COMBINATORY POSSIBILITIES IN MURRINH-PATHA COMPLEX PREDICATES: A TYPE-DRIVEN APPROACH

Melanie Seiss
Universität Konstanz

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Abstract

This paper is concerned with complex predicates in Murrinh-Patha, a Northern Australian language. In Murrinh-Patha, a verb usually has a bipartite structure, i.e., the lexical meaning of a word is determined together by two different parts. This paper looks at the combinatory possibilities of these two parts, establishes some factors which may play a role in the selection process and proposes a formal modeling of the data using a fine-grained semantic type hierarchy. The paper then compares this approach to accounts utilizing the idea of lexical conceptual structures (LCSs) (Jackendoff, 1990) such as e.g., Butt (1995) and Wilson (1999).

1 Introduction

This paper is concerned with verbal structure in Murrinh-Patha, a North Australian language. In Murrinh-Patha, a verb usually has a bipartite structure, i.e., the lexical meaning of a word is determined together by two different parts. These bipartite structures can be considered complex predicates in the sense of Alsina et al. (1997) as the two parts together determine the argument structure of the phrase.

Such bipartite verbal complexes have also been treated as instances of event classification (McGregor, 2002; Schultze-Berndt, 2000), as one of the parts, the so-called classifier stem, functions to classify the event. In (1a), the classifier stem HANDS(8) classifies the event as an event involving hands, while in (1b) the classifier stem FEET(7) classifies the event as involving feet. In both examples, the lexical stem *rirda* 'push' is used.[1]

(1)	a. *marntirda*	b. *nungarntirda*
	mam-rirda	nungam-rirda
	3sgS.HANDS(8).nFut-push	3sgS.FEET(7).nFut-push
	'He pushed him (with hands).'	'He kicked him.'
		(Nordlinger, 2008)

As has been pointed out by Nordlinger (2008), sometimes it is obvious why a specific classifier stem is chosen (as in (1)), but sometimes it is not obvious how

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[1]Traditionally, the Murrinh-Patha classifier stems have been glossed with a number. In more recent publications it has become common to use small capitals to account for the generic meaning of the classifier stem and to keep the number to ensure compatibility with earlier publications. Murrinh-Patha classifier stems are inflected for subject person and number as well as for tense in portmanteau forms. The same classifier stem can thus have very different surface forms. The following abbreviations have been used in the glosses: sg = singular, pl = plural, S = subject, DO = direct object, RDP = reduplicated, nFut = non-future tense, Fut = future, PImpf = past imperfective, Pres = present tense, Asp = unmarked for aspect, Foc = focus marker, NC = noun class, DEM = demonstrative.

the meaning of the classifier and lexical stem is composed to form the meaning of the complex predicate. For example, in (2) it is not clear why the classifier stem HANDS(8) is used.

(2) *mam-pun-mardaraki*
3sgS.HANDS(8).nFut-3sgDO-disappoint
'He disappointed them.' (Nordlinger, 2008)

This paper investigates some of the factors which are involved in Murrinh-Patha event classification. McGregor (2002) claims that three different factors may be important in event classification in Australian languages generally: valency, aspect/Aktionsart and vectorial configuration. Seiss and Nordlinger (2010) were mainly concerned with the factors valency and aspect for Murrinh-Patha complex predicates. However, these two factors are not enough to explain the combinatory possibilities. Vectorial configuration, i.e., the lexical semantic content of the classifier and lexical stems, also plays an important role, which is the main focus of this paper.

In Murrinh-Patha, the same classifier stem can be used in a range of different complex predicates. For example, the classifier stem POKE(19) can be used in events in which contact is made with the tip of a long object, in events of linear movement and in certain mouth-associated events, among others. This variety can be nicely modeled with a type-driven approach in which a lexical item has a simple lexical entry with multiple typing restrictions. For this purpose, the paper makes use of Asher's (2011) idea of fine-grained semantic type hierarchies and his Type Composition Logic (TCL).

For the formal modeling of the lexical semantics of complex predicates in other languages, many approaches have utilized the idea of lexical conceptual structures (LCSs) (Jackendoff, 1990), e.g., Butt (1995), Andrews and Manning (1999), Broadwell (2000) or Wilson (1999). The paper compares the two approaches and shows that applying such approaches to the Murrinh-Patha data is difficult.

The paper is structured as follows. In section 2, a very brief introduction to Murrinh-Patha is presented. Section 3 is concerned with the argument structure of Murrinh-Patha complex predicates, showing that an account which builds purely on argument structure alone does not suffice. Section 4 then introduces data with the classifier stems POKE(19), BASH(14) and SLASH(23) which are used in the case study of the formal approach using types in section 5. Section 6 compares the type-driven approach to the more established LCS account and section 7 concludes the paper.

2 A brief introduction to Murrinh-Patha

Murrinh-Patha is a non-Pama-Nyungan language spoken in and around Wadeye in the Daly river region, approximately 400 kilometers south-west of Darwin. Green (2003) showed that Murrinh-Patha is related to Ngan'gitymerri (e.g. Reid, 2011), forming the Southern Daly language family. In contrast to most other Australian languages, it is still spoken in everyday life and still acquired by children, with about 2500 current speakers (Nordlinger, 2008).

Murrinh-Patha is a highly polysynthetic language with a complex verbal morphology and optional case and discourse marking on nouns. Besides the bipartite verbal structure of classifier and lexical stems which are the focus of this work, tense, reflexivity/reciprocality as well as subject and object markers can be part of the verbal complex. Additionally, body parts as well as adverbials and particles can be incorporated. For a detailed overview over the verbal template see Nordlinger (2010c). Further descriptions of the language include, among others, Street (1987); Walsh (1976); Nordlinger (2010a, 2011); Nordlinger and Caudal (2012) and Blythe (2009).

