Competition between word order and case-marking in interpreting grammatical relations: a case study in multilingual acquisition*

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ABSTRACT

The study examines strategies multilingual children use to interpret grammatical relations, focusing on their two primary languages, Lajamanu Warlpiri and Light Warlpiri. Both languages use mixed systems for indicating grammatical relations. In both languages ergative–absolutive case-marking indicates core arguments, but to different extents in each language. In Lajamanu Warlpiri, pronominal clitics in a nominative–accusative pattern also indicate core arguments, and in Light Warlpiri word order in a nominative–accusative pattern partially does so. The study asks which sentence interpretation strategies children rely on most, when they learn to rely on them and whether cross-linguistic influences are seen. Children aged 5;0, 7;0 and 9;0 and adults saw paired, animated events simultaneously on video and heard a transitive sentence spoken. The participants pointed to the event depicted by the sentence heard. Adults used a case-marking strategy consistently in both languages. Children initially used both case-marking and word order strategies, but used case-marking more often as age increased.

Languages use several mechanisms to encode grammatical relations, the most common being word order within the sentence (e.g. English, French) and case-marking on nouns (e.g. Turkish, Inuktitut).

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(1) My mother gave this book to Ali. (English)
(2) Anne-m   bu   kitab-ı   Ali-ye   ver-di.
    mother-POSS.1SG   this book-ACC   Ali-DAT   give-PAST.3SG
    'My mother gave this book to Ali.' (Turkish)

In example (1), in English, the order of *my mother* and *Ali* in relation to the verb *gave* and the preposition *to* indicate who gave the book to someone, and to whom it was given. In example (2), which is Turkish, the suffix -ı 'accusative case' shows that the book is the definite object of the verb 'give', the suffix -ye 'dative case' shows that the book was given to Ali, and the verb is positioned at the end of the sentence.

Case-marking systems are hypothesized to be easier to learn than word order systems because nominal case-marking is more transparent as a cue than word order (Slobin, 1982: 138). The type of case-marking system used – nominative–accusative or ergative–absolutive – does not make a difference in ease or speed of learning of grammatical relations (Pye, 1990: 1321). Even the use of a mixed case-marking system, such as ergative–absolutive for nouns and nominative–accusative for pronouns, does not seem to slow children's learning rate for grammatical relations (Pye, 1990: 1297). However, few studies have investigated these questions in languages where the cues to grammatical relations are in clear competition within the language.

In addition, we know little about how grammatical relations are acquired by children learning two languages where each has a mixed system of marking grammatical relations. Literature on bilingual acquisition suggests that children show developmental paths in each language that resemble the developmental path shown by monolingual children learning the same languages (de Houwer, 1990), and show that they are able to distinguish between the two linguistic systems from an early age (Genesee, Nicoladis & Paradis, 1995: 627). But cross-linguistic influences have also been found, especially where structural patterns are partially similar in each language being learned (Döpke, 2000: 224; Müller & Hulk, 2001: 16).

This article seeks to advance the literature on the acquisition of grammatical relations through a study of multilingual children aged 5;0–9;0. The study focuses on the two languages which are dominant in the home environment and in the children's early years – Lajamanu Warlpiri, the variety of Warlpiri spoken in the community of Lajamanu, in northern Australia, and Light Warlpiri, a mixed language which combines elements of Warlpiri and varieties of English and Kriol (English/Kriol). Each of the languages in focus has a mixed system for encoding grammatical relations. In Lajamanu Warlpiri, grammatical relations are indicated by an ergative–absolutive system of case-marking on core arguments, and a nominative–accusative pattern in clitic pronouns (Hale, Laughren

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& Simpson, 1995: 1431). Free pronouns are treated as other nouns and are marked according to the ergative–absolutive system. In Light Warlpiri, grammatical relations are indicated partly by an ergative–absolutive system of case-marking on core arguments, partly by a nominative–accusative (SVO) pattern of word order, and partly by semantic and pragmatic factors (O'Shannessy, 2009: 422). So both languages use a mixture of ergative–absolutive and nominative–accusative systems to indicate grammatical relations, but in different ways.

This study asks three questions. One, it examines how multilingual children use the cues of case-marking and word order to comprehend grammatical relations in transitive sentences in each of the two languages in focus. Second, the study asks if there is any cross-linguistic influence between the languages. Third, the study asks whether, in a context in which the cues are not completely regular or transparent, the children learn them as early as, or later than, children do in learning contexts in which the input patterns are more regular. The current study adds to the understandings gained from an earlier study of monolingual classic Warlpiri-speaking children's interpretation of transitive sentences (Bavin & Shopen, 1985), because in the current study the children are learning the two languages in focus simultaneously, and both of them have mixed systems for indicating grammatical relations.

Grammatical relations

To discuss grammatical relations I use Dixon's (1979: 59) distinctions of A (for a subject of a transitive verb), S (for a subject of an intransitive verb) and O (for an object of a transitive verb). In all languages, regardless of the system used to indicate arguments, some information about arguments is provided by more than one cue. In addition to morphological marking and word order, properties such as verbal agreement, information in verbal auxiliaries or pronominal clitics, animacy of NP referents, lexical semantics and event probability provide information about arguments. For example, if there are two nouns, 'girl' and 'peach', and a verb 'eat' in a clause, the meanings of each of the words, the animacy of the nouns and knowledge of real-world events of people eating peaches assist us to arrive at the conclusion that the A argument is the girl and the O argument is the peach. While these cues are always relevant, the focus of the present study is the use of the most common systems for indicating grammatical relations, case-marking and word order.

Case-marking

Systems for indicating grammatical relations, whether by word order or case-marking, most often follow one of two patterns: either a

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nominative–accusative pattern, as in English, in which the A and S arguments are treated the same way, and the O argument is treated differently, or an ergative–absolutive pattern, in which the A argument is treated one way and the S and O arguments are treated in another way. An example of ergative–absolutive patterning is given in (3) and (4) using Lajamanu Warlpiri.

(3) Kuuku   ka-ø   parnka-mi
    monster   IMPF-3SG   run-NPST
    'The monster runs.'

(4) Kuuku-ng   ka-ø- ø   jarntu   ma-ni
    monster-ERG IMPF-3SG-3SG   dog   get-NPST
    'The monster gets the dog.'

Neither the intransitive subject in (3), *kuuku* 'monster', nor the object of the transitive verb in (4), *jarntu* 'dog', receives a case-marking suffix. Only the subject of the transitive verb in (4), *kuuku* 'monster', receives a case-marking suffix, which is the ergative marker.

In ergative languages the ergative patterning is often not uniform (Dixon, 1979: 63; Van Valin, 1992: 19). The languages Van Valin discusses have split ergative patterning, in which the ergative–absolutive system operates only under specific conditions and another system operates under other conditions. One factor that can condition the split is the distinction between nouns and free or bound pronouns, with nouns and free pronouns following one pattern and bound pronouns following another. This pattern is found in classic and Lajamanu Warlpiri (Hale *et al.*, 1995: 1431).

All of the morphologically ergative languages for which there is empirical acquisition data are syntactically nominative–accusative. Languages which are morphologically ergative, but syntactically nominative–accusative, present a specific challenge for child learners. In a language which is nominative–accusative in both syntax and morphology, A and S arguments are consistently treated in the same way syntactically and also receive the same morphological marking. O arguments are consistently treated differently from A and S arguments, both syntactically and morphologically. But in a morphologically ergative language which is syntactically nominative–accusative, although A and S arguments are treated in the same way syntactically, the morphological marking for each is different: the A argument is marked in one way, but the S argument is marked differently. The O argument is treated differently from both A and S arguments syntactically, but receives the same morphological marking as the S argument.

Languages with differential argument marking, such as optional ergative marking, present another level of complexity for the learner. The cue for indicating arguments is not always present in the input, so it is

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more difficult for children to learn its function and its domain of application than if the cue occurred in the input regularly and frequently. Variation in marking is often conditioned partly by semantic properties, for example, the animacy of the A argument referent, and partly by pragmatic properties, for example, contrasts between discourse referents (e.g. McGregor, 2010, and references therein).

