pay attention to and retain the two adjective-noun combinations in the verbal input in the face of a ‘loaded’ picture that includes the reverse as well as the target combinations. These demands go well beyond everyday comprehension, where the child hears utterances in contexts that rarely focus on decontextualised conceptual contrasts (e.g. in size, spatial order, temporal order) and rarely present minimal pairs, and where some aspects of the meaning may be predictable from situational experience, reducing the need to attend to *every* aspect of the input to form a full and correct mental representation of the meaning.

Exposing these wider demands of receptive language tasks does not invalidate them as measures of language comprehension, which clearly includes the ability to understand the full linguistically encoded meaning without contextual support, and the ability to extend interpretation through integration of linguistic meaning with context. Indeed, understanding language in school relies on these abilities and increasingly so through the school years. Performance on receptive language tasks is therefore informative about the range of verbal comprehension essential for take-up of school input. Our point is that such abilities go beyond basic language comprehension

and that poor performance on these tasks may reflect limited experience of task demands such as cross-modal matching, interpretation of pictures and/or situations depicted in these, inferencing and sustained attention. Higher order cognitive functions such as the selection, shifting and sustaining of attention, the maintenance of information in working memory and inhibitory control involved in the regulation of goal directed behaviour are referred to collectively as executive function (EF) or executive control (Rueda, Posner, & Rothbart, 2005; Wiebe et al., 2011). As will be seen, there is increasing evidence of EF deficits in children from socioeconomically disadvantaged backgrounds.

The same points can be made about expressive language. Basic language production entails the mapping of the child's own meaning intentions onto words and word combinations in conformity with the requirements of the language, i.e. with words in the appropriate order for intended meaning, and obligatory function words and inflections included. Expressive language tasks vary in the extent to which they exceed these basic demands. Being asked to produce a sentence to describe a picture using a given word, as on the CELF, is clearly different from expressing a self-generated meaning intention: the child must not only know the target word/structure, but must also focus on relevant aspects of the picture and adopt the intended semantic target before mapping this onto the appropriate word(s)/structure. In a task eliciting a grammatical marker such as past tense, the child must know the target morpheme (e.g. regular/irregular past tense), but must also recognise the requirement of the task to produce the verb presented in the input and mark this with the simple past tense rather than another auxiliary modifier even if this would be syntactically acceptable. Again, the wider demands of expressive language tests do not invalidate these as measures of children's verbal abilities. Schooling relies on and contributes to the development of the type of verbal skills they elicit: through the school years, children are increasingly required to adopt new perspectives and new meanings and to encode these in precise forms of language. Expressive language tests are therefore informative about children's readiness to meet the oral language demands of the classroom.

The higher level language abilities measured by standard language tests are therefore essential for children's participation in and benefit from academic life, and indicate risk of academic struggle and failure, as follow-up studies of children confirm (see above). The basic language skills we have identified, on the other hand, are essential for children's everyday life. When children have difficulty understanding utterances in everyday contexts, and frequently 'get the wrong end of the stick', and when they have problems storing and accessing words, mispronounce words, struggle to convey familiar events using the usual range of verbs and verb structures, mix up temporal references and omit or substitute grammatical markers (required even if they make little difference to meaning), their difficulties affect more fundamental aspects of their lives: their social interaction and relations with family, peers, and the wider community. Such difficulties are hallmarks of SLI (Leonard, 1998; Chiat, 2001). But

they are not necessarily problems for children who perform poorly on standard tests of receptive and expressive language, since these are liable to be influenced by input and experience in ways that basic language skills are not.