3 Argument structure

Seiss and Nordlinger (2010) provide a basic overview over the behavior of the argument structure in Murrinh-Patha complex predicates. They claim that in general, the classifier stem provides the number of arguments while the lexical stem fills in the thematic role specifications. However, they also report on (more or less common) exceptions from this general tendency.

This section provides an overview over the findings discussed by Seiss and Nordlinger (2010) and shows that valency is one factor in determining the selectional restrictions on classifier and lexical stems, but not the only one, with a complex interaction of the selectional factors.

Murrinh-Patha has 38 paradigms of classifier stems which can be roughly divided into intransitive, transitive and reflexive/reciprocal classifier stems. The classifier stems 1 to 6 are posture and motion classifier stems and have been glossed SIT(1), LIE(2), STAND(3), BE(4), PERCH(5) and MOVE(6). These classifier stems can also function as the sole verbal predicate, i.e., without an accompanying lexical stem, and are intransitive in these cases.

These classifier stems mostly form intransitive complex predicates with lexical stems. Two examples are provided in (3). In (3a), the lexical stem *karrk* ‘cry’ combines with the classifier stem SIT(1) to form a complex predicate. The lexical stem *karrk* ‘cry’ can be considered an intransitive lexical stem, as it never occurs in a transitive complex predicate and it refers to a semantically monovalent activity. Seiss and Nordlinger (2010) thus assume that *karrk* ‘cry’ contributes an agent to the complex predicate formation.

(3) a. *dim-karrk*
3sgS.SIT(1).nFut-cry
‘He’s crying.’

b. *dim-lerrkperrk*
3sgS.SIT(1).nFut-crush
‘It’s smashed.’
(Seiss and Nordlinger, 2010)

(3b) is another intransitive complex predicate formed with SIT(1). However, in this case the lexical stem involved is *lerrkperrk* 'crush', which is considered to be a transitive lexical stem as it otherwise combines with different transitive classifier stems in transitive complex predicates. *lerrkperrk* is hence treated as involving two arguments, an agent and a patient, by Seiss and Nordlinger (2010). The construction itself is considered to be an anticausative/resultative construction as the classifier stem SIT(1) only provides one argument slot, resulting in an intransitive complex predicate with just a theme argument.

The intransitive classifier stems 1 to 6 may also convey aspectual meaning and form transitive complex predicates such as in (4). Looking at the combinations for intransitive classifier stems with lexical stems thus reveals that argument structure plays a role in the selectional process, but that other factors are involved, too.

(4) a.

ku	*ngurlmirl*	*wurran-ku*
NC_{anim}	fish	3sgS.MOVE(6).nFut-fish

'He continually catches fish.' (Seiss and Nordlinger, 2010)

b.

ngani-nan-part-nu-warda	*ngurru-warda*
1sgS.BE(4).Fut-2plDO-leave-Fut-now	1sS.GO(6).Fut-now

'I've got to leave you behind, I'm going.' (Seiss and Nordlinger, 2010)

Similar findings can be reported for transitive classifier stems and their combinatory possibilities with lexical stems. (5) provides an example of a typical transitive complex predicate formed with the classifier stem HANDS(8).

(5) *mam-kurrk*
1sgS.HANDS(8).nFut-scratch
'I scratched it.' (Seiss and Nordlinger, 2010)

Barone-Nugent (2008, 53) claims that the prototypical use of the classifier stem HANDS(8) is the following: "x is in physical contact over a period of time with y using hands". In this use, the classifier stem only ever occurs in transitive complex predicate constructions. However, the classifier stem HANDS(8) can also be used (although rarely) in intransitive complex predicates such as in (6). Barone-Nugent (2008) argues that HANDS(8) can be used in combination with the lexical stem *wel* 'glide' (and other similar lexical stems) because a wing can be seen as similar to a hand, and that the classifier stem HANDS(8) can be used in events involving hands more generally.[2]

(6)

ku	*murrirrbe*	*mampel=kanam*
ku	murrirrbe	mam-wel=kanam
NC_{anim}	bird	3sgS.HANDS(8).nFut-glide=3sgS.BE(4).nFut

'The bird is gliding.' (Street, 1989)

[2]Boban Arsenijevic pointed out that the classifier stem in (6) could be understood as applying an action carried out with the hands to *yourself* and that the intransitive behavior results from this kind of reflexive reading. However, I would then expect the complex predicate to be formed with the reflexive/reciprocal version HANDS:RR(10).

As with the case of intransitive classifier stems, transitive classifier stems do not determine the argument structure of the complex predicate in all cases either. Semantic concepts such as hand-like body parts may play a role in the selection process of the classifier and lexical stem combination, overruling the valency requirements.

The aim of the remainder of this paper is to determine some semantic concepts which may play a role in the selection process and to present an account which explains the combinatory possibilities.

4 Case study: BASH(14), POKE(19) and SLASH(23)

This section introduces the core data for which the formal approach is tested in section 5. As a case study, the classifier stems BASH(14), POKE(19) and SLASH(23) are discussed, paying special attention to the similarities and differences in the combinatory possibilities. For POKE(19), Barone-Nugent (2008) has already presented a detailed study, cast within cognitive semantics. His findings are used here to contrast them with the behavior of the classifier stems BASH(14) and SLASH(23), for which Street (1989) as well as field notes by Rachel Nordlinger and Joe Blythe have been used as a data base.