Word order

If a language indicates grammatical relations through word order patterns, it is usually a relatively fixed pattern, such as SVO order in English. It typically allows for the re-ordering of constituents for pragmatic reasons, for instance, topicalization of a referent. In contrast, a language with a pragmatically based word order has no single, basic order which is more grammatically acceptable than any other. A cluster of pragmatic properties determines word order in flexible order languages, pertaining to the relative newsworthiness of the constituents in the sentence (Mithun, 1987: 59) or their predictability and accessibility (Givon, 1988: 275). More newsworthy (Mithun, 1987: 59), less predictable and less accessible elements (Givon, 1988: 275) typically occur earlier in the sentence.

Many languages have word orders which are flexible to some degree, but are not entirely pragmatically ordered (Givon, 1988). In a language of this type, if one order occurs more commonly than others, and is the least marked order in terms of pragmatics, it can be thought of as the basic order. In some less flexible languages there are correlations between word order and case-marking, for example, in Samoan (Ochs, 1985) and Kaluli (Schieffelin, 1985), ergative case-marking is applied to A arguments in specific word orders.

Previous research on the acquisition of grammatical relations

Information about grammatical relations is provided by more than one cue in a language, but cues differ as to how informative they are in each language, for instance, by being more or less transparent, or occurring more or less often. For example, in Light Warlpiri the ergative marker is optional, so is not always available as a cue. Children must learn the relative availability and regularity of the cues in the languages they are learning. The more regular and simple the system of cues, regardless of whether it is a morphological or word order system, the more easily children learn it (Slobin, 1982; Slobin & Bever, 1982). Slobin (1982) suggests that children learn a nominal case-marking language faster than a fixed word order language because case-markers are local cues, that is, they are immediately available on particular nouns, regardless of the position of the noun in the

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clause, and can be interpreted without taking the entire clause into account. Studies of the acquisition of split ergative languages, in which ergative marking is applied only to A arguments in particular environments, show that children begin to produce ergative marking early, but not in all obligatory contexts (e.g. Pye, 1990, and references therein). Children learning fixed word order languages learn to produce and comprehend the word order patterns early (Bowerman, 1981). Children learning variable word order languages, in which case-marking plays the major role in indicating grammatical relations, learn even earlier to rely on case-marking rather than on word order, but still learn to use adult-like word order preferences early (Aksu-Koç, 1985; Slobin, 1982; Slobin & Bever, 1982). Children learning languages in which both case-marking and word order indicate grammatical relations take a little longer to learn when to rely on each subsystem (Slobin, 1982; Slobin & Bever, 1982).

A framework for analyzing cues languages use to indicate grammatical relations, and how they are interpreted within and between languages, is provided by the Competition Model (MacWhinney & Bates, 1978), in which the validity of different cues is compared. CUE AVAILABILITY is how often the cue is available when the person needs to make the relevant decision. For instance, in some ergative languages the cue of ergative marking is always available on A arguments, but in optional ergative languages the same cue is available less often. CUE RELIABILITY is how often the cue leads to the correct conclusion when it is used. If a cue always leads to the right conclusion, then it is highly reliable. For instance, if the ergative marker only occurs on A arguments, then it is completely reliable, because an ergatively marked NP will always be the A argument. But if it also occurs on instrument NPs then it is a less reliable cue to A arguments, because it also occurs on words that are not A arguments. CUE VALIDITY is the product of cue availability and cue reliability – the cues highest in validity are those that are most often available and most reliable. Another factor is CUE STRENGTH, determined by a combination of cue validity and how frequently the cue is needed. A cue that is always available and reliable AND for which the context in which it is needed occurs frequently is a stronger cue than one that is available and reliable, but is needed less often. The Competition Model predicts that split and optional marking systems are more difficult for children to learn than systems in which marking occurs more often and more regularly.

The Competition Model was used to examine the cues children used in sentence interpretation in one split ergative language, classic Warlpiri, spoken in the community of Yuendumu, in central Australia (Bavin & Shopen, 1985; 1989). In classic Warlpiri ergative–absolutive case-marking indicates grammatical relations, but the ergative case-marker is neither fully available nor reliable, so the studies aimed to determine which cues children paid attention to in developing sentence processing strategies for simple

transitive sentences, and how early they relied on the case-marker as the main cue. Children listened to simple reversible transitive sentences (in which the action denoted by the verb could be carried out by either of the NPs in the clause) and used toys to act out what they heard. The children's accuracy of interpretation increased with age, but they reached 67% accuracy in choosing A argument referents for ergative–absolutive sentences only after age 4;0.

In a later study, Bavin & Shopen (1989) examined children's sentence interpretation with respect to the cues of case-marking, word order, subject animacy and event probability. The study found that for children under 5;0, pragmatic and semantic cues, including verb semantics and A argument animacy, were much stronger than the cues of case-marking and word order. Argument animacy and verb semantics have been found to be salient for learners of other languages too (MacWhinney, 1987: 256). In accounting for why children learning classic Warlpiri come to rely on case-marking so late, compared to learners of other languages, Bavin & Shopen (1985: 608; 1989: 189–92) explain that in classic Warlpiri the cue of case-marking is not fully available or reliable, is not regular in form and is difficult to detect, so the children are forced to rely on other cues such as lexical semantics and event probability in sentence interpretation.

Cross-linguistic influence in bilingual acquisition

Studies of simultaneous bilingual acquisition show that the linguistic structures of the languages being learned affect the degree and type of structural interaction between a child's two languages in speech production (Döpke, 2000: 224). When a domain of the two languages being learned has similar structures, for example similar word order patterns, the similarity promotes ease of learning in both (p. 210). In a domain where the structures of the languages are quite different, the two languages can develop independently, with the path and rate of learning within that domain similar to that of monolingual children learning the same languages (de Houwer, 1990). De Houwer's subject learned English and Dutch simultaneously, and from age 2;3 each of her languages followed a path and rate of learning similar to monolingual learners of English and Dutch. Similarly, French–English blingual children aged 1;10 to 2;2 and French–German bilingual children aged 1;0 to 4;0 showed independent syntactic development in each language (Genesee *et al.*, 1995; Meisel, 1986, and references therein). But although structures in many areas of a bilingual's languages develop independently, when compared to monolingual children learning the same languages bilingual children show relative delays in the acquisition of some patterns and use of some non-target structures for relatively longer periods (Austin, 2007; Döpke, 2000; Müller & Hulk, 2001). The differences

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are due to cross-linguistic transfer, in which a non-target option which is possible in one language from the child learner perspective is reinforced by the same option being available in the other language. This occurs when there are partially overlapping patterns in the two languages, as shown by Müller & Hulk (2001) in a study of Dutch–French, German–French and German–Italian bilinguals, and by Döpke (2000) in a study of German–English bilinguals.

Cross-linguistic influence was also observed in a context of bilingual acquisition where grammatical relations are indicated through ergative–absolutive morphology in one of the languages being learned. Austin (2007) compared twenty children aged 2;01 to 3;04 learning Spanish and Basque simultaneously, to eight children within the same age range learning Basque only. In Basque a split ergative case-marking system indicates grammatical relations, and in Spanish a nominative case system does so. Monolingual child learners of Basque omit ergative marking in a non-adult-like way at first. But the bilingual children used ergative case-marking in Basque less often than the monolingual children in the same age range. For bilingual Basque–Spanish learners, non-target omission of the ergative is reinforced by the nominative pattern of Spanish, in which A arguments are not marked.

It is not known whether cross-linguistic influence would be seen in a bilingual learning context in which both case-marking and word order systems overlap, or in which they compete within and between the languages being learned. The current study provides such a context – ergative marking occurs in both Lajamanu Warlpiri and Light Warlpiri but to differing extents, and within Light Warlpiri word order and ergative case-marking compete to indicate A arguments.