This claim finds support in evidence of SES effects on standard language measures where this is available. While standardised test manuals include information about the socioeconomic distribution of the standardisation sample, it is relatively rare for manuals to include a breakdown of scores according to socioeconomic grouping. Interestingly, though, Peers, Lloyd and Foster (2000) included such analysis as part of the standardisation of the Clinical Evaluation of Language Fundamentals - Preschool^{UK} (CELF-P), and found that moderate or severe language delay was more than five times as likely in children from low SES backgrounds. However, Locke et al. (2002) suggested that the low performance of socially disadvantaged children does not arise from inherently lower language-learning abilities, but is more likely attributable to their early experience when 'it is likely that most of them have the potential for normal language development' but 'have lacked the input and opportunities to acquire vital linguistic skills' (p.13). In Campbell et al.'s (1997) words, 'poor performance may actually reflect the child's relative lack of experience with the test's format or stimuli, rather than indicating a more fundamental deficit' (p.519). Tomblin et al. (1997, p.1258) make similar points about the findings of their prevalence study: 'The results showing a greater rate of SLI among most children of minority backgrounds were not surprising, given the cultural and linguistic bias of the clinical instruments employed'. These findings on test performance and language experience have important implications. If children attain low scores due to SES bias of the tests, they will require intervention to enhance their language knowledge and skills, thereby equipping them better to access and benefit from education. However, they will not require the clinical intervention targeting basic linguistic skills appropriate for children who have intrinsic difficulties in language acquisition.

Given the different possible causes of low language performance, associated with different repercussions and needs, we argue that a distinction should be made between deficits in basic language skills necessary for everyday interactions, and deficits in higher level language skills particularly necessary for schooling and for participation in a highly literate culture, and propose that the term SLI or language disorder should be reserved for children who have deficits in everyday language. This accords with Vasilyeva et al. (2008)'s distinction between production of basic syntax, which was not affected by SES, in contrast to production of complex syntactic structures, which they took to be more affected by the nature of verbal input.

But if standard tests of language elicit poor performance in both cases, how can language disorder and language disadvantage be distinguished? Tomblin et al. (1997, p. 1248) suggest this may be 'a challenging if not intractable problem because epidemiologic research calls for highly standardized methods that are inherently

insensitive to cultural differences'. Taking a different approach, Campbell et al. (1997, p.519) observe that 'proposals for alternative or unconventional tests that are free of bias have been in short supply'. Nevertheless, they and others have identified measures that test language skills in ways that are minimally dependent on experience and established knowledge, and are relatively independent of SES, and that may therefore distinguish between language disorder and language disadvantage. The proposed measures are often designated as 'processing-dependent' as opposed to 'knowledge-dependent' (Campbell et al., 1997), since they minimise demands on children's language and cultural knowledge. In addition, some require minimal attention, no metalinguistic skills, and no inferencing, and they are less open to influence from everyday exercising or testing of language skills. Impairment on these tasks is known to relate to language disorder, and we refer to them as 'core language measures'.

Core language measures

Key amongst the proposed measures of core language are verbal repetition tasks. Word/nonword repetition and sentence repetition are known to probe important language skills: they relate to many other measures of language in mixed SES groups, and distinguish children with typical and atypical language development (Conti-Ramsden, Botting, & Faragher, 2001; Gathercole, 2006; Graf Estes, Evans, & Else-Quest, 2007; Seeff-Gabriel, Chiat, & Dodd, 2010). Both have been proposed as clinical markers for SLI (Bishop, North, & Donlan, 1996; Conti-Ramsden et al., 2001). Furthermore, word and nonword repetition have been found to predict later morphosyntactic skills as measured by sentence repetition and grammar score on the Renfrew Action Picture Test (Chiat & Roy, 2008; Roy & Chiat, 2008). At the same time, these tasks appear to be relatively unaffected by SES. No differences in nonword repetition performance were found between UK children from upper middle class and working class backgrounds (Burt, Holm, & Dodd, 1999). Similarly, Engel, Santos and Gathercole (2008) found no differences between 6-7 year old Brazilian children from high and low income families on nonword repetition, despite significant differences in vocabulary; Campbell et al. (1997) found no differences between 'minority' and 'majority' participants, aged 11-14 years, on a nonword repetition test, but significant differences on a broad-based measure of oral language. In our standardisation of the Early Repetition Battery (Seeff-Gabriel, Chiat, & Roy, 2008), we found that parental education level affected scores for whole sentence repetition, and to a lesser extent, word-nonword repetition, with children of parents who had no qualifications accounting for those effects that were observed. Interestingly, though, no SES effects were found for number of content words (all of which were early-acquired familiar items) and number of function words repeated correctly, The function word score, in particular, is taken to be a measure of basic morphosyntax; according to our findings, then, mastery of basic morphosyntactic skills is robust in the face of environmental differences.