Barone-Nugent (2008) states that the basic meaning of POKE(19) is that of events in which contact is made with a pointed end of an instrument, such as a stick or spear. This prototypical use of the classifier stem is illustrated in (7).

(7) *ku* *thithay* *nganthak=ngem*
ku thithay ngam-thak=ngem
NC_{anim} honey 1sgS.POKE(19).nFut-dip=1sgS.SIT(1).nFut
'I'm dipping into the honey.' (Street, 1989)

In this use of caused contact, the classifier stem POKE(19) contrasts with the classifier stems BASH(14) and SLASH(23). BASH(14) is used to denote events in which flat, solid objects such as stones, hammers etc. play a role. In contrast, SLASH(23) denotes events in which the long side of an object such as a knife etc. figures prominently. In this reading, a range of lexical stems combines with all three classifier stems which illustrates the difference in meaning nicely. An example is provided in (8) in which the lexical stem *wirntay* 'miss' is used with all three classifier stems. According to Street (1989), *wirntay* 'miss' in combination with POKE(19) means "miss with a spear", while it means "miss with a stone or short spear" with the classifier BASH(14) and "miss with a stick" with the classifier stem SLASH(23).

(8) a. *nga-wirntay-nu*
1sgS.POKE(19).Fut-miss-Fut
'I will miss (with a spear).' (Street, 1989)

b. *bangam-na-wirntay*
1sgS.BASH(14).nFut-3sgIOm-miss
'I missed him (with a stone).' (Street, 1989)

c. *thu* *thay* *pan-na-wirntay*
NC_{weapon} stick 1sgS.SLASH(23).nFut-3sgIOm-miss
'I missed (hitting) him with the stick.' (Street, 1989)

However, not all lexical stems need to combine with all three different classifier stems to form complex predicates in which caused contact plays a role. The lexical stem *rtal* 'cut off', for example, only combines with the classifier stems BASH(14) and SLASH(23), denoting an action of cutting something down with an axe and of cutting something with a knife respectively. An action in which something is cut with the tip of an instrument probably does not exist or is very rare, so that the combination of *rtal* 'cut off' and POKE(19) does not exist (at least in my database).

(9) a. *thay* *wakal* *bangarntal*
thay wakal bangam-rtal
tree little 1sgS.BASH(14).nFut-cut.off
'I cut down the little tree with an axe.' (Street, 1989)

b. *nanthi* *terert* *pana* *ngu-rartal-nu*
$\text{NC}_{residue}$ many DEM 1sgS.SLASH(23).Fut-cut.off(RDP)-Fut
'I'll cut those things there with a knife.' (Street, 1989)

Beyond these basic meanings of the classifier stems BASH(14), POKE(19) and SLASH(23), each classifier stem also has further meanings. All three classifier stems can be used in events involving movement. Barone-Nugent (2008) showed that POKE(19) is used in linear movement, both in horizontal movement along the x axis as in (10a) and in vertical movement along the y axis such as in (10b).

(10) b. *nga-riwak-nu*
1sgS.POKE(19).Fut-follow-Fut
'I will follow him.' (Street, 1989)

a. *nga-wintigat-nu*
1sgS.POKE(19).Fut-descend-Fut
'I'm going down.' (Fieldnotes R. Nordlinger)

In contrast, BASH(14) and SLASH(23) can be found in the database with lexical stems of non-linear movement, such as circular or undirected movement as in (11a,b). They cannot be used with lexical stems of linear movement, as can be seen in (11c).

(11) a. *ba-rikat-nu*
1sgS.BASH(14).Fut-circuit-Fut
'I'll go around.' (Fieldnotes R. Nordlinger)

b. *ngu-rikat-nu*
1sgS.SLASH(23).Fut-circuit-Fut
'I will go around.' (Street, 1989)

c. **ba-wintigat-nu*
1sgS.BASH(14).Fut-descend-Fut (Fieldnotes R. Nordlinger)

A third meaning range for all three classifier stems can be identified as "mouth-associated" actions. Barone-Nugent (2008) points out that POKE(19) can be used in actions in which the mouth or mouth-associated body parts such as lips, teeth etc. play a role. He assumes that the perception of the tongue or the teeth as pointed ends may have enabled the use of the classifier stem POKE(19) in actions in which the mouth plays a role.

The subgroup of mouth-associated actions is quite large; it comprises, among others, blowing, licking and chewing actions. For the purpose of illustrating the different combinatory possibilities of the three classifier stems POKE(19), BASH(14) and SLASH, only two subgroups, speech actions and ingesting, is considered.

The classifier stem POKE(19) can be used both in complex predicates denoting speech actions and ingestion. Two examples are provided in (12).

(12) a. *nga-nhi-dharrpu-nu*
1sgS.POKE(19).Fut-2sgDO-ask-Fut
'I'll ask you.' (Street, 1989)

b. *kura* *parranthap*
kura parram-thap
NC_{aqua} 3plS.POKE(19).nFut-taste
'They tasted the water.' (Street, 1989)

In contrast, the classifier stem BASH(14) is not used in complex predicates denoting speech actions. It can be used in complex predicates of ingesting, such as in (13). In this meaning range, it can combine with some lexical stems which also combine with POKE(19), e.g., with *thap* 'taste'.