Lajamanu Warlpiri and Light Warlpiri

The present study focused on two varieties of Warlpiri which have properties of great interest for the question of the acquisition of grammatical relations, because the cues for indicating core arguments are similar but not identical in each language, are in competition with each other within and between the languages, and do not have high validity. In Lajamanu Warlpiri, the cue of case-marking is often not available because arguments are not always overt, and is not completely reliable, and in Light Warlpiri, the cues of case-marking and word order are both variably used, so are even less available and reliable.

Language situation. Warlpiri is a Pama-Nyungan language spoken as a first language by approximately 3,000 people in the Northern Territory of Australia. Most Warlpiri people live in one of four small, remote communities, and many also live in larger urban centers. The current study

was set in the community of Lajamanu, which has a population of about 600 people, and is situated about 600 kilometers from the other three Warlpiri communities. Before colonization the Warlpiri were a hunter–gatherer people occupying a large area of land, but after colonization were forced to live in government-run settlements. The Lajamanu Community was established when the government forcibly moved a group of people to a new area, which subsequently became the community of Lajamanu, and is geographically distant from the other communities. In Lajamanu Community, two varieties of speaking have developed which differ from classic Warlpiri as described in the literature, called Lajamanu Warlpiri and Light Warlpiri.

Classic Warlpiri and Lajamanu Warlpiri. I call the variety of Warlpiri described in the literature (e.g. Bavin, 1992; Bavin & Shopen, 1985; 1989; Hale *et al.*, 1995) classic Warlpiri. Classic Warlpiri and Lajamanu Warlpiri are almost identical in terms of structure and how they indicate grammatical relations. In both varieties case-marking on nouns indicates grammatical relations and both varieties have variable word order. Lajamanu Warlpiri differs slightly from classic Warlpiri, mainly in terms of whether words end with vowels or consonants, the distribution of ergative case-marking, and the distribution of allomorphs of some case-markers. Of relevance to this study, in Lajamanu Warlpiri the ergative case-marker is not applied to all A arguments by speakers under about age sixty. Rather it is applied to approximately 90 percent of overt A arguments, making it slightly less available as a cue than in classic Warlpiri (O'Shannessy, 2009: 428). A minor difference between varieties is that in Lajamanu Warlpiri the ergative case-marker has an allomorph, *-ng*, in addition to the allomorphs *-ngku/-ngki* and *-rlu/-rli*, and the velar initial allomorphs can be applied to a wider range of word stems than in classic Warlpiri. These are the only differences between Lajamanu Warlpiri and classic Warlpiri in terms of how the varieties indicate grammatical relations, and the only difference of real importance to children's learning is that of less than obligatory use of the case-marker on overt A arguments.

Light Warlpiri. Light Warlpiri differs considerably from both classic and Lajamanu Warlpiri. Light Warlpiri is a newly emerged way of speaking, which has arisen from contact between Lajamanu Warlpiri, and English/Kriol. Kriol is spoken by many indigenous people across the north of Australia as a lingua franca. It varies according to geographical area, and also according to whether it contains more features of Australian languages (basilectal varieties), or more features of English (acrolectal varieties). Light Warlpiri is typologically a mixed language, that is, it must be traced genetically to more than one parent language (e.g. Matras & Bakker, 2003: 1). It consists of a combination of elements from its source languages – most verbs and the verbal morphology are from English/Kriol,

while most nouns and the nominal morphology are from Lajamanu Warlpiri. It has an innovative auxiliary paradigm, which draws on Lajamanu Warlpiri and English auxiliary patterns and English/Kriol pronouns (for details, see O'Shannessy, 2005). Light Warlpiri is spoken by children and adults under approximately age thirty in Lajamanu as their primary language, but the children and adults also learn Lajamanu Warlpiri from birth and, later, English/Kriol. Adults over approximately thirty years old mainly speak Lajamanu Warlpiri, but frequently code-switch with, and borrow from, English/Kriol, especially when speaking to children.

The following examples show how Light Warlpiri combines elements from Lajamanu Warlpiri and English/Kriol. In the examples, elements drawn from Lajamanu Warlpiri are in italics, and those from English/Kriol are in plain font. Example (5) shows Lajamanu Warlpiri, (6) shows English/Kriol and (7) shows Light Warlpiri.

(5) *karnta-jarra-rlu   ka-pala-ø   wajilipi-nyi   kuuku*
    girl-DUAL-ERG   IMPF-3DL-3SG   chase-NPST   monster
    'The two girls are chasing the monster.' (Lajamanu Warlpiri)

(6) det   tu   gel   jeis-im   monsta
    DET   two   girl   chase-TR   monster
    'Those two girls are chasing the monster.' (English/Kriol)

(7) de-m   jeis-ing   it   *kuuku   det   tu   karnta-jarra-*(ng)
    3PL-NFUT   chase-PROG 3SG   monster DET two girl-DUAL-ERG
    'Those two girls are chasing the monster.' (Light Warlpiri)

All three examples are similar in meaning. In (5), any of six word orders are possible, but the auxiliary *ka-pala-ø* 'IMPF-3DL-3SG' must occur in second position in the sentence. In (6), no other word orders are permitted, unless the object is topicalized. In (7), other word orders are permitted, but elements in the verbal unit *dem jeising it* must occur contiguously. The diagnostic of Lajamanu Warlpiri is the use of a Lajamanu Warlpiri verb and auxiliary, as in (5), and the diagnostic of Light Warlpiri is the use of a verb with English/Kriol structure and a Light Warlpiri auxiliary, as in (7). Example (7) has an English/Kriol verb, a Light Warlpiri auxiliary and Lajamanu Warlpiri nouns. Note that ergative case-marking, realized as -*ng*, is optional on the A argument NP, *karnta-jarra*, 'girl-DUAL'. Light Warlpiri clearly differs from English/Kriol in consisting of a considerable amount of Lajamanu Warlpiri – the nominal case-marking system – and in addition has an innovative auxiliary paradigm. The use of this paradigm, along with the systematicity of which elements are sourced from which language, also distinguishes Light Warlpiri from practices of code-switching between Lajamanu Warlpiri and English/Kriol (O'Shannessy, 2005).

Children learn both Lajamanu Warlpiri and Light Warlpiri in the home, but usually produce only Light Warlpiri when they first start to speak.

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They typically start producing Lajamanu Warlpiri from when they are four to six years old. The extent to which children speak Lajamanu Warlpiri when they are young varies between families – in families in which both younger and older adults speak to children in Lajamanu Warlpiri most of the time, the children produce more Lajamanu Warlpiri than in families in which younger adults speak to them in Light Warlpiri most of the time. Children hear some English/Kriol through adults' code-switching between languages, but how much English/Kriol they can speak independently of the elements that occur in code-switching is unclear – they are exposed to some Standard Australian English (SAE) from a small number of SAE speakers working in the community, and they hear English on television and on DVDs. They are exposed to more SAE from the age of 3;0–4;0, when they attend preschool, conducted in Lajamanu Warlpiri, Light Warlpiri and some SAE. At the time of this study, the school ran a bilingual education program in Lajamanu Warlpiri and SAE, with Lajamanu Warlpiri prioritized in the early years, so the children's early years of schooling, from age 3;0 to approximately age 9;0, were usually conducted mostly in Lajamanu Warlpiri, depending on the organization of the school at the time, but there were always several monolingual English speakers at the school. From approximately age 10;0 the children received more schooling in English than in Lajamanu Warlpiri. Outside of the school classroom their input is mostly in Lajamanu Warlpiri and Light Warlpiri. The situation is not one of diglossia, as there is no clear separation of language use by domain or context, except that English is spoken to monolingual English speakers. Light Warlpiri speakers use Light Warlpiri when speaking to other Warlpiri in any situation, including on traditional ceremonial occasions. Similarly, code-switching between languages occurs in any context. The separation of languages is by interlocutor – Light Warlpiri speakers mostly use Light Warlpiri, especially to each other and to children, and older speakers mostly use Lajamanu Warlpiri, but frequently code-switch into English/Kriol. Community members distinguish between the different styles of speech – Lajamanu Warlpiri, Light Warlpiri and varieties of English/Kriol by using different names for them, describing who uses them, and identifying some grammatical differences between them. Language norms are very fluid, and switching between varieties is typical.