The capacity to learn new words has also been proposed as a processing task that does not rely on prior knowledge. Vocabulary acquisition is a crucial aspect of language acquisition, and is known to be impaired in children with SLI. These children perform less well than typically developing children on tasks requiring fast mapping between novel word forms and their referents and retention of novel words for subsequent recognition and naming (Alt & Plante, 2006; Leonard, 1998; Oetting, 1999; Rice et al., 1994). Horton-Ikard and Ellis Weismer (2007) investigated fast mapping skills in groups of African American children from low and middle SES backgrounds at age 30-40 months and found no significant difference between SES groups on this task, in contrast to the significant difference found on standard tests of receptive and expressive vocabulary.

The identification of processing tasks showing reduced if any effects of SES provided the motivation for our hypothesis that these tasks would help to distinguish language disorder from language disadvantage in preschool children living in a socially disadvantaged community. We investigated this hypothesis in a study of children living in a socially disadvantaged area of Greater London.

Standard and core language performance in a low SES sample: The Barking and Dagenham study

Participants in our study were 219 children with English as a first language who attended nurseries or reception classes in schools in Barking and Dagenham, a local authority ranked in the bottom 3-6% (out of 354) in England according to the Index of Multiple Deprivation (2007). The children were aged between 3;6-5;0, with an equal distribution across three six-month age bands. Standard tests were administered to assess receptive and expressive language (CELF-Preschool-2; Semel,Wiig, & Secord, 2006) and receptive vocabulary (BPVS-3; Dunn et al., 2009). To investigate core language, we identified four assessments that make minimal demands on knowledge and experience, and that test speech production, phonological processing and memory, and morphosyntax:

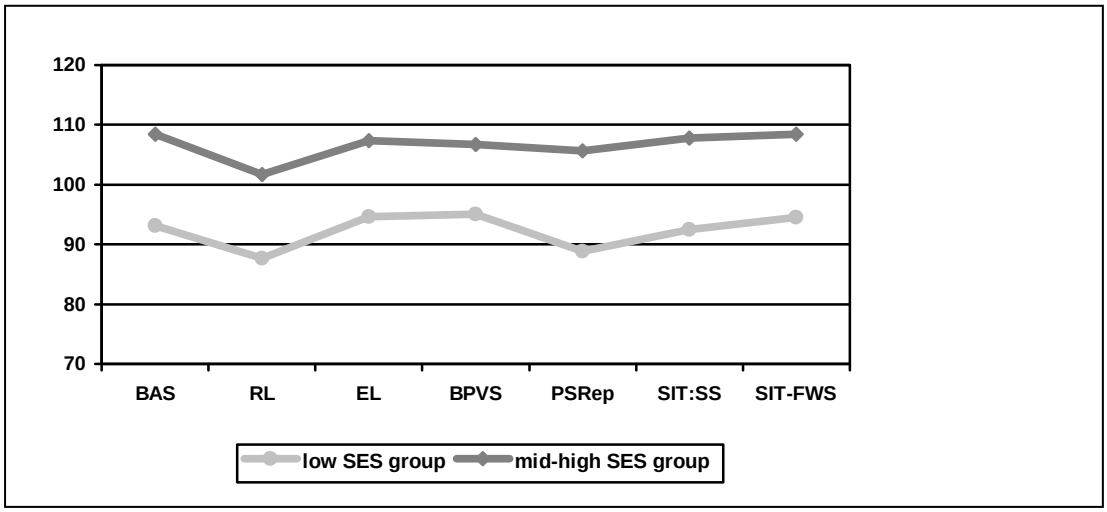
- the Diagnostic Evaluation of Articulation and Phonology (DEAP; Dodd et al., 2002), which identifies children with speech delay and disorder
- the two tests in our Early Repetition Battery (Seeff-Gabriel, Chiat, & Roy, 2008):
    - the Preschool Repetition Test (PSRep), which assesses children's repetition of real words and nonwords
    - the Sentence Imitation Test (SIT) which assesses children's repetition of content words and function words within sentences
- a novel word learning task.