(13) *ku* *ngen* *ba-gatkat-nu*
NC_{anim} meat 1sgS.BASH(14).Fut-eat.until.satisfied
'I'll eat meat until I'm satisfied.' (Street, 1989)

SLASH(23) behaves the other way around, i.e., it can be readily used in speech actions ((14a)), but usually not in complex predicates of ingesting. The only two examples which can be found in my data base of SLASH(23) being used in a complex predicate of ingesting are given in (14b,c). In these examples it can probably be argued that it is not the ingesting that is important for the selection of the classifier stem but rather the action that leads to the food being brought close to the mouth.

(14) a. *pan-ngi-rerda=kanam*
3sgS.SLASH(23).nFut-1sgDO-blame=3sgS.BE(4).nFut
'He continually blames me' (Street, 1989)

b. *ku* *ngalek*
ku ngalek
NC_{anim} mosquito
puninkatattha=dini
puni-nkatat-dha=dini
3sgS.SLASH(23).PImpf-catch-PImpf=1sgS.SIT(1).PImpf
'He was catching mosquitoes (with his tongue).' (Street, 1989)

c. *ku* *lapi* *pan-purl*
NC_{anim} rib membrane 3sgS.SLASH(23).nFut
'He dragged the membrane from the rib bone with his teeth.'
(Street, 1989)

What becomes clear from this discussion of the data is that the same classifier stem can be used in a wide variety of different complex predicates. For some complex predicates, it is quite obvious why a specific classifier stem is used, e.g., in the examples involving caused contact above. Similarly, even for quite different complex predicates such as the caused contact and movement complex predicates involving POKE(19) it is understandable why the same classifier stem can be used. The core meaning of the classifier stem POKE(19) seems to be something like "moving in a pointy direction", which can account both for the caused contact complex predicates and for the movement complex predicates.

In contrast, for some complex predicates it is not clear why the same classifier stem is used. For example, Barone-Nugent (2008) suggests that POKE(19) is licensed in complex predicates in which the mouth plays a role because the teeth and the tongue can be perceived as the pointed end of a long object. However, this extension is quite difficult to accommodate, especially because the explanation does not extend to the cases in which SLASH(23) is used in speech actions. If POKE(19) is used in mouth-associated actions because the teeth and the tongue are received as pointed ends of long objects, it is not clear why at the same time the side of a long object should play a role in speech actions.

It is thus questionable whether all combinatory possibilities rely on cognitive, perceptual factors. In some cases, it may be pure morphological coincidences that the same classifier stem is used. Barone-Nugent (2008) argues for such an explanation for the classifier stem HANDS(8) which is used in actions performed by the hands but which is also used in speech acts. Barone-Nugent (2008) points out that the paradigm for the classifier stem HANDS(8) is very similar to the paradigm of the classifier stem SAY/DO(34) and that this similarity together with the similarity in meaning for the non-speech acts may have licensed the use of HANDS(8) with speech acts.

The approach taken here aims at looking at the combinatory possibilities and focusses on the factors which play a role in the selection of the classifier stems (such as caused contact, movement, etc.) and the subtypes which are determined by different classifier stems (linear vs. non-linear movement etc.). In the following section, an approach using a fine-grained semantic type hierarchy is proposed to model the various combinatory possibilities.

5 An account using types

The previous section discussed the classifier stems POKE(19), BASH(14) and SLASH(23) and their similarities and differences in the combination with lexical stems. The discussion showed that all three classifier stems can combine with some lexical stems to form complex predicates of caused contact, but also that subgroups of lexical stems exist which can only combine with one or two of these classifiers.

This section aims at a formalization of the findings of the previous section. It discusses the requirements that such an approach needs, introduces Asher's (2011) Type Composition Logic (TCL) and discusses how TCL can be applied to the Murrinh-Patha data.

From the discussion it should be clear that a simple enumeration approach, in which each possible classifier and lexical stem is listed, is not satisfying. What is needed instead is an approach which enables a flexible grouping of the classifier stems and the lexical stems into different subclasses to describe which combinations are possible.

While similar classifier stems have been discussed more or less closely together in a range of works, among them Schultze-Berndt (2000) and Reid (2011), this paper proposes a formal modeling of the grouping of classifier stems and lexical stems. The formal modeling should account for the flexible subgroupings of the classifier stems, i.e., it should model the fact that one classifier stem can belong to one or more subclasses, combining with various subgroups of lexical stems. Such an approach is offered by multi-dimensional type hierarchies.

For the purpose of modeling the type hierarchies, I use concepts adopted from Asher's (2011) Type Composition Logic (TCL). Asher (2011) proposes a very fine-grained semantic type hierarchy, in which very specific types as well as very general types can be assumed. He combines this type hierarchy with simple lexical entries which can come with a whole range of defeasible typing restrictions. This view of the lexicon makes it possible to account for the very general meaning of the Murrinh-Patha classifier stems and the flexibility in the combinatory possibilities with lexical stems in an elegant manner. TCL has also been used to account for verb-formation patterns in the Australian language Panyjima by Caudal et al. (2012).

Asher (2011) is mainly concerned with cases of coercion such as those given in (15). In (15a), people usually assume that Mary either started *writing* or *reading* the book. How people come to this understanding has been the matter of extensive research, with Pustejovsky's (1995) Generative Lexicon as a seminal work.

(15) a. *Mary started the book.*
b. *Mary enjoyed the book.*

c. *The goat enjoyed the book.*

Asher (2011) extends the Generative Lexicon approach to handle data more flexibly. He proposes that it is not only the object of the verb which triggers different event readings but that the choices can also be restricted by the subject. For example, if the subject is an *author* who started the book it is most likely that the event was one of starting to *write* a book. Alternatively, if the subject is a goat, then the event is most probably an *eating* event ((15c)).

