

Productive use of the English past tense in children with focal brain injury and specific language impairment

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Abstract

In this study, 22 children with early left hemisphere (LHD) or right hemisphere (RHD) focal brain lesions (FL, $n = 14$ LHD, $n = 8$ RHD) were administered an English past tense elicitation test ($M = 6.5$ years). Proportion correct and frequency of overregularization and zero-marking errors were compared to age-matched samples of children with specific language impairment (SLI, $n = 27$) and with typical language development (TD, $n = 27$). Similar rates of correct production and error patterns were observed for the children with TD and FL; whereas, children with SLI produced more zero-marking errors than either their FL or TD peers. Performance was predicted by vocabulary level (PPVT-R) for children in all groups, and errors did not differ as a function of lesion side (LHD vs. RHD). Findings are discussed in terms of the nature of brain–language relations and how those relationships develop over the course of language learning.

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1. Introduction

English-speaking children typically begin to mark plural or past tense forms before their second birthday and often do so appropriately for both regular (e.g., “Daddy *walked*”) and irregular forms (e.g., “Johnny *took* my blocks,” “I *won!*”). Later, inappropriate uses of inflectional morphemes (e.g., *taked*, *winned*) begin to be observed. These errors persist well into the school-age period, however, their frequency gradually diminishes as children’s production of both regular and irregular forms approaches an adult-like pattern. It is generally assumed that these errors reflect progress in the development of productive language use, i.e., the hallmark human ability to generate words or sentences that have not been heard in the input (Berko, 1958; Bybee & Slobin, 1982; Cazden, 1968; Kuczaj, 1988).

In recent years, the details of this achievement and the precise mechanisms guiding its development have been the subject of considerable study, refinement, and debate. It has become clear that a simple stage-like account is inadequate and does not account for the complex developmental pattern that has emerged in more recent studies (e.g., Marchman, 1997; Marcus, Pinker, Ullman, & Hollander, 1992; Plunkett & Marchman, 1991). Children do not enter a period in which the regular rule is applied across-the-board. Instead, past tense forms of some irregular verbs are produced correctly at the same time that others are being overregularized. Although it is rare to find a child who never produces overregularizations (Marchman, 1997), errors typically reflect only a small portion of children’s irregular verb use (e.g., less than 15% reported by Marcus et al., 1992). Finally, while overregularizations are the most oft-cited evidence that children have abstracted systematicities that are inherent in the language, other types of productions also occur, including zero-markings (e.g., “he *sit*”) and vowel changes (e.g., “she *brang*”). Analyses have shown that these errors are systematic (Marchman,

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1997; Marchman, Wulfeck, & Weismer, 1999), predicted by frequency, and phonological similarities that exist across sub-clusters of irregular verbs (Pinker & Prince, 1988).

While the facts have been refined, the standard interpretation remains true to the conclusion that overregularizations signify the emergence of grammatical rule-based knowledge. The ability to generalize the regular pattern to irregular forms is seen as evidence that the child has abstracted the regular pattern and stored it in a symbolic, rule-based format that can apply to any verb, regardless of its phonological or surface characteristics (Marcus et al., 1992). This symbolic encoding of linguistic regularity is crucial to the child's acquisition of grammatical rules and is independent of the statistically based lexical-learning system that is required to master the exceptions to those rules (Marcus et al., 1992; Pinker, 1991; but see Christiansen & Curtin, 1999; Seidenberg, 1999). Support for this dual-mechanism view is based in studies of naturalistic productions (Marcus et al., 1992), acceptability judgments (Kim, Marcus, Pinker, & Hollander, 1994; Prasada & Pinker, 1993), cross-linguistic analyses (Clahsen, Rothweiler, Woest, & Marcus, 1992), and neuroimaging (Jaeger et al., 1996). More recently, studies have shown that infants as young as 7 months of age can discriminate novel sequences of nonsense words that adhere to a rule-based pattern (e.g., "ga ti ga") versus those that do not (Marcus, 2001; Marcus, Vijayan, Bandi Rao, & Vishton, 1999). As Marcus et al. state "infants possess at least two distinct tools for learning about the world and attacking the problem of learning language: one device that tracks statistical relationships and another that manipulates variables, allowing children to learn rules" (1999, p. 79).

Adopting a more unified view of the language faculty, other researchers have suggested that the mechanisms involved in processing statistical regularities allow language learners to master lexically based mappings as well as encode the regularities that occur across them (e.g., Elman et al., 1996; Seidenberg, 1997). In connectionist models of past tense acquisition (Plunkett & Marchman, 1991, 1993), both learning tasks are inextricably linked, suggesting that size of lexicon should be a strong predictor of the onset of generalization behavior. Marchman and Bates (1994) tested this prediction in a large sample of children using a parent report measure of vocabulary production and use of correct and overgeneralized English verbs. As in the models, overregularizations were rare in children with small verb vocabularies, and tended to increase in frequency as vocabulary sizes exceeded a particular level. Such strong continuity across lexical and grammatical development is consistent with a host of findings that have established strong links between lexical and grammatical acquisition more generally (e.g., Bates et al., 1988; Fenson, Dale,

Reznick, & Bates, 1994; Rollins & Snow, 1998). Further, this view has implications for the nature of the representations underlying lexical and grammatical development and processing (Akhtar & Tomasello, 1997; Bates & Goodman, 1997) and the origins of grammatical categories in lexically based terms (Goldberg, 1995; MacDonald, Pearlmutter, & Seidenberg, 1994).

Debates regarding the origins of productive language use have also received considerable attention from researchers interested in disordered populations. For example, children with Specific Language Impairment (SLI) show general delays in expressive language abilities that place them below expectations based on age- and cognitive-level. However, a hallmark characteristic of SLI in English-speaking children is a disproportionate difficulty with grammatical morphology. It is consistently reported in the literature that children with SLI tend to omit grammatically inflected forms in obligatory contexts more frequently than their typically developing (TD) counterparts, producing more zero-marked (or "unmarked") plural or past tense forms (e.g., "he walk") compared to their peers (Bishop, 1997; Marchman et al., 1999; Rice, Wexler, & Cleave, 1995; Oetting & Horohov, 1997). While TD children will also produce unmarked forms, errors tend to persist later in development in children with SLI. In addition, children with SLI are more likely to avoid target inflected forms in elicitation tasks, choosing instead to produce a non-past form (e.g., "he is walking") or a filler phrase (e.g., "I don't know") (Marchman et al., 1999).

Some accounts of SLI propose that these children have particular difficulties at the level of representations of linguistic structures (Gopnik & Crago, 1991; Rice & Wexler, 1996; Ullman & Gopnik, 1999; van der Lely & Christian, 2000; van der Lely & Sloowerck, 1997; van der Lely & Ullman, 2001). For example, Gopnik and Crago (1991) studied a three-generation British family (ranging from 2 to 74 years of age), in which half of the members presented a serious form of language impairment. Following a dual-mechanism view, Gopnik and Crago (1991) suggested that the affected family members had a language-specific deficit that precluded their ability to apply grammatical rules productively. Correctly inflected forms were produced via an item-based mechanism utilized for memorizing individual lexical items. However, the specificity of the language deficits observed in individuals with language impairment is controversial. When Vargha-Khadem and colleagues (Vargha-Khadem, Watkins, Alcock, Fletcher, & Passingham, 1995) conducted follow-up assessments on the family members, results indicated a general impairment of IQ in some affected family members (e.g., IQ scores below 85), as well as broader language impairments in domains such as word repetition, prosody, and manipulation of word order. Further, upon re-testing with an expanded set of items, family members displayed the

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