The BAS-II (Elliott, Smith, & McCulloch, 1996) was used to measure nonverbal abilities. With the exception of the novel word learning task, all standard and core language measures were standardised assessments.

As well as comparing their performance with norms on standard and core measures, we made comparisons with performance of a mid-high SES sample of 168 age matched children drawn from socioeconomically more advantaged areas across London. The two samples differed significantly on all our key indices of SES (education, occupational levels and employment status of primary and secondary caregivers).

As expected, the distribution of language scores in our low SES group was consistently low, and significantly below the scores of the mid-high SES comparison sample. In contrast, performance below the average range was vanishingly rare in the mid-high sample. The nonverbal measure yielded similarly skewed performance in the two groups (see figure 1 for mean scores of each group on each measure).

Figure 1: Distribution of the mean standard and core language scores and nonverbal scores for the low and mid-high SES groups (all tests with a mean of 100 and SD of 15)



BAS: British Ability Scales II

RL, EL: Receptive and Expressive CELF Preschool 2

BPVS: British Picture Vocabulary Scale 3rd ed.

PSRep: Preschool Repetition Test

SIT:SS, SIT-FWS: Sentence Imitation Test total sentence score and function word score

Broadly, then, our findings on standard language measures replicated the outcomes of previous studies of socially disadvantaged preschoolers (Locke et al., 2002; Locke & Ginsborg, 2003; Fish & Pinkerton, 2003; Qi et al., 2003; King et al., 2005). However,

profiles of performance across measures and across age contrasted with previous findings in some respects. While performance on receptive language was poor in our sample and the proportion below average similar to previous findings, expressive performance was relatively higher, and higher than previously reported for disadvantaged groups where expressive and receptive scores were found to be equally depressed. Many more children were identified with receptive-only problems or combined problems than expressive-only problems (contrasting not only with previous findings on low SES groups but with profiles observed in clinic samples: see Roy & Chiat, submitted).Whilst nonverbal performance did not account for the between-SES group differences in standard and 'core' language scores, a substantially higher proportion of the low SES group had below average nonverbal scores compared with the mid-high SES sample (27.4% vs. 4.8%). In both groups, children with below average nonverbal IQ were much more likely to have co-occurring LI than those with nonverbal scores in the average range.

While this profile of language performance was consistent across the three age groups in our study, the rate of poor performance was not equally distributed across the three 6-month age groups. Many more nursery children (3;6-3;11) were low scorers compared with the two older age groups (4;0-4;5 and 4;6-4;11) in reception class whose language skills were broadly comparable. Although receptive scores overall were lower than expressive, the age-related differences were more marked in receptive performance. In contrast, Locke et al. (2003), in their study of UK pre-schoolers (median 3;5), found little or no evidence of improvement with age, and the proportion of children with severe problems at follow-up (median 5;4) increased.

The non-linear age differences in standard scores that we observed suggest that school, at least initially, had a positive impact on language performance. Evidence of a significant association between rate of school attendance and language performance, particularly in the youngest age group, supports this conclusion. Studies of low SES groups inevitably differ in details of sampling and methods, and while Locke et al.'s study is similar to ours in both respects, it is still possible that differences in sampling characteristics or in early years programmes may be responsible for different findings. However, conclusions from our study must remain tentative as the data are cross-sectional and may reflect cohort effects rather than true age-related changes. To test this out, we are in the process of running a small follow-up study of the youngest age group.

