Reading difficulties and arithmetic difficulties

Brian Butterworth, University College London, UK

Learning difficulties in reading and arithmetic are among the most commonly noted in school-age learners, with around 5% seriously affected in each skill. Reading appears to involve a brain network that has little overlap with that for basic number processing, and the candidate genes for reading disability seem to be quite different from those for dyscalculia. Nevertheless, there is evidence that dyslexia and dyscalculia co-occur more often than would be expected by chance if they depended on completely independent capacities. Here I consider possible explanations for this paradox.

Emergent literacy foundations for reading: A critical examination

Philip S. Dale, University of New-Mexico, USA

A wide range of skills in early childhood have been identified as precursors of literacy, including vocabulary, phonological awareness, narrative comprehension and production, print awareness, and others. In the first part of this keynote presentation, I will review the evidence for prediction from these skills. In the second half, I will examine the evidence more critically with respect to three questions. First, do specific precursor skills differentially predict specific reading outcome skills? Second, does the pattern of prediction vary across languages, educational settings, and orthographies? And third, what is the underlying etiology of the prediction, i.e., do skills reflect common genetic influence or environments that facilitate diverse skills?

Growth dimensions of language acquisition of children with Specific Language Impairment (SLI): Lessons from developmental trajectories

Mabel L. Rice, University of Kansas, USA

Much of our understanding of language impairments comes from cross-sectional comparisons of children with impairments to typically developing children of the same age or same language level. Such comparisons focus on the limitations of the affected children as compared to unaffected children. A shift to longitudinal investigation reveals robust similarities between affected and younger unaffected children in linguistic growth trajectories. This presentation will summarize longitudinal outcomes from a program of investigation of children with SLI. Discussion will focus on how longitudinal evidence is changing our interpretation of cross-sectional differences, how language impairment and reading impairment may be linked, and how language impairment may or may not be similar to second language learning.

Implicit and explicit second language acquisition and their interface

Nick Ellis, University of Michigan, USA
The first part of this paper concerns the ways in which language acquisition involves implicit learning from naturalistic usage. Psycholinguistic analyses demonstrate that fluent language users are exquisitely sensitive to the relative probabilities of occurrence of different constructions in the speech stream and their most likely interpretations in context. Such frequency effects provide clear testament of usage-based acquisition. Implicit learning provides a distributional analysis, tallying the occurrence of constructions, generalizing schemata from conspiracies of memorized utterances, and forging composites by chunking. These processes provide optimal solutions to the problem spaces of form-function mappings and their contextualized use. Yet, however necessary in rational fluency, these incidentals are not sufficient. Many aspects of second language are unlearnable from implicit processes alone. The “Basic Variety” typical of untutored L2A is usually considerably below what a child achieves in L1. SLA research suggests positive effects of explicit instruction and explicit learning, and high levels of adult attainment usually require both. Explicit and implicit knowledge are distinct and dissociated; they involve different types of representation and are substantiated in separate parts of the brain. Nevertheless, they do interact. Questions concerning their interface have lain at the heart of applied linguistic theory for 30 years or more. Our answers to these questions affect the ways we approach language acquisition, the ways we interact with learners, and whether and how we plan instruction. This paper reviews various psychological and neurological processes by which explicit knowledge of form-meaning associations impacts upon implicit language learning. The interface is dynamic: It happens transiently during conscious processing, but the influence upon implicit cognition endures thereafter.

**Language interaction in bilinguals: Developmental perspective on Where, When, Why, and Who**

*Ginny Gathercole, University of Wales, Bangor, UK*

This talk examines evidence for interaction between a bilingual's two linguistic systems and possible explanations for its occurrence. Data are presented from several different bilingual groups (e.g., Welsh-English, Spanish-English, Arabic-English) documenting the presence or absence of interaction in certain areas of the bilingual's two languages. Particular attention is paid to semantic and morpho-syntactic systems, and the question of where and when interaction occurs is addressed. The evidence is viewed from a developmental perspective that attempts to explain, e.g., differences in the direction of influence in early versus later bilinguals, differences in the prevalence of interaction in certain areas (semantics) more than in others (morphology), and differences within a given area (in certain types of semantic categories) more than in others. A developmental model is proposed to explain and predict linguistic interaction in bilingual language learners.

**Reading lessons from twins**

*Brian Byrne, University of New England, Australia*
The use of genetically sensitive research designs, such as studies of monozygotic and dizygotic twin children and adolescents, has generated convincing evidence that variation in reading ability is substantially influenced by genetic variation. This fact and others gained from behaviour-genetic research explain well-attested observations by educational professionals, such as that reading problems tend to “run in families,” and that students with reading problems tend to have difficulties in other school subjects. But this research has also produced some unexpected findings and raised some controversial issues. In this talk, as well as summarizing the basic results from our group’s projects, I wish to identify and address some of these findings and issues. Among them are:

• Preschool precursors to literacy such as phonemic awareness and verbal memory show the effects of genes,
• Other preschool precursors such as vocabulary show more effect of the home (shared) environment, but…
• …shared environment influences do not continue to influence school literacy levels for very long,
• There are differences in heritability of early literacy as a function of country-based educational practices,
• Despite the finding of country differences, the effect of schools on literacy differences among children is, overall, non-existent-to-very-modest,
• There is a similarly modest effect of individual teachers on differences among children,
• Phonological awareness, an important component in current theories of reading (dis)ability, is heritable, but the genes that specifically contribute to it may play only a minor role in determining differences in decoding,
• Genes that influence how easily children lay down memory traces of print-speech pairings appear to play a substantial role in literacy levels.