

***Optimality Theory, Phonological Acquisition and Disorders.* Daniel A. Dinnsen and Judith A. Gierut (eds.) (Series: *Advances in Optimality Theory*) London, UK: Equinox. 2008. 513pp. ISBN 978-1-84553-121-8.**

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This volume represents a synthesis of collaborative research from Indiana University's Learnability Project. Its chapters report data, methods, treatments, and findings derived primarily from corpora of nearly three hundred English-learning children aged 3 to 7 with 'functional (non-organic) phonological delays', referred to hereafter in this review as PDs. The book sustains an extended argument for the Project's long-standing approach: using current theories of phonology (here, Optimality Theory) to interpret PD grammars and guide clinical therapies, and likewise testing OT theory against the facts of PD acquisition. The book aims to reach a wide audience of students and researchers, including phonologists, psychologists and speech language pathologists, and its authors have spent considerable effort on the explanation of basic concepts in OT, experimental design and phonological delays. The book is structured into five sections: the first serves as introduction to the entire collection, the next three present a cluster of Research Reports on a particular research area, and the last concludes with an epilogue.

Chapter 1 *Fundamentals of optimality theory*, written by Learnability Project's co-PI Daniel Dinnsen, is a brief but careful introduction to OT for any reader with a basic knowledge of rule-based phonology, beginning with the basics of ranked markedness and faithfulness constraints. It also provides an initial discussion of constraint demotion algorithms for learning new grammars from errors, and the OT principle of Richness of the Base in acquisition. The complementary chapters 2 and 3 are written by the Project's other PI, Judith Gierut, and they meticulously detail the empirical basis for the majority of the book's results. Chapter 2, *Phonological disorders and the Developmental Phonology*, presents the context of the studies' phonologically-delayed learner population, as well as the battery of tests used to document learners' phonologies – most notably the Phonological Knowledge Protocol (Gierut 1985) and two probes designed to assess onset and coda cluster production (Gierut 1998). Its appendix also includes a complete set of all materials from each of the tests used in the book. Chapter 3, *Fundamentals of experimental design and treatment*, introduces single-subject and multiple-baseline studies, assuming next to no background in experiment building or clinical treatment, and discusses how evidence from single participants can be generalized and validated across studies and learners. This chapter also explains the Project's use of nonce words in treatment, and highlights the overall claim that 'complexity of the input governs phonological change, such that more complex structure promotes the greatest gains in children's sound systems' (117).

Part Two, *Research Reports: Opacity Effects*, is a self-contained unit of three chapters on phonological opacity in PD acquisition. It begins with perhaps the most theoretically-intensive chapter, *A typology of opacity effects in acquisition* by Daniel Dinnsen. Its first empirical focus is a case study of interacting processes in one PD child (LP18)'s phonology. LP18's initial phonology showed a transparent interaction between two

processes, but the child's subsequent improvement on a treated contrast resulted in an opaque interaction. The chapter underscores the fact that learners *innovate* opaque phonologies in the course of acquisition (and thus that phonological theory should capture them). Two OT analyses of this LP18's opacity are presented: the first using Local Conjunction (Smolensky 1995; Lubowicz 2002), and the second using Comparative Markedness (McCarthy 2002). An extended comparison of these two accounts draws in many other examples of process underapplication in developing grammars, including novel data from the Project's corpus; it also provides some rather interesting arguments for the Comparative Markedness account rather than Local Conjunction; and it finally explores overapplication opacities in phonological development using Sympathy Theory (McCarthy 1999).

Chapter five, *An unusual error pattern reconsidered* by Dinnsen and Ashley Farris-Trimble discusses a famous opaque PD grammar originally reported in Leonard and Brown (1984), and again uses Comparative Markedness to capture this pattern's observed and inferred stages. This section's final chapter, *Innovations in the treatment of chain shifts* by Michelle Morrisette and Gierut, turns to a treatment approach specific to phonological opacity. It describes the simultaneous treatment of all three sounds of a common chain shift ( $s \rightarrow \theta \rightarrow f$ ) via nonce-word triplets (e.g. [seib] ~ [θeib] ~ [feib]) and describes the set of observed stages found pre- and post-treatment using partial rankings (following Antilla and Cho 1998).