Whatever our eventual findings on 'catch-up' through school experience, the proportion of our low SES group with language impairment was disturbingly high, with nearly a third scoring in the impaired range according to knowledge-based standard language measures. But how did they perform on measures of core language previously found to be less affected by SES?

Results on these core language measures were not as we expected. Contrary to theoretical predictions and findings from previous studies (Campbell et al., 1997; Engel et al., 2008; Law, McBean, & Rush, 2011), the 'core' language performance of the low SES group was as depressed as their standard language performance (see figure 1). Significantly more children in the low SES group failed the speech screen of the DEAP (17.8%, compared with 8.9% in the mid-high SES group). Full assessment of these children found more false positives in the low SES group, and while more children in this group than in the mid-high SES group were classified as having speech disorders (13.7% vs. 8.3%), this difference fell short of significance. However, speech problems classified as 'delayed' were disproportionately high in the low SES group: about four times greater than the rate found in the mid-high SES. Moreover, the therapists assessing the children reported that the spontaneous productions of some children in the low SES group were much less intelligible than their responses to the individual targeted DEAP items. In other words, the clinical measure might overestimate the children's intelligibility in everyday discourse and underestimate the speech problems in our low SES group. It seems that even basic speech processing is at increased risk of delay in these children. The distribution of performance on basic phonological and morphosyntactic skillls (as measured by the Early Repetition Battery: Seeff-Gabriel et al., 2008) were again below the level expected in the general population. Poor performance was more marked on the word/nonword repetition on PSRep, than the function words of the SIT, which nevertheless showed a gap of 1 SD between the SES groups. Moreover, speech disorders did not explain the unexpectedly poor PSRep performance in the low SES group. Our novel word learning task, reflecting children's fast mapping skills and phonological retrieval skills, was exceptional in eliciting equal scores for *comprehension* of the new words, but when it came to *production*, the significant disparity favouring the high SES group recurred.

As with the standard measures, the distribution of performance on core measures improved across age, and for function word scores, the distribution 'normalised'. In this case, as with sentence scores, improvement was linear across the three age groups, suggesting that maturation and/or increased input over time was more important than the specific input provided by school for the development of basic morphosyntactic skills.

Our findings at a group level are clearly at odds with our hypothesis: contrary to our predictions, performance on core language measures, presumed to rely less on experience and knowledge, was for the most part as affected by SES as performance on standard measures. At an individual level, on the other hand, there was some evidence of children with our hypothesised profile of language disadvantage: poor performance on standard language measures in the face of sound core language skills. On average, about a third of the children with poor standard language scores were in the normal range on core language measures. This nevertheless leaves a substantial

proportion of children scoring poorly on core as well as standard measures, a profile we took to indicate impairment rather than disadvantage.

This unexpected outcome raises a number of questions and issues. First, why did we find depressed performance on measures previously found to be free of SES effects? This is most striking in the case of our word/nonword repetition test, which relies *least* on prior experience and knowledge (particularly in the case of nonwords since these are new to all children) yet showed markedly low performance across our age range. Previous studies of nonword repetition in low SES groups have involved children of 6 years and above (see section on 'Core language measures'). Our own study found that the rate of performance in the impaired range reduced across the age range. It is possible, then, that thresholds of experience required for 'normal' nonword repetition are reached later in socially disadvantaged groups, and that this 'core' measure would be more effective in differentiating disadvantage from disorder in school-age children. Comparing our findings on novel word learning with those of Horton-Ikard and Ellis Weismer (2007), who found no differences between their low and middle SES groups, it is striking that their sample size was small (n=15 in each group), and as in our study, variability in scores was high. Therefore, as acknowledged by the authors, this study lacked power. Furthermore, their data show a difference in production of novel words favouring the middle SES group, but this difference was not analysed.