Asher (2011) proposes that such specifications are part of the lexicon and are modeled as defeasible specifications such as in (16). For example, (16a) specifies that if there is a subject α which is a human and there is an object β which has a "physical" and an "informational" aspect (P • I) such as a book, then it follows for a statement involving coercion (EV$(\alpha, \epsilon(\alpha, \beta))$) that the event ($\epsilon$) in which the subject and the object are involved is most probably a *reading* event. The $>$ is used as a weak conditional operator accounting for the defeasibility of the rule.

The defeasible rule in (16b) specifies that if the subject is not only human but also an author, i.e., a more specific sub-type, then the specification from (16a) can be overruled and the event is most probably a *writing* event. (16c) accounts for the fact that the event is most probably an *eating* event if the subject is a goat.

(16) Defeasible specifications (Asher, 2011, 228):

a. $(\alpha \sqsubseteq \text{HUMAN} \wedge \beta \sqsubseteq \text{P} \bullet \text{I}) \rightarrow (\text{EV}(\alpha, \epsilon(\alpha, \beta)) > \epsilon(\alpha, \beta) = \text{READ}(\alpha, \beta)$

b. $(\alpha \sqsubseteq \text{AUTHOR} \wedge \beta \sqsubseteq \text{P} \bullet \text{I}) \rightarrow (\text{EV}(\alpha, \epsilon(\alpha, \beta)) > \epsilon(\alpha, \beta) = \text{WRITE}(\alpha, \beta)$

c. $(\alpha \sqsubseteq \text{GOAT} \wedge \beta \sqsubseteq \text{P} \bullet \text{I}) \rightarrow (\text{EV}(\alpha, \epsilon(\alpha, \beta)) > \epsilon(\alpha, \beta) = \text{EAT}(\alpha, \beta)$

Asher (2011) offers a very detailed formal account of the mathematics of TCL which cannot be discussed here. But the examples given show the main properties of the TCL approach: there are simple types such as HUMAN or more complex types with multiple aspects such as P • I. A type can be very generic such as physical property (P) or it can be very specific such as GOAT. These types in combination with a type hierarchy and the defeasible specifications account for the cases of coercions such as exemplified in (15).

The Murrinh-Patha data as illustrated and understood so far seems to need a detailed type hierarchy in which more specific types block the combination of lexical stems with classifier stems of less specific types similarly to blocking principles in morphology. For modeling this kind of type hierarchy, other accounts of subtyping could be used. However, it seems that for complex predicates crosslinguistically, the defeasibility of the specifications and the modeling of coercions which is build into TCL is needed as well.

The defeasibility of the specifications accounts for the fact that classifier and lexical stem combinations can be used in novel contexts denoting new meanings.

Coercion may be involved in cases in which the resulting complex predicate actually involves more than the pure sum of the meanings of the classifier and lexical stem. Butt and Geuder (2001) and Butt and Tantos (2004) discuss this issue for complex predicates in Urdu. An example of such a phenomenon in a Northern Australian language is found in Jaminjung. As Schultze-Berndt (2000) states, the inflecting verb HIT is normally used in cases in which impact is made in a non-specified way. It is thus similar to the Murrinh-Patha classifier stems BASH(14), POKE(19) and SLASH(23) but does not specify the shape of the instrument. However, HIT in certain complex predicate combinations "encodes complete affectedness" (Schultze-Berndt, 2000, 314). Schultze-Berndt (2000) illustrates this with complex predicates of 'encircling'. She states that a lexical stem such as *walig* 'move around' can combine with motion classifier stems, but in combination with HIT, a sense of complete encircling arises. An example is provided in (17). This can be modeled with the specification in (18) which states that if the classifier stem HIT (α) combines with lexical stems of encircling (β), the resulting complex predicate (*cp*(α, β)) is one of complete encircling.

(17) *walig* *gani-ma-m* *gurrurrij*
around 3sg:3sg-HIT-Pres car
'He walks around the car.' (Jaminjung, Schultze-Berndt, 2000, 314)

(18) $(\alpha \sqsubseteq$ HIT $\wedge\ \beta \sqsubseteq$ ENCIRCLE$) >$ *cp*(α, β) = COMPLETE ENCIRCLING

As no lexical stems and only few classifier stems can occur on their own in Murrinh-Patha, it is difficult to determine whether some meaning parts just evolve from the combination or whether these meaning parts are part of the classifier or lexical stem. However, a more refined understanding will probably reveal situations very similar to the Jaminjung case. For this reason, TCL is adopted as a formalism.

The TCL approach is now applied to the Murrinh-Patha data which was discussed in section 4. To model the similar behavior of POKE(19), BASH(14) and SLASH(23) with lexical stems, one can assume that all three classifier stems are of a rather general type CAUSED CONTACT. This is formalized in (19). The formula in (19c) accounts for the data in (8). It states that if α is a classifier stem of caused contact, and if β is a lexical stem of type MISS, e.g. the lexical stem *wirntay* 'miss', then most likely they can combine in a complex predicate and the resulting complex predicate is one of missed caused contact.

(19) a. POKE(19), BASH(14), SLASH(23) $\sqsubseteq$ CAUSED CONTACT(x,y)
b. *wirntay* 'miss' $\sqsubseteq$ MISS(x,y)
c. $(\alpha \sqsubseteq$ CAUSED CONTACT(x,y) $\wedge\ \beta \sqsubseteq$ MISS(x,y))
$> cp(\alpha, \beta)$ = MISSED CAUSED CONTACT(x,y)

The lexical stem *rtal* 'cut off' from the examples in (9) is only listed with BASH(14) and SLASH(23) in Street (1989), not with POKE(19). To account for this combination, BASH(14) and SLASH(23) form a subgroup of the classifier stems of CAUSED CONTACT: they form a subtype CUTTING. The specifications in (20) account for the combinatory possibilities.