The research reports in parts three and four are grouped under the titles *Developmental shifts and learning* and *Acquisition of Consonant Clusters*. Most of these chapters choose a theoretically-relevant subset of the Project's cross-sectional data and evaluate its analyzability via a variety of OT proposals. Chapter eight, *Recalcitrant error patterns* by Dinnsen, returns to the trajectories along which PD grammars develop towards their target, noting again that resolving a current error by correctly demoting one constraint may sometimes cause new errors elsewhere in the system. The chapter discusses how PD learners' generalize error reductions resulting from therapy, which from the OT perspective should be dependent on the nature of CON and its implicational relationships between constraints. This discussion also introduces the main focus of Chapter 9, *The prominence paradox* by Dinnsen and Farris-Trimble. Here the authors provide evidence that many early stages of child phonology *preserve* marked contrasts in positions where they are most likely to *neutralize* in adult languages, e.g. acquiring voicing in codas before onsets. The chapter's explanation for this discontinuity is that children first assume the *ends* of phonological constituents to be the privileged position, and that this assumption is encoded in an initial-state constraint ranking and later overturned during maturation.

The last set of research reports in part Four, which focus on consonant clusters, contain two more OT-testing chapters. In chapter 12, *Gapped s-cluster inventories and faithfulness to the marked*, Farris-Trimble and Gierut report a cross-sectional analysis comparing the pseudo-order of acquisition of /sn/, /sl/ and /sw/ clusters. The results show that children with 'gapped' inventories are quite common in the Project's corpus – several meet a threshold for having acquired [sn] and [sw], the most and least marked

onsets according to sonority sequencing, while not yet acquiring the intermediate [sl]. These data are analyzed with both fixed-ranking and stringency approaches to markedness hierarchies like sonority, noting the need to adopt a theory of faithfulness to the marked (de Lacy 2002). Chapter 13, *A typological evaluation of the split-margin approach to syllable structure in phonological acquisition*, investigates the plausibility of a different overall approach to cluster markedness. Here, Jessica Barlow and Gierut take up the Split Margin hypothesis (Baerstech 2002) whereby syllable phonotactics are understood as the local conjunction of sets of constraints: the first with a preference for the beginnings of onsets to not be sonorous, and the other a preference for the codas and second members of an onset to be sonorous. The chapter tests one Split Margin prediction – that the acquisition of C<sub>1</sub>C<sub>2</sub>V also implies that acquisition of C<sub>2</sub> as a coda – against a subset of the Project’s corpora, and finds rather minimal support for the implicational claim.

Three remaining chapters turn from corpus data to other experimental methodologies for testing OT-based claims. In chapter 11, *Experimental instantiations of implicational universals in phonological acquisition*, Gierut reports a series of experiments with PD learners aimed at testing two proposed universals: first, that the L1 acquisition of onset clusters imply affricates but not vice versa (Leo and Prinz 1997); second, that the L2 acquisition of liquids in onset clusters implies a laterality contrast (i.e. between r and l) but not vice versa (claimed in Archibald 1998 for L1 Korean learners of English.) With respect to clusters and affricates, the results show one asymmetry in the expected direction; however, no support emerged for an implication between liquids in clusters and laterality contrasts.

In a different vein, two other chapters turn to children’s perceptual grammars and the role of structural phonological knowledge in judging segmental similarity. Chapter seven, *Developmental shifts in children’s correspondence judgments* by Gierut and Dinnsen, presents a study which investigated typically-developing children’s intuitions about similarity among triplets of nonce words differing only in their initial fricatives. In a task adapted from Treiman and Breaux (1982), each triplet was presented as the names of three identical characters and children were asked to indicate which two of the three were ‘friends’. The overall results suggest that shared place and manner of articulation play a role in predicting nonce words pairings, and in some cases place appeared to contribute more than manner. Chapter 10, *Syllable onsets in developmental perception and production* by Gierut, Holly Storkel and Morisette, used the same triad task to test children’s perception of similarity among syllable onset types: singletons, affricates, true clusters (here stop + glide) and adjuncts (s + stop). The broad aim was to determine whether learners recognize onset structure beyond obvious surface characteristics like raw number of segments. The results show that most children have converging similarity preferences, and that these perceptual judgments are independent of their ability to produce onset types faithfully.