Taking into account findings of other studies, it seems that at least in the early years some experiences of social disadvantage are associated with poor core language performance as well as poor performance on standard tests of receptive and expressive language. Further research is needed to identify the indices of social disadvantage that are associated with poor performance on core as well as standard language measures. Whatever the outcome of such research, the findings in our Barking and Dagenham study bring us back to the issues we set out to address: whether poor performance in the low SES group can be differentiated from intrinsic language impairment in the wider population, and/or whether it reflects a considerably higher rate of intrinsic language impairment found in the wider population. Further reflection on our findings may throw some light on the sources of the disproportionately poor performance observed in our low SES group, even on core measures. First, our finding that CELF receptive language, and particularly the Concepts and Following Directions subtest, was most affected and changed most with school experience *is* in line with our argument and expectations: this task is most reliant on attention and inferencing skills that go beyond the processing skills needed for basic language comprehension (see above). Interestingly, the demands of this task are strikingly similar to the BAS Picture Comprehension task which Kovas et al. (2005) found had zero heritability estimates at the extreme low end of ability in their UK study of 787 pairs of 4-5-year-old twins. They put forward the argument that

genetic influences in language development are much more evident in expressive than receptive skills where the genetic role is negligible, as mentioned above.

In the case of core language measures, while previous evidence suggested that these rely minimally on experience, it is clear that they rely on *some* experience: after all, children acquire the phonology and morphosyntax of the language to which they are exposed. Furthermore, even the least knowledge-based task of nonword repetition is now recognised to be affected by knowledge and experience since children are better able to repeat items if they are more like real words and contain more typical phonotactic sequences (Gathercole, 2006). The nonlinear effects of SES suggest that input and experience across the middle-high socioeconomic spectrum reach the threshold needed to consolidate core language skills. This does not rule out the possibility that input and experience of children in some low SES groups do not reach this threshold, so that more input is required to master even core language skills. Our finding that rates of speech delay, but not speech disorders, were disproportionately high in our low SES group is in line with this possibility. So is our finding that children's standard scores for repetition of sentences and more specifically function words show catch-up. Finally, there is some indication that prior exposure and item familiarity played some role in our findings on word/nonword repetition. For both SES groups, words were repeated better than nonwords, but there was a significant age group x SES group interaction with real words, due to significantly poorer real word repetition in the youngest age group in the low SES sample.

Rates of referral according to SES factors

Given the substantially higher rate of poor performance in the low SES group on core as well as standard measures, we might expect rates of clinical referral to be substantially higher. Contrary to this expectation, though in line with previous evidence (Zhang & Tomblin, 2000), SES factors were unrelated to SLT referrals. Just over 10% of *both* SES groups had experienced some contact with SLT services, with 6.4% of the low SES group and 7.1% of the mid-high SES group currently known to the services. Nor were there group differences in the number of SLT sessions the children had experienced, with the exception of one extreme outlier in the mid-high SES group who was reported to have had 100 sessions. A full three-quarters of the low SES group who had problems on our language and/or speech measures had no contact, either current or past, with SLT services, as was the case for half the mid-high SES group (but given the low rate of poor performance in this group, the actual number was small). Why are such a high proportion of children apparently being overlooked by services? Is this due to sheer weight of numbers in the low SES group? Or does it reflect the nature of the referral process, different thresholds for clinical referral in different SES groups (Roy & Chiat, submitted) and the type of problems that are noticed and lead to referral?

The profiles of children referred from low and mid-high SES groups are informative. The majority of the mid-high SES group in current contact with the services (60%) had no identifiable problems according to the measures and cut-offs we used, and the remainder had speech-only problems. Thus, no child referred in the mid-high group scored poorly on language measures in our study. In contrast, about a third of the referred children in the low SES group had language-only problems, and the remaining two-thirds had speech problems (with or without language). Our findings on rates of referral together with the profiles of referred children are in keeping with previous findings that speech has a stronger effect on receipt of intervention than language, and that receptive language problems, particularly characteristic of our low SES group, are likely to be overlooked (Zhang & Tomblin, 2000). Further, recent evidence has shown that children of low SES with language problems were less likely to have contact with SLT services (Bishop & McDonald, 2009) and referred children with adequate language development were more likely to be of higher SES (Keegstra, et al., 2007).