(20) a. BASH(14), SLASH(23) $\sqsubseteq$ CUTTING(x,y)
b. *rtal* 'cut off' $\sqsubseteq$ CUTTING(x,y)
c. ($\alpha \sqsubseteq$ CUTTING(x,y) $\wedge$ $\beta \sqsubseteq$ CUTTING(x,y))
$> cp(\alpha, \beta)$ = CUTTING(x,y)

As was also discussed above, the classifier stems show a different behavior when combined with lexical stems of movement. This means that the classifier stems belong to different types with respect to movement, i.e., POKE(19) has the type LINEAR MOVEMENT while BASH(14) and SLASH have the type NON-LINEAR MOVEMENT. The specifications in (21b) display different lexical stems with the subclasses LINEAR MOVEMENT and NON-LINEAR MOVEMENT.

(21) a. POKE(19) $\sqsubseteq$ LINEAR MOVEMENT
BASH(14), SLASH(23) $\sqsubseteq$ NON-LINEAR MOVEMENT
b. *riwak* 'follow', *wintigat* 'descend' $\sqsubseteq$ LINEAR MOVEMENT
rikat 'go around', *rdertpart* 'skirt' $\sqsubseteq$ NON-LINEAR MOVEMENT
c. ($\alpha \sqsubseteq$ LINEAR MOVEMENT $\wedge$ $\beta \sqsubseteq$ LINEAR MOVEMENT)
$> cp(\alpha, \beta)$ = LINEAR MOVEMENT(x,y)
($\alpha \sqsubseteq$ NON-LINEAR MOVEMENT $\wedge$ $\beta \sqsubseteq$ NON-LINEAR MOVEMENT)
$> cp(\alpha, \beta)$ = NON-LINEAR MOVEMENT(x,y)

The different typing restrictions are summarized in Figure 1 as a multi-dimensional type hierarchy. The hierarchy only comprises the data which has been discussed in this paper. A more elaborate structure is needed to account for all different combinatory possibilities in Murrinh-Patha complex predicate formation. The multi-dimensional hierarchy again shows the idea that a classifier stem can belong to more than one type and this enables the modeling of the fact that a classifier stem may pattern with other classifier stems for one type but does not need to pattern with these classifier stems for other types.

That the classifier stems indeed have multiple types along different dimensions can be seen in combinations of classifier stems with certain lexical stems such as *rikerdek* 'finish' or *wirntay* 'miss'. The resulting complex predicate carries the meaning of 'finish an event specified by the classifier stem' or 'miss an event specified by the classifier stem' respectively. That is, the combination of POKE(19) plus *rikerdek* can refer to either finishing a writing event or finishing an eating event. Similarly, POKE(19) plus *wirntay* can be used to refer to an event in which someone was missed with a spear or to an event in which a message was missed, referring to the 'talking' aspect of POKE(19). The meaning of this kind of complex predicate is underspecified if used in isolation but receives a specialized interpretation from the context.

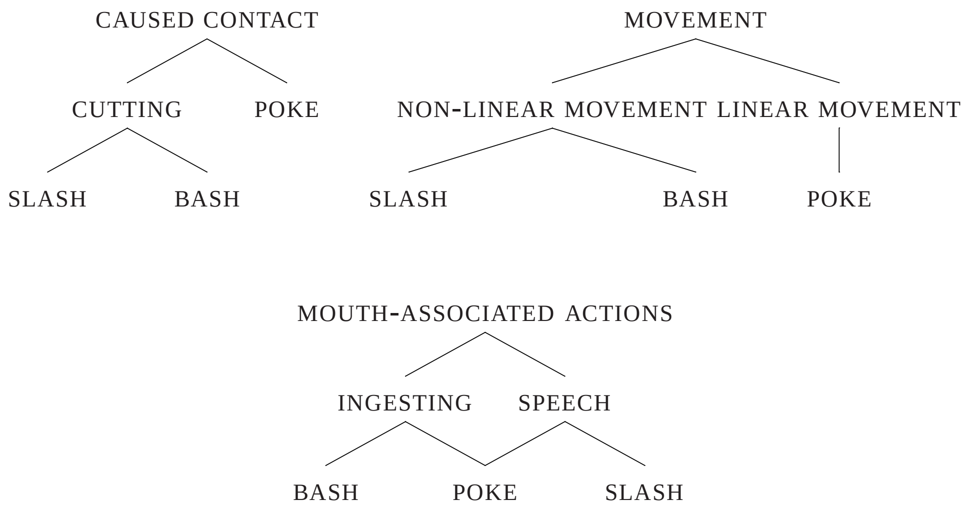

Figure 1: Multi-dimensional type hierarchy: for ease of readability, the hierarchies have been displayed in separate trees. On the left: a simplified type hierarchy for the type CAUSED CONTACT. On the right: a simplified type hierarchy for the type MOVEMENT. On the bottom: a simplified type hierarchy for the type MOUTH-ASSOCIATED ACTIONS.

To sum up, this section discussed a formal modeling of the combinatory possibilities using a multidimensional, fine-grained semantic type hierarchy. The following section compares this approach to the more established approaches using Lexical Conceptual Structures (Jackendoff, 1990).