The final research report discusses the acquisition of onset clusters in a different clinical setting: *Constraints on consonant clusters in children with cochlear implants* by Steven Chin. It begins with a basic introduction to speech in children with cochlear implants, and

then reports on the cluster production patterns of 10 such young children. The results are fairly comparable to both typically-developing and PD learners: the majority of clusters are retained, and errors usually involve either deletion or epenthesis – though one notable aspect of the data is an extremely wide range of intra-speaker variation in accuracy.

As a whole, the most successful twin aspects of this volume are its reliance on a wealth of well-reported and controlled corpus data, and the wide range of OT proposals it entertains. I found many of the Optimality Theoretic arguments novel and thought-provoking; the chapters on opacity in particular make interesting reading. Most of the chapters work well as self-contained units – I have in fact already assigned some of them as readings in courses on phonological acquisition. The clear, comprehensive exposition of ranking arguments and theoretical assumptions, as well as experimental design, are ideal for those making early forays into new research areas: phonologists or psychologists interested in acquisition or grammatical delays from the OT perspective, and clinicians interested in applying OT reasoning to their therapy design.

One area in which the volume is less convincing is its interpretation of experimental findings; while these chapters are perhaps the most ambitious, the contribution of their results remains unclear. In chapter 7, children's judgments on nonce words within each trial is interpreted as evidence for the ranking of Output-Output faithfulness constraints (Benua 1997/2000) – but how the task might provide children with evidence of a common morphological base among those nonce words is not explained, and chapter 10 uses the same task to probe judgments of onset cluster similarity but with no reference to OO-faith. In another case, chapter 11 focuses in large part on a failure to replicate an implicational claim about the L2 acquisition of English liquids – but as the authors note, this claim was based on a representational view of L1 Korean adults' phonologies, and the chapter does not discuss why the L1 English PD child learners in this study should begin with L1 Korean-like representations.

Another unresolved tension of some concern is the book's conception of how observed acquisition stages relate to proposed learning algorithms. Chapter 1 focuses on the now-standard view of learning in 'classic' OT (Prince and Smolensky 1993/2004, Tesar and Smolensky 1998, 2000) in which errors among the learner's output prompt constraint demotion. Many chapters describe the progression from one stage to the next as being learnable from a particular kind of available error, but there is no systematic attempt to understand why these errors cause constraint demotion rather than any others (apart from hints regarding lexical frequency, see e.g. pages 33 and 195.) More broadly, the centrality of constraint demotion algorithms as the mechanism for development seen in chapter 1 is often undermined throughout the volume. Chapter 5 suggests that a child's demotion of NOCODA-[s] was an attempt to provide a 'minimal response that allows maximal compliance with the default ranking of undominated conflicting markedness constraints' (196) (alluding perhaps to a global acquisition strategy?); chapter 6's view of successive stages based on Antilla and Cho (1998) must allow errors to prompt crucial *unranking* rather than demotion, though through unclear means; chapter 9's view of a developmental re-ranking of constraints assigning privilege to final and initial positions also does not appear to be error-driven in any sense. Since the book explicitly presents

OT as an ideal tool for understanding the successive grammatical stages produced by clinical intervention, this lack of synthesis among conflicting learning mechanisms seems unsatisfactory.

Nevertheless, this volume brings together a compelling range of data and results from a unique and impressive corpus, and presents a sustained argument for the integration of theoretical, experimental and clinical research. Taken as a whole it will provide food for thought for anyone studying speech, sound and acquisition, particularly those seeking to find unexpected and challenging results from across allied disciplines.

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