Executive functions, low SES and language delay

Our argument that non-linguistic functions such as selective and sustained attention and working memory may be implicated in the weak receptive performance of our low SES group is in tune with recent research investigating associations between childhood poverty and neurocognitive development. These studies aimed to identify more fine grained functions that underpin the well established SES disparities in cognitive performance and school achievement in order to develop more effective interventions targeted at deficits in these functions. In addition to language, SES disparities in executive functions, working memory and attention have been found.

SES differences in EF have been identified from early infancy through the school years to young adulthood (Lipina et al., 2005; Mezzacappa, 2004; Farah et al., 2006; Noble et al., 2005, 2007). A US study of socioeconomically diverse first graders found SES was related to performance on language and a number of executive function tasks using composite scores (Noble et al., 2007). In terms of our findings and discussion of skills involved in receptive language performance, it is interesting to note that two individual tasks with high SES loadings and the highest intercorrelations amongst the adopted tests were the Peabody Picture Vocabulary Test language measure, and an auditory attention task, a measure of executive cognitive control. It is beyond the scope of this chapter to consider these studies in depth, but there have been a number of useful recent reviews in the area (see for example Hackman & Farah, 2009; Hackman, Farah, & Meaney, 2010; Raizada & Kishiyama, 2010; Tomalski & Johnson, 2010). A series of three neurocognitive studies of young children at risk of language problems using event related potential (ERP) measures conducted by Stevens et al. (2006, 2008, 2009) are of particular relevance and will be discussed in more detail.

ERPs have been described as providing 'a biological window onto processes required for successful language learning' (Barry, Hardman, & Bishop, 2009). Two studies by Stevens et al., 2006, 2009 revealed that children with SLI and those from lower SES backgrounds (as measured by maternal education) had selective attentional auditory deficits compared with typically developing children or children whose mothers had higher levels of education. For both groups attention problems occurred in the early stages of perceptual processing. However, ERPs revealed between group differences in the underlying neural mechanisms. Attentional deficits in the low SES group were due to reduced ability to filter out irrelevant auditory information, whereas the SLI group had reduced signal enhancement in the attended channel. The authors argued that both deficits are likely to have cascading consequences on the development of language and reading. Such deficits could underpin and differentiate the poor word/nonword repetition performance we found in our low SES sample, and may also be significant in their difficulties in learning novel words. To the best of our knowledge there are no ERP studies of children's nonword repetition skills, but a recent ERP study of adults with good and poor repetition skills concluded that deficits were due to an 'inability of encoding mechanisms to keep pace with incoming input' (Barry et al., 2009).

The third study by Stevens et al. (2008) was an intervention study. A detailed discussion of interventions is outside the scope of this chapter but this study raises a number of crucial issues that need to be born in mind, not least in understanding the complex nature of children's language difficulties. The study evaluated the effectiveness of FastforWord-Language program (FFW: Tallal, 2004), an intensive computerised language training program (6 weeks, 100 mins/day) with a small sample of 6-to 8-year-olds with SLI and typically developing children. Although visual attention was not measured, the authors cited evidence that attention deficits in children with language disorders are domain general, and found in both linguistic and non-linguistic contexts. The program produced significant receptive language gains (as measured by CELF 3) in the SLI group and improved scores in neural measures of selective auditory attention, with changes localised to signal enhancement. The receptive gains were substantial, nearly a standard deviation, but contrary to predictions the gains in expressive skills were less marked. Previous evidence has been mixed (see Stevens et al., 2008, for a summary of evidence). It has been argued that language gains, when they occur, are non-specific and may work by training attention skills. If this is the case, the effect of training on expressive skills may be less immediate than the effect on receptive skills and gains may not be realised until much later. Stevens et al. argued that 'prior training in attention might help children with language deficits benefit more from targeted instruction in an academic domain.'(2008, p.63). In similar vein it has been suggested that enhancement of executive function skills and self-regulation may underpin the longer-term gains in academic achievement found in children who attended Head Start programmes from a

young age despite the disappointing short-term fade out in cognitive skills found in their early years (see Raizada & Kishiyama, 2010, for fuller argument and evidence).