6 Lexical Conceptual Structures

Many approaches to complex predicate formation use Jackendoff's (1990) LCSs to model the compatibility of the complex predicate constituents and to exclude illformed combinations. These analyses were inspired by Butt's (1995) analysis of complex predicates in Urdu. For Australian languages, LCSs have been used in the analysis of complex predicates in e.g., Wagiman (Wilson 1999, Wilson 2006), Wambaya (Nordlinger, 2010b) or across languages (Baker and Harvey, 2010; Andrews and Manning, 1999). In this section I compare the LCS approaches with the type-driven approach proposed in the previous section.

Butt (1995) is concerned with complex predicates in Urdu in which so-called light verbs, which roughly correspond to Murrinh-Patha classifier stems, combine with another verb, noun or adjective. To model the semantic contribution of each part of the complex predicate, Butt (1995) uses LCSs for each of the parts and different mechanisms of how these LCSs can combine. She accounts for the fact that light verbs are semantically bleached by proposing an LCS with a *transparent event* for the light verb. In complex predicate formation, the LCS of the full verb is inserted into the transparent event and, depending on the light verb, either event fusion or argument fusion takes place.

Wilson (1999) uses the idea of LCSs for complex predicate formation in Wagiman, a non-Pama-Nyungan language of the Northern Territory of Australia. However, he shows that a different approach is needed in Wagiman, as the two parts which form a complex predicate in Wagiman can combine in more diverse ways than in Urdu. This is also the case for complex predicates in Murrinh-Patha and other Australian languages. For this reason, his approach has also been adopted by others, e.g., Baker and Harvey (2010), and will therefore be discussed in more detail here.

In Wagiman, the complex predicate consists of two morphologically distinct words, and the terminology therefore differs from what is used for Murrinh-Patha. Wilson (1999) (among others) uses the term *inflecting verb* for the corresponding Murrinh-Patha classifier stem and the term *coverb* for the equivalent to the Murrinh-Patha lexical stem.

In contrast to Butt's (1995) approach to Urdu complex predicates, the LCS of the coverb is merged into the LCS of the inflecting verb **wherever it fits**. This accounts for the fact that coverbs and inflecting verbs can combine in various ways in Wagiman, and for the observation that inflecting verbs in Wagiman do not necessarily have to be semantically light. Ungrammatical combinations are ruled out if merging the LCS of the coverb into the LCS of the inflecting verb is impossible. This is best explained by an example. In Wagiman, coverbs of state can combine with stative inflecting verbs ((22a)) while coverbs of change of state cannot ((22b)).

(22) a. *ga-yu* *guk-ga* *gahan* *labingan*
3sg-be.Pres sleep-Asp that baby
'That baby is asleep.' (Wagiman, Wilson 1999, 150)

b. **bort-da* *ga-yu*
die-Asp 3sg-be.Pres
'He is dead.' (Wagiman, Wilson 1999, 150)

Wilson (1999) explains this with the fact that one can merge the LCS of *guk* 'sleep' into the LCS of -*yu*- 'be', but this is not the case for the LCS of *bort* 'die'. This contrast can be observed in (23a) and (23b). The LCS of *guk* 'sleep' can combine with the LCS of -*yu*- 'be', because both are states and the more detailed information for place in the LCS of *guk* 'sleep' can fill in the underspecified place in the LCS of -*yu*- 'be'. The LCS of the complex predicate *guk*-*yu*- ((23d)), thus, is the same as the LCS of *guk* 'sleep' in (23a).

(23) a. *guk* 'sleep'
$[_{State}\ BE_{Ident}\ ([_{Thing}\ \ ]_{A}\ ,\ [_{Place}\ AT_{Ident}\ (\ [_{Property}\ \textit{asleep}])])]$

b. *bort* ‘die’
$[_{\text{Event}}$ BECOME ($[_{\text{State}}$ BE$_{\text{Ident}}$ ($[_{\text{Thing}}$ $]_{\text{A}}$, $[_{\text{Place}}$ AT$_{\text{Ident}}$ ($[_{\text{Property}}$ *dead*])])])]

c. -*yu*- ‘be’
$[_{\text{State}}$ BE ($[_{\text{Thing}}$ $]_{\text{A}}$, $[_{\text{Place}}$ —-])]

d. *guk*-*yu*- ‘sleep-be’
$[_{\text{State}}$ BE$_{\text{Ident}}$ ($[_{\text{Thing}}$ $]_{\text{A}}$, $[_{\text{Place}}$ AT$_{\text{Ident}}$ ($[_{\text{Property}}$ *asleep*])])]

The change of state coverb *bort* ‘die’, however, cannot combine with the inflecting verb -*yu*- ‘be’ because the two LCSs cannot be merged in an appropriate way. In Wilson’s (1999) account, the inflecting verb determines the general shape of the LCS of the complex predicates, which means that only the LCS of the coverb can be merged into the LCS of the inflecting verb, not vice versa. The combination **bort*-*yu*- ‘die-be’ is ungrammatical because the LCS of the coverb cannot be merged into the LCS of the inflecting verb -*yu*- ‘be’.

To summarize Wilson’s (1999) account of Wagiman complex predicates, he uses the compatibility of the LCSs of the inflecting verb and the coverb to explain grammatical and ungrammatical combinations. The rule he uses for the compatibility is very simple: a complex predicate is only grammatical if the LCS of the coverb can be fused into the LCS of the inflecting verb.

To apply this account to the Murrinh-Patha data is difficult. Although some patterns of combinations of inflecting verbs and coverbs are similar in Wagiman to the combinations of classifier and lexical stems in Murrinh-Patha, the differences that do exist result in a more complicated system. As a consequence, more rules for possible combinations would have to be defined to account for the Murrinh-Patha data. Additionally, different LCSs for the same classifier stem would be needed to account for the different combinations. LCSs thus do not serve to restrict the combinatory possibilities in Murrinh-Patha complex predicates as they do in Wagiman complex predicates. Consequently, an account building on the compatibility of the LCSs does not have explanatory power for Murrinh-Patha. This is not to say that LCSs cannot be helpful in establishing the meaning of a certain range of classifier and lexical stems and their combinations, but that an account in which the LCSs themselves account for the combinatory possibilities is not helpful. The remainder of this section discusses these claims in more detail.

One difference between complex predicate formation in Wagiman and complex predicate formation in Murrinh-Patha seems to be that in Murrinh-Patha, the number of arguments of the lexical stem can be reduced. This is the case for Murrinh-Patha anticausative/resultative constructions with the classifier stem SIT(1), discussed above and repeated in (24) for convenience.

(24) *dim-lerrkperrk*
3sgS.SIT(1).nFut-crush
‘It is smashed.’ (Seiss and Nordlinger, 2010)

In this anticausative/resultative construction, it seems that the single argument of the classifier stem SIT(1) picks out the theme object of the lexical stem and thus reduces the number of arguments the lexical stem takes. This cannot be accounted for by merging the LCSs of the lexical stem in terms of Wilson's (1999) proposal.

(25) a. SIT(1)
$[_{\text{State}}\ \text{BE}\ ([_{\text{Thing}}\ \ ]_{\text{A}}, [_{\text{Place}}\ \text{—}\ ])]$
b. *lerrkperrk* 'crush'
$[_{\text{Event}}\ \text{CAUSE}\ ([_{\text{Thing}}\ \ ]_{\text{A}}, [_{\text{Event}}\ \text{BECOME}$
$([_{\text{State}}\ \text{BE}\ ([_{\text{Thing}}\ \ ]_{\text{A}}, [_{\text{Place}}\ \text{AT}\ ([_{\text{Property}}\ \textit{crushed}])])])])]$
c. SIT(1)-*lerrkperrk* 'be crushed'
$[_{\text{State}}\ \text{BE}\ ([_{\text{Thing}}\ \ ]_{\text{A}}, [_{\text{Place}}\ \text{AT}\ ([_{\text{Property}}\ \textit{crushed}])])]$

The problem is that the LCS of the lexical stem should always be merged into the LCS of the classifier stem, which is not possible in this case. What happens intuitively is that the LCS of the lexical stem is reduced, i.e., the two events CAUSE and BECOME in the LCS of the lexical stem are deleted because they do not match with the LCS of the classifier stem. While the process of picking out a patient argument of a lexical stem can be explained in terms of LCSs, the process itself changes the algorithm put forward by Wilson (1999).

For other combinations of classifier and lexical stems it is not obvious how rules should be defined to combine the prototypical LCS of the classifier stem with an LCS of the lexical stem. The only way of accounting for these combinations seems to be to assume a different LCS for the classifier stem in different combinations. This can be illustrated with the different uses of the classifier stem POKE(19) discussed above. As we have seen, POKE(19) is used in constructions in which contact is made with the pointed end of a long object. This is considered the prototypical use of POKE(19) by Barone-Nugent (2008). An example was provided in (7) in which the lexical stem *thak* 'dip (into liquid)' is combined with POKE(19).

One could define an LCS for the prototypical use of POKE(19) as in (26a). This LCS uses the basic LCS proposed by Jackendoff (1990) for verbs of contact, in which the slot for the instrument is already filled by an object with a pointed end. Similarly, for the LCS of the lexical stem, the slot for the place has already been specified, i.e. liquid.

(26) a. POKE(19)
$[_{\text{Event}}\ \text{CAUSE}\ ([_{\text{Thing}}\ \ ]_{\text{A}}, [_{\text{Event}}\ \text{BECOME}\ ([_{\text{State}}\ \text{BE},$
$([\text{POINTED\_END\_OBJECT}], [_{\text{Place}}\ \text{—}])])])])]$
b. *thak* 'dip in liquid'
$[_{\text{Event}}\ \text{CAUSE}\ ([_{\text{Thing}}\ \ ]_{\text{A}}, [_{\text{Event}}\ \text{BECOME}\ ([_{\text{State}}\ \text{BE},$
$([_{\text{thing}}\ \ ]_{\text{A}}, [_{\text{Place}}\ \text{IN}\ ([\text{LIQUID}])\ ])])])]$

Because the LCSs of the lexical stem and the classifier stem share most of their structure, they can be combined as in (27) to form a coherent complex predicate.

(27) POKE(19) + *thak* 'dip in liquid':

$[_{\text{Event}}$ CAUSE $([_{\text{Thing}}\ ]_{\text{A}}, [_{\text{Event}}$ BECOME $([_{\text{State}}$ BE,

$([\text{POINTED\_END\_OBJECT}], [_{\text{Place}}$ IN ([LIQUID])])])])]

The LCS account thus seems to work nicely for this kind of classifier and lexical stem combination. However, as was also discussed above, the classifier stem POKE(19) can also be used in complex predicates of movement, and actually in both transitive and intransitive ones. Examples were provided in (10) for the lexical stems *riwak* 'follow' and *wintigat* 'descend'. Another example is provided in (28) for the lexical stem *dhadumnum* which is paraphrased as 'bob/poke