Grammatical relations in Lajamanu Warlpiri and Light Warlpiri

Lajamanu Warlpiri. In classic and Lajamanu Warlpiri, ergative–absolutive case-marking indicates core arguments – A arguments (nouns and free pronouns) take an ergative case-marker and S and O arguments take absolutive marking, realized as null marking. Non-core arguments are

also indicated by case-marking. Core arguments may be elided if the entity they refer to can be recovered anaphorically, and typically many core arguments are not overt. In one study of narrative texts in Lajamanu Warlpiri, 82 percent of A arguments were elided (Swartz, 1991: 33). The percentage of A arguments elided in spontaneous conversation is not clear, but elision certainly occurs. Word order is variable and does not indicate arguments. Word order plays a pragmatic role, in that the most salient information, whether a subject, object or verb, is provided first in a sentence, and if encoded by an argument, the argument is overt (Hale, 1992; Laughren, 2002; Simpson, 2007; Swartz, 1991). When an A argument is overt, the most common word order is AV (Swartz, 1991: 56). Lajamanu Warlpiri differs from classic Warlpiri in that in the speech of people under about age sixty in Lajamanu Warlpiri, ergative case-marking occurs on most, but not all, overt A arguments (O'Shannessy, 2009: 428), whereas in classic Warlpiri it is obligatory, except on first and second person pronouns in some contexts (Bavin & Shopen 1985: 609).

Core arguments are also indicated in both varieties by a system of obligatory bound pronominal clitics in the auxiliary cluster in a nominative–accusative pattern – both A and S arguments are cross-referenced by one form, and non-subject arguments by another (Hale *et al.*, 1995: 1431). When the realization of the pronoun is null, the interpretation is third person singular. The null realization applies to both subject and non-subject referents. If only one of two referents was third person singular, an overt form would appear for the other referent. The pronominal element attaches to a tense–mood–aspect element. Example (8) shows a transitive sentence from Lajamanu Warlpiri.

(8) nya-nyi   ka-lu-jana   wawirri   yankirri yapa-patu-rlu
    see-NPST IMPF-3PLS-3PLO kangaroo emu   person-PLURAL-ERG
    'The people saw the kangaroo and the emu.'

In (8), the auxiliary cluster consists of *ka-lu-jana* 'present imperfective-they-them'. The element *ka* contains information about tense, mood and/or aspect, specifically, 'present imperfective'. The pronominal element -*lu* encodes third person plural subject, and -*jana* encodes third person plural non-subject. The transitive subject is *yapa-patu* 'person-plural'. It has an ergative marker, -*rlu*, attached to it and it is positioned at the end of the sentence. The object of the transitive verb consists of two nouns juxtaposed, *wawirri yankirri*, meaning 'kangaroo and emu'.

The cue of ergative marking in classic and Lajamanu Warlpiri is not always available, reliable or regular (Bavin & Shopen, 1985: 608; 1989: 189–92). The evidence for this is that: (i) core arguments can be omitted, so that the case-marker is not available at all; (ii) if there are two or more words in an NP, often only the final word carries the case-marker; (iii) the

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classic Warlpiri ergative marker has four allomorphs, conditioned by the length of word stem and vowel harmony; and (iv) the ergative marker has homonyms. Two of the ergative allomorphs, *-rli* and *-ngku*, have the same form as bound pronouns, so each form has more than one function, making it less reliable than a form with only one function.

Other types of homonymity are where the ergative operates as a marker of instrumental case, as in example (9), and as an adverbial marker, as in example (10).

(9) kuyu   ka-ø-jana   panti-rni   wujita-kurlu-rlu
     game   IMPF-3SG-3PL   pierce-NPST   spear-COM-ERG
     'He is spearing the game with a spear.' (Hale, 1982: 280)

(10) karnta-ngku   ka-ø-ø   kurdu   muurlpa-rlu
     woman-ERG   IMPF-3SG-3SG   child   carefully-ERG
     ka-nj-a-ni
     carry-INF-GO-NPST
     'The woman is carrying the child along carefully.' (Hale, 1982: 280)

The ergative-as-instrument marker is likely to influence the reliability of the form because the instrument marker is common, only occurs in transitive clauses and is distributed similarly to the ergative marker in that it attaches to NPs.

There are several additional cues which provide information about grammatical relations in classic Warlpiri and Lajamanu Warlpiri – information in the pronominal clitics in the auxiliary, animacy of NP referents, lexical semantics and event probability. Information in the auxiliary for person and number of A, S and O argument referents is available in every clause in the form of clitic pronouns. When the clitic pronoun is null, it is interpreted as third person singular. The usefulness of the clitic pronoun depends on how much information is needed for referent identification, for example, if more than one probable entity could be referenced by a third person singular pronoun, then other information is needed to identify the appropriate entity.

Light Warlpiri. In Light Warlpiri grammatical relations are indicated by case-marking and word order, which compete for this function. Ergative–absolutive case-marking is partially used – ergative marking occurs on 65% of A arguments in adult narrative data (O'Shannessy, 2009: 432). In addition to the function of indicating A arguments, ergative marking has the function of showing discourse prominence and heightened agentivity of a referent (Meakins & O'Shannessy, 2010: 1709). Core arguments may be elided in Light Warlpiri. When they are overt, word order is used to indicate arguments to some extent – word order is variable, but the most common order in transitive sentences is AVO. AV order (regardless of overtness and position of O), occurs in 81% of transitive

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sentences in adult Light Warlpiri narrative data (O'Shannessy, 2009: 432). There is a correlation between ergative marking and word order, such that postverbal A arguments are ergatively marked more often than preverbal A arguments – 66% of postverbal arguments and 58% of preverbal arguments in adult narrative data are ergatively marked (O'Shannessy, 2009: 432).

Light Warlpiri has free pronouns from Lajamanu Warlpiri, which take case-marking as they do in Lajamanu Warlpiri. It also has a system of pronouns drawn from English/Kriol which occur in an auxiliary cluster, and optionally have tense–mood–aspect elements attached to them. But unlike the pronominal elements in the auxiliary cluster in Lajamanu Warlpiri, in Light Warlpiri they only provide information about person and number for subjects, not for non-subjects. So less information about argument referents is provided by the auxiliary cluster in Light Warlpiri than in Lajamanu Warlpiri.

In sum, both ergative marking and AVO word order are cues to grammatical relations in Light Warlpiri, but neither cue is always available nor very reliable. Core arguments can be omitted, and when they are neither word order nor case-marking can provide information about grammatical relations. When A arguments are overt, the ergative marker occurs on only approximately 65 percent of them, so is less available than in Lajamanu Warlpiri. The ergative case-marker has several forms, so is not very regular. The ergative marker is also used as an instrumental and causative marker, as in Lajamanu Warlpiri, so there is no one-to-one mapping of form to function, reducing the reliability and validity of the case-marker.

AVO word order is not always reliable as a cue because A arguments can occur in non-initial positions in a clause. Postverbal A arguments are often ergatively marked, but not always. Speakers need to rely on information in the discourse other than ergative marking and word order, such as that provided by pronominal elements in the auxiliary cluster, animacy of arguments, verb semantics and real-world knowledge to interpret argument roles.

Research questions

There are three main research questions regarding sentence interpretation strategies involving case-marking and word order under conditions where the discourse pragmatics do not vary. The first question is, when interpreting simple transitive sentences, will adults and children orient more to either case-marking or word order as a cue, or will they use a combination of both strategies, in different linguistic environments? For instance, will they orient to the cue of case-marking when it is present, and to AV word order

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when case-marking is not present? In Lajamanu Warlpiri, ergative marking is expected to be the strongest cue, because word order does not play a syntactic role. But in Light Warlpiri there is no clear prediction for which strategy adults or children will choose. The competition between case-marking and word order in Light Warlpiri provides an interesting context for Slobin's (1982) hypothesis that local marking (i.e. case-marking) is easier to learn than non-local marking (i.e. word order patterns). If this hypothesis holds, children hearing Light Warlpiri should rely on case-marking earlier and more often than they rely on word order. But ergative marking is not always available in the input, and there is a preference for AV word order in adult Light Warlpiri speech, so the children might orient to AV order as a more reliable strategy than case-marking for indicating grammatical relations.

The second question relates to cross-linguistic influence between languages. In Lajamanu Warlpiri, ergative case-marking mostly indicates grammatical relations, but in Light Warlpiri it does so much less often. The question is whether the use of case-marking in Lajamanu Warlpiri influences its use in Light Warlpiri, so that adults and children would use case-marking more than word order in sentence interpretation in Light Warlpiri. Alternatively, does the use of word order as a cue in Light Warlpiri strengthen it as a cue in Lajamanu Warlpiri, especially as Light Warlpiri is the children's stronger language? If so, reliance on the cue of case-marking in Lajamanu Warlpiri would be weakened.

The third question interacts with that of cross-linguistic influence, and is about when children come to rely on the strategy or strategies they choose. Children learning classic Warlpiri, a language variety very similar to Lajamanu Warlpiri, learned to rely on case-marking as a cue after age 4;0. Will the children in this multilingual learning context, in which the cues of case-marking and word order pattern differently in each language under study, and are less available and reliable than in classic Warlpiri, learn to use them even later in both languages?

METHOD

Participants

Participants were three groups of children, mean ages 5;0 (7 girls, 2 boys, age range 3;10–6;0), 7;0 (5 girls, 5 boys, age range 6;1–8;0) and 9;0 (7 girls, 2 boys, age range 8;2–9;5), and one group of 8 female adults aged 19–23 years. Appropriate permissions were obtained. The task was conducted at a house in the community in which I was staying, and in a school building. Participants were chosen by my asking children of the appropriate age if they would participate and asking the families if the children could participate in the task.

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Materials

The methodology is based on the Intermodal Preferential Looking paradigm but pointing is used to indicate the participants' preference of one scene or another rather than looking. The children were presented with two short, simple, animated video clips on a computer screen featuring cartoon-style humans and familiar animals, created using Adobe Flash software, and played through a web browser. The video clips depict simple two-participant events which are typically encoded by transitive verbs. The content of the video clips was devised by me in consultation with my advisors and the artwork and animation were done by a professional film company. The events represented humans and animals familiar to the children, although the children had not seen the specific cartoon representations before. An example of a set of characters is given in Figure 1.

A pair of events showed the same two characters, and the same action was performed by one of the characters on the other, but in a pair of scenes the roles of the two characters were reversed, such that the agent in one scene was the patient in the other, and vice versa. In each language there were two conditions, case-marking and word order, with two levels of each condition. In the case-marking condition the two levels were 'with' and 'without' ergative case-marking on the overt NP. In the word order condition the two levels were NV order and VN order. The order of presentation of scenes and sentences within the task was randomized, then counterbalanced, so that a systematic interpretation was possible for an equal number of scenes appearing on each side of the screen (for example, an ergatively marked NP is the A argument). Each sentence the children heard contained one lexical core argument, with or without ergative marking, an auxiliary and a transitive verb. All argument referents were animate. Each sentence had only one lexical argument for reasons of naturalness, since in spontaneous speech transitive sentences with only one lexical core argument are common (Swartz, 1991: 33).

Procedure

The participants first saw each animated scene, separately, one on each side of the screen. Then they saw both scenes at the same time and heard a prerecorded sentence. For each transitive verb there was a set of two scenes. Each scene appeared separately, for five seconds, with one second between scenes, then after two seconds both scenes appeared on the screen side-by-side and stayed for six seconds. There was a five-second interval between trials. The auditory stimuli were loaded onto the computer separately and played in Quicktime format; each one was started by a

mouse click from me. The auditory sentences began when the two scenes appeared on the screen side-by side. The children pointed to the scene which represented the sentence heard. There was a series of warm-up scenes before the task, and an intransitive filler scene after every four or five test scenes, to counter any pattern in response the children might be using, and to see if they were attending to the task. Intransitive scenes were chosen as fillers so that they did not lead to a bias in the children's responses, and also included an auditory recording.

The trial scenes were presented in four different orders and each participant was presented with a different order of scenes in each language. For instance, if a participant did the task first in Lajamanu Warlpiri and saw scenes in order A, then two weeks later the same participant did the task in Light Warlpiri and saw scenes in order B, C or D. Orders were counterbalanced so that different participants did the task with different combinations of orders. Each child and adult participated in the task twice, once when the prerecorded sentences were in Lajamanu Warlpiri and once when they were in Light Warlpiri, with a two-week break between sessions. Half of the children and adults performed the task first in Lajamanu Warlpiri, then in Light Warlpiri, and the other half performed the task with the languages in the reverse order.

In natural speech, the omission of a core argument is contextualized, in that the argument can only be omitted when its referent can be retrieved through the linguistic or non-linguistic context and, accordingly, in the task a discourse context was provided by visual information in the scenes the children were looking at. The children saw the two characters before they heard the sentence in which only one of them was named. To enable the children to cue into the language they were about to hear in the task, they first watched a short video in the language of the task. Children were also given a sandwich to eat while they watched the video, in case being hungry caused them to lose concentration during the task, and they were given an ice-cup afterwards.

The Lajamanu Warlpiri examples here are given with English translations which represent the Lajamanu Warlpiri (and classic Warlpiri) interpretation of the sentences. Table 1 summarizes the conditions and possible inter-pretations.

I will call the interpretation using case-marking as the cue the 'case-marking interpretation'. For the 'with case' condition the case-marking interpretation is that the character referred to by the overt NP with ergative case-marking is the A argument. For the 'no case' condition the case-marking interpretation is that the character referred to by the overt NP without case-marking is the O argument, and the other, unnamed character is the A argument. This is because in the case-marking interpretation only a case-marked NP is interpreted as an A argument,

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TABLE 1. *Experimental conditions and possible strategies*

Condition	Strategy	NV condition	VN condition
'with case' condition	case-marking strategy	A	A
	word order strategy	A	B
'no case' condition	case-marking strategy	B	B
	word order strategy	A	B

Coding: A. Listener chooses referent of named NP.
       B. Listener does not chose referent of named NP.

and unmarked NPs are interpreted in a transitive sentence as O arguments. I will call the other possible interpretation of the sentences the 'word order interpretation'. This is based on the assumption that if a word order strategy should be used in Light Warlpiri or Lajamanu Warlpiri for this function it would most likely be AVO order, because AVO is the most common order in Lajamanu Warlpiri (Swartz, 1991: 56) and Light Warlpiri (O'Shannessy, 2005; 2009) and AVO order is used to indicate grammatical relations in English and Kriol. The word order interpretation is that when the order is NV, the character referred to by the overt NP is the A argument, in other words, NV = AV, regardless of case-marking. When the order is VN, the character referred to by the overt NP is the O argument, in other words, VN = VO, regardless of case-marking.

The following examples show Lajamanu Warlpiri and Light Warlpiri sentences for the same pair of scenes, with one example for each condition. Examples (11) and (12) are in Lajamanu Warlpiri. Example (11) shows the 'with case, NV order' condition, and example (12) shows the 'with case, VN order' condition.

(11)   nantuwu-rlu   ka-ø-ø   panti-rni
           horse-ERG   IMPF-3SG-3SG   poke-NPST
           'The horse is poking it/him/her.'
(12)   parlupi-nyi ka-ø-ø   wawirri-rli
           find-NPST   IMPF-3SG-3SG   kangaroo-ERG
           'The kangaroo finds it/him/her.'

The next two examples show Lajamanu Warlpiri sentences for the 'no case' condition, in both NV (13) and VN (14) orders. In (13) and (14), in which the overt NP does not have ergative case-marking, the case-marking interpretation is given in the gloss, which is that the unmarked core NP is the O argument.

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(13) prokprok   ka-ø-ø   marnpi-rni
     frog   IMPF-3SG-3SG   touch-NPST
     'It/he/she touches the frog.'

(14) ma-ni   ka-ø-ø   jungunypa
     get-NPST   IMPF-3SG-3SG   mouse
     'It/he/she picks up the mouse.'

Examples (15) and (16) are Light Warlpiri, for the 'with case, NV order' and 'with case, VN order' conditions.

(15) uuju-*ng*   i-m   puk-um
     horse-ERG   3SG-NFUT   poke-TR
     'The horse is poking it/him/her.'

(16) i-m   faind-im   kengkaru-*ng*
     3SG-NFUT   find-TR   kangaroo-ERG
     'The kangaroo finds it/him/her.'

In (17) and (18), both the case-marking interpretation and word order interpretations are given in the translations. How the Light Warlpiri adults would interpret these sentences was an empirical question, because there is no ergative case-marker on the nouns, and because this kind of study had not previously been conducted with Light Warlpiri-speaking adults.

(17) prokprok   i-m   taj-im
     frog   3SG-NFUT   touch- TR
     'It/he/she touches the frog.' (case-marking interpretation)
     Or: 'The frog touches him/her/it.' (word order interpretation)

(18) i-m   ged-im   *jungunypa*
     3SG-NFUT   get-TR   mouse
     'It/he/she picks up the mouse.' (Both case-marking and word order interpretations lead to the same choice.)

Figure 1 shows the final images that the children saw when they heard the sentence in example (18). The figure shows that the children could point to a scene that shows a frog picking up a mouse (on the left-hand side) or a mouse picking up a frog (on the right-hand side). I administered the task to each child individually, recording on paper the scene the child pointed to during the task. The task was not videotaped because a pilot task showed that it was difficult to position the video camera such that the child's hand movement could be seen to differentiate clearly between scenes. When I was not sure to which scene the child pointed I asked *nyarrpara?* 'where?' and recorded the scene to which the child pointed the second time. Some children's results were not included in the final set of data for analysis because the children's hand movements did not unambiguously indicate one or
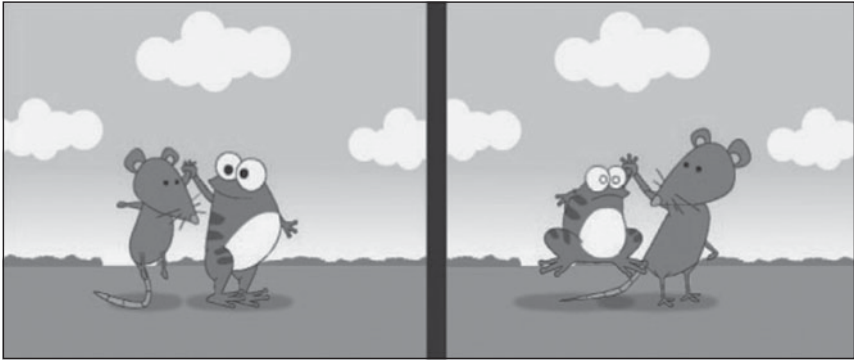
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Fig. 1. Final image participants saw for example (18).

other of the scenes. For example, some children pointed to the same side of the screen for every sentence, including the intransitive filler items. If a child did not point to the correct scene in the filler items the task was abandoned for that child, and none of the child's choices were included in the data. This was the case for one girl and two boys in the five-year-old age group, and one girl in the seven-year-old group. After each set of items, whether successful or not, each child was given an ice-cup.

Data analysis method

The data were analyzed using a multilevel logistic regression analysis with a binomial link function (Pinheiro & Bates, 2000). Four independent variables were assessed: (i) language (Light Warlpiri or Lajamanu Warlpiri); (ii) ergative case-marker (present or not present); (iii) word order (NV or VN); and (iv) age group of listener (mean ages 5, 7, 9 or 20). One dependent variable was assessed: whether participants did or did not choose the NP which was named in the sentence. In addition, Participant and Item were entered into the analysis as random effects. This analysis was chosen because it takes into account the following five key features of the study design. First, the dependent variable is binary, allowing the participants to choose only either the named referent or the non-named referent. Therefore, an analysis requiring a normal distribution of datapoints was not possible. Second, the participants conducted the task twice, once in each of two languages, requiring a design which accounts for repeated measures. Third, the choices made were not independent of each other, in that the same individuals made choices in each condition. If the individual units of analysis were treated as independent and their relationships to each other were ignored – being the same participants in each condition – the results

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might be misleading or not as informative as they could be (Goldstein, 2003: 2). The analysis takes into account that individual units share certain properties (the participants are the same in each condition), and can be grouped in some way. The next level of groups can again be grouped (one language is used in each condition), providing a more accurate and informative picture. Fourth, the characteristics of items in the task differ also. Even when the number and type of items in a study are set as part of the design, the items themselves might not be truly equivalent in that some might be easier to process or lead to a particular conclusion more easily than others for reasons that are not immediately obvious or transparent (Clark, 1973). Assuming that the items are equivalent can cause misleading results. The solution to this problem is to treat the items and individuals performing the task as random effects (Raaijmakers, Schrijnemakers & Gremmen, 1999: 417). Fifth, the analysis allows for several predictor variables to be evaluated, in this case word order and case-marking. Sankoff (1988: 989) explains that when trying to distinguish between the effects of potentially explanatory factors on a particular linguistic choice, one needs to understand the combined effect of the factors, but statistical models that are simply additive make inaccurate predictions. Therefore a model with a link function is required.

RESULTS

The study examined how adults and children used the cues of ergative case-marking and AV word order in interpreting grammatical relations in simple transitive sentences in Lajamanu Warlpiri and Light Warlpiri. It was expected that the case-marking strategy would be used most in Lajamanu Warlpiri, but there were no clear predictions for how adults and children would use the cues in Light Warlpiri. The second question is about cross-linguistic influences. Influence from Lajamanu Warlpiri on Light Warlpiri might strengthen case-marking as a cue in comparison to word order. Alternatively, influence from Light Warlpiri on Lajamanu Warlpiri, and from English/Kriol on both languages, might strengthen word order as a cue. The third question is about when children learn to rely on the cues they use. Since neither case-marking nor word order has high cue validity in Light Warlpiri, the children's reliance on either cue might be delayed, compared to learners of cues in other languages in which the cues are more available and reliable. Also, cross-linguistic influence from the use of word order in Light Warlpiri and in English/Kriol might delay children's reliance on case-marking.

Figures 2 and 3 show the percentage of trials in which the named NP was selected in each of the four conditions for each of the four age groups, for Lajamanu Warlpiri and Light Warlpiri, respectively.
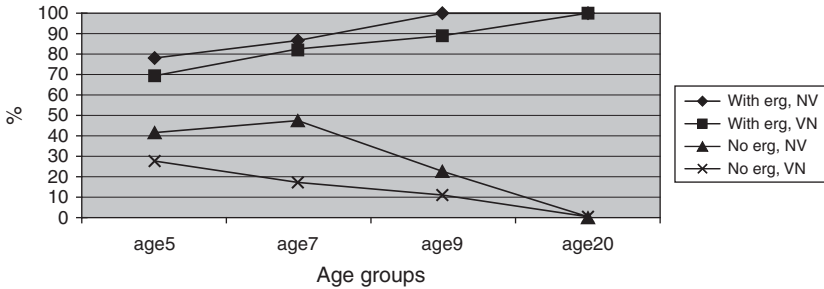
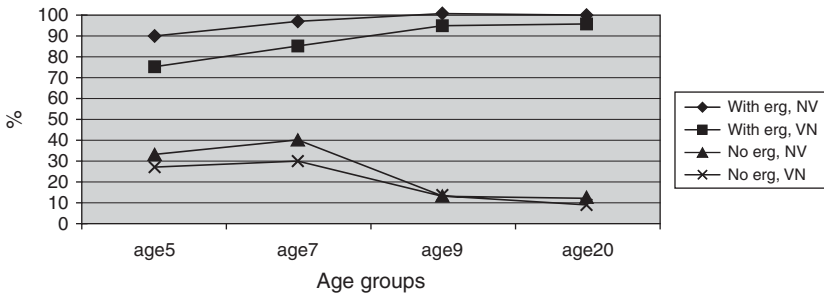Fig. 2. Percentage choices of named NP, Lajamanu Warlpiri, by age.

Fig. 3. Percentage choices of named NP, Light Warlpiri, by age.

The output of the multilevel logistic regression analysis is provided in Table 2. There is one less item in the condition $N^{+erg}V$, because for one scene in that condition the cartoon animation allowed two possible interpretations of who the agent was, so the scene was not included in the analysis.

To help interpret Figures 2 and 3, each combination of conditions and the strategy used for each choice is given in Table 3.

In response to the first and second questions, about which strategies the children use to interpret grammatical relations in each language, a main effect of ergative marking shows that ergative case-marking was a stronger cue than word order across all age groups, including adults, in both languages ($p < 0.001$). There was no difference between languages in which cue was used most often. Figures 2 and 3 show that the adults consistently used case-marking as a cue – when the ergative was present they chose the ergative-marked NP as the A argument, and when it was not present, they did not choose the named NP as the A argument ($p < 0.001$). But word order was also a salient cue – a main effect of word order shows that the named NP was chosen more often when the word order was NV than when it was VN ($p < 0.001$). This means that listeners considered the N in NV

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TABLE 2. *Output of statistical analysis**

Random effects:

Groups:	Name	Variance	Std. Deviation
Speaker	(intercept)	0·050522	0·22477
Sentence	(intercept)	0·0503305	0·23088

Number of observations: 1020
Groups: speaker, 36; sentence, 15
Estimated scale: 0·949991

Fixed effects	Estimate	Std error	Z value	Probability
(Intercept)	4·91528	1·02636	4·7891	$p < 0.001$**
Age 5	−3·24616	1·03607	−3·1331	$p = 0.001$**
Age 7	−2·52476	1·04474	−2·4166	$p = 0.01$**
Age 9	−1·42739	1·09679	−1·3014	$p = 0.19$
No ergative	−7·50583	1·11608	−6·7252	$p < 0.001$**
VN order	−0·72725	0·21888	−3·3226	$p < 0.001$**
Age 5, No erg	5·44998	1·14256	4·7700	$p < 0.001$**
Age 7, No erg	4·78066	1·14900	4·1607	$p < 0.001$**
Age 9, No erg	2·62798	1·20694	2·1774	$p = 0.03$**

* Dependent variable: choice of named NP as agent in Lajamanu Warlpiri and Light Warlpiri transitive sentences, mean ages 5;0, 7;0, 9;0, 20.
** The probability is less than 0·05.

TABLE 3. *Strategies listeners use when making a choice in each condition*

Choice of NP as A argument	With ergative		No ergative	
	NV	VN	NV	VN
Named NP	case, word order	case	word order	neither
NP which is not named	neither	word order	case	case, word order

order to be the A argument more often than not, but recall that in two conditions ($N^{+erg}V$ and VN^{+o}) the case-marking strategy and word order strategy led to the same choice.

Regarding the second question, the case-marking strategy is used most often in both languages ($p < 0.001$), so it appears that the use of case-marking in Lajamanu Warlpiri influences its use in Light Warlpiri. But conversely, there is some reliance on word order in the NV condition in both languages ($p < 0.001$), so the use of word order in Light Warlpiri, and possibly in English/Kriol, must in turn influence Lajamanu Warlpiri.

In response to the third question, of when children rely on the cues they use, there is a clear developmental pattern in the use of the case-marking strategy and a steady decrease in the use of the word order strategy.

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The main effects of age show that the children at ages 5;0 ($p=0{\cdot}001$) and 7;0 ($p=0{\cdot}01$) were not adult-like in their use of either strategy – they used case-marking less often, and word order more often, than the adults. The nine-year-olds made choices similar to those of the adults ($p=0{\cdot}19$, i.e. no significant difference from the adults). The five-year-old group ($p=0{\cdot}001$) and seven-year-old group ($p=0{\cdot}01$) each differed from the other groups. Children in these groups sometimes did not choose the referent of the named NP when ergative marking was present. Interaction effects of age and ergative marking also show a clear developmental pattern, in which each age group differs from each other group. When case-marking was not present in the sentence heard, the five-year-olds relied on the case-marking strategy the least ($p<0{\cdot}001$), the seven-year-olds relied on it more often ($p<0{\cdot}001$), and the nine-year-olds more often again ($p=0{\cdot}03$). We can interpret from these results that the converse is true for word order – the youngest age group used word order the most often, and each older age group used it less often. In other words, for the younger children, both word order and case-marking cues were salient, so they paid attention to both. As they got older case-marking was used as an increasingly stronger cue.

DISCUSSION

Strategies used most in both languages

At the outset of the study, the prediction was that adults would use case-marking to comprehend grammatical relations in Lajamanu Warlpiri sentences because ergative marking appears on most A arguments in spoken Lajamanu Warlpiri and thus case-marking is a relatively reliable cue in Lajamanu Warlpiri, even though it is not completely available or reliable (cf. Bavin & Shopen, 1985; 1989). This prediction was largely upheld: adults used case-marking to interpret grammatical relations between 94% and 100% of the time depending on the condition. However, it was not clear what strategy adults would use in Light Warlpiri because ergative marking is much less reliable, and word order is also a cue. Interestingly, we found that in Light Warlpiri also, case-marking is a stronger cue than word order for adults.

The information in Figures 2 and 3 is useful for understanding the comparative strengths of the cues. The adults used the case-marking strategy in all conditions, but the children showed some non-adult-like patterns. There are two conditions in which case-marking and word order as cues led to the same choice – in the $N^{+\mathrm{erg}}V$ condition both strategies led to choosing the referent of the named NP as the A argument. In the VN^{+o} condition neither strategy leads to choosing the referent of the named NP as the A argument (i.e. the postverbal N is the O argument). So children could be

expected to choose the referent of the named NP as the A argument most often in the $N^{+erg}V$ condition and to choose the referent of the named NP least often in the VN^{+o} condition. The children did behave as expected – they chose the referent of the named NP as the A argument more often in the $N^{+erg}V$ condition.

The context of this study, in which case-marking and word order are in competition, is a good testing ground for Slobin's hypothesis that nominal case-marking is an easier cue to learn than word order. The children did not initially choose a case-marking strategy for sentence interpretation over a word order strategy in all of their choices. But they did rely on it more often than they relied on word order, even in the conditions where the competition between cues is most apparent, the VN^{+erg} and $N^{+o}V$ conditions. This suggests that, although case-marking is not always available and reliable in either language, it is interpreted by all age groups as the most valid cue. Conversely, although word order is interpreted as having some validity, it has less validity than case-marking. In the conditions in which case-marking and word order led to different choices, all age groups used the case-marking strategy more often than the word order strategy, lending tentative support for Slobin's (1982) hypothesis that case-marking is easier to learn. The VN^{+erg} and $N^{+o}V$ conditions show competition between case-marking and word order cues most clearly, because the use of case-marking or word order as the cue led to different choices. In the VN^{+erg} condition the children relied on case-marking for approximately 70% of choices in both languages, and in the $N^{+o}V$ condition they used it in approximately 60% of choices in both languages – case-marking won out over word order as the strongest cue. In both Lajamanu Warlpiri and Light Warlpiri, NV is the most frequent order and would often be an accurate predictor of agents. Despite this, in the two conditions in which the cues are most clearly in competition, the youngest children used the case-marking strategy more often than the word order strategy, and the older groups used the case-marking strategy more often again.

Adults used the case-marking strategy as the default strategy in both languages, in both the 'with case' and 'no case' conditions. But recall that when they SPEAK Light Warlpiri they do not always produce ergative marking on A arguments – in spoken Light Warlpiri the cue of case-marking is not always available (O'Shannessy, 2005; 2009). This means that listeners in real-life conversations in Light Warlpiri hear speakers producing A arguments which are not morphologically marked, so they presumably use non-morphological, contextual cues to interpret them as A arguments. The discrepancy between comprehension and production can perhaps be explained by the use of cues other than case-marking in real discourse. In the comprehension task in this study, each sentence was discrete and did not depend on previous discourse for its interpretation. In discourse there

is a wealth of contextual cues available: word order, information about person and number in the auxiliary, lexical semantics, event probability and information packaging. These are present in both Light Warlpiri and Lajamanu Warlpiri, but Light Warlpiri speakers make use of them more. When these cues are informative enough the listeners are probably sensitive to them, and so rely on the presence or absence of ergative case-marking less. When these cues are not informative, such as in the comprehension task used in the study, listeners are more sensitive to the presence or absence of ergative case-marking.

Information in the auxiliary for person and number of argument referents is available in the form of clitic pronouns in the auxiliary, in a nominative–accusative pattern. That is, for each number and person the pronoun form for A and S roles is different from that for O roles. In one theory of classic Warlpiri syntactic structure, it is the clitic pronominal elements in the auxiliary which are the verbal arguments (Jelinek, 1984: 43). Independent noun phrases are considered to be adjuncts, without argumental properties, and are co-indexed via their case-markers to the encliticized pronouns. The case-marking on a noun phrase indicates to which pronominal argument the noun phrase is indexed. But the theory of pronominal clitics as arguments does not entirely resolve the question of how agents are indicated – the case-marking would still be needed to show which pronominal element co-references the noun phrase, that is, which is the subject and which the non-subject of a transitive clause. The usefulness of information in the pronominal elements for person and number of referents varies according to how much information is needed to disambiguate the referents – if two referents have the same person and number, more information would be needed for disambiguation. Additionally, ergative marking is not always present in Lajamanu Warlpiri. Further, in contrast to Lajamanu Warlpiri, the Light Warlpiri auxiliary does not carry information for non-subject referents, so the pronominal elements in the Light Warlpiri auxiliary cannot be considered to be arguments. For these reasons, the theory that the pronominal clitics are the arguments does not alter the learnability question raised in this study.

Crosslinguistic influence

Cross-linguistic influence could have been observed either from Lajamanu Warlpiri to Light Warlpiri, through more reliance on case-marking than on word order as a cue, or from Light Warlpiri (and possibly English/Kriol) to Lajamanu Warlpiri, through increased reliance on word order, and weakening of case-marking, as a cue. The results show that there is more reliance on case-marking than on word order in both languages, suggesting an influence of Lajamanu Warlpiri on Light Warlpiri. But for the younger

children there is also some use of word order as the cue in both languages, so it appears that cross-linguistic influence is bi-directional. This is most apparent for the younger children.

In contrast to the classic Warlpiri-speaking children in the Bavin & Shopen (1989) study, for whom word order was the weakest cue in sentence interpretation, the multilingual Lajamanu children do use a word order strategy as well as a case-marking strategy in Lajamanu Warlpiri. Possible explanations are the prevalence of an AV word order pattern the children hear in all input languages, and the AV pattern they use often in their own speech production. In both Light Warlpiri and Lajamanu Warlpiri, animate A arguments are in preverbal position more often than inanimates, and postverbal A arguments are more likely to be ergatively marked than preverbal A arguments, so an unmarked preverbal N can often be correctly interpreted as the A argument (O'Shannessy, 2009: 431). Children at ages 5;0 and 7;0 choose the named, unmarked preverbal N as the A argument for approximately 20% of items (18·7% and 21·8%, respectively). At age 9;0, children still made this choice, but less often (9% of choices), and instead relied mostly on a case-marking strategy (84% of choices). The results show that the role of word order in indicating grammatical relations is greater in the languages currently spoken in Lajamanu, than it was in classic Warlpiri spoken in Yuendumu community for the Bavin & Shopen (1989) study. I hypothesize that the difference is due to the influence of Light Warlpiri, their primary language, in which ergative marking occurs less often, and possibly also due to contact with English/ Kriol.

When children learn to use the strategies

At age 5;0, the children used both case-marking and word order strategies, but case-marking was the stronger cue. As they got older they increasingly used the case-marking strategy, approaching the pattern of choices made by adults, but at age 9;0 they still made different choices from the adults.

Interestingly, there were two conditions in which neither case-marking nor word order was the cue the children relied on. In the VN$^{+\text{erg}}$ condition, the five-year-olds and seven-year-olds did not always choose the named referent. In the VN$^{+\emptyset}$ condition, both word order and case-marking strategies would lead to NOT selecting the referent of the named NP as the A argument, but five-year-olds and seven-year-olds chose this referent for 28% and 24% of choices, respectively. In this combination of conditions the children appeared to choose the referent of the named NP simply because it was named. As they got older they relied on the cues of case-marking and word order. This suggests that since both case-marking and word order

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are low in validity as cues, they are hard to learn, as predicted by the Competition Model. In comprehension studies by Bavin & Shopen (1985: 605), child speakers of classic Warlpiri in another community reached scores of 67% correct in interpreting ergative case-marking only after age 4;0. The youngest children in the Lajamanu study were one year older and show a slightly higher rate of success at age 5;0: when ergative marking is present, they use the case-marking strategy in 74% of choices. Despite the children in Lajamanu Community receiving input in both languages, there is no apparent impact in the children's interpretation of case-marking as a reliable cue in Lajamanu Warlpiri. But the success rate in interpreting transitive sentences for Lajamanu Warlpiri- and Light Warlpiri-speaking children is lower than that for children tested in the Slobin & Bever (1982) study. In each language in those studies, the children reached 67% accuracy in sentence interpretation by the ages of 2;0 (for Turkish) to 3;0 (for Serbo-Croation). In accounting for the relatively late age of attainment of accuracy by the classic Warlpiri-speaking children, Bavin & Shopen (1989: 191) explain that the ergative marker in classic Warlpiri is difficult to learn because it is not always available nor reliable. In Lajamanu Warlpiri, ergative marking is less available than in classic Warlpiri, and children in Lajamanu receive input in more codes, with availability of ergative marking varying in each code. In the context of this study, in which ergative marking is used less often in one language than in the other, we might expect that the marking would be more difficult for the children in the multiple input context to detect. But these children do not appear to perform less well than the children in the earlier classic Warlpiri study, even though the two contexts are not directly comparable. This is less surprising in the light of bilingual first language acquisition studies which show that children's learning in each language can proceed independently (de Houwer, 1990), and that children can identify structural differences between their languages very early (Genesee *et al.*, 1995: 627).

CONCLUSIONS

The study examined children's (ages 5;0, 7;0, 9;0) and adults' use of the cues of case-marking and word order to comprehend grammatical relations in transitive sentences in Lajamanu Warlpiri and Light Warlpiri. The younger children tested used both word order and case-marking cues in both languages, and the older children used case-marking much more often than the younger children. The adults almost always used case-marking as the cue. There was bi-directional cross-linguistic influence between the two languages being acquired – word order patterns in Light Warlpiri influenced sentence interpretation in Lajamanu Warlpiri, but case-marking in Lajamanu Warlpiri influenced the use of case-marking in Light Warlpiri.

Finally, the multilingual children in this study relied on the case-marking cue at an older age than monolingual children tested in studies in which cues are more regular and reliable.

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