However, other factors in addition to training related changes in selective auditory attention may have been responsible for the receptive language gains, for example the large amount of attention participants received from adults may have been significant. The coach-student ratio was excellent and the children were provided with lots of incentives for staying on task and engaged in the program. Informal observations of children's reactions to the assessment process in our community sample suggest that the effect of such interpersonal factors may be non-uniform across SES groups. Overall the children in the low SES group in our community sample relished the individual attention the assessments afforded, and stickers and praise were highly reinforcing and effective. In contrast, the children in the mid-high SES group were reported to be much less bothered about either adult attention or stickers. Although less extreme, there are some similarities between the desire for adult attention found in the low SES group and the social disinhibition observed in some children who have experienced early institutional care. Interestingly this social disinhibition and lack of social selectivity was found to be highly correlated with observed and rated inattention/overactivity (Roy, Rutter & Pickles, 2004). Rueda et al. (2010) have argued that individual differences in attentional control and self-regulation play an important role in school readiness, socioemotional development and academic success.

Conclusion

It is clear that the distinction between language disorder and disadvantage is by no means clear-cut: as might be expected, evidence points to compounding of social and intrinsic risk factors. Nevertheless, we have argued that a proportion of children from low SES backgrounds who perform poorly on standard measures of language have intact language potential. Hypothetically, if they had grown up in a more advantaged environment, they would perform in the normal range. For these children enhanced input is needed to realise their language potential. If home and community environments remain unchanged, they will continue to lag behind peers. The rationale for early group based interventions for preschoolers such as Sure Start in the UK and Head Start in the US is that enriched input can compensate for the effects of earlier disadvantage. However, whilst such programmes might enhance their language skills they are not enough to close the SES gap in language performance, and this is not due in any simple way to the enormous differences in vocabulary exposure between children from the least and more advantaged backgrounds by the time they reach school.

We have seen that the effect of multiple factors associated with low SES on children's development is not restricted to language skills; executive functions and self-

regulation are compromised too. Limitations in the development of EF skills may impact on both top-down and bottom-up processing skills involved in the understanding and use of language. Impairments in attention, inhibition and working memory can affect children's capacity to process and respond appropriately to the kind of decontextualised language and multiclausal instructions they face in academic settings. In addition, the deficits in selective auditory attention found in young children from low SES backgrounds may be implicated in the higher than expected speech delay, poor word/nonword repetition and novel word learning skills we found in our sample of preschoolers. The extent to which computerised training programmes designed to enhance attention can improve language skills in children from low SES backgrounds is not currently known. However, even if shown to be helpful, it is unlikely that such programmes will be sufficient to address fully the social emotional problems and academic difficulties known to co-occur with language delay in disadvantaged children and affect their life chances in the longer term (Snow et al., 2007). To stand a chance of keeping up, many such children will need continued enhanced input throughout the school years (Joffe, 2008, 2011).

Furthermore, where children have deficits in basic language skills, indicative of SLI in our terms, enhanced input is unlikely to suffice. We have argued that children with core deficits experience difficulties in everyday life not shared by their peers, calling for specialist intervention to develop their language skills, along with wider support for their social needs and for their families.

Acknowledgement

The Barking and Dagenham study was funded by the Nuffield Foundation, an endowed charitable trust that aims to improve social well-being in the widest sense. The Foundation funds research and innovation in education and social policy and also works to build capacity in education, science and social science research. The views expressed are those of the authors and not necessarily those of the Foundation. More information is available at www.nuffieldfoundation.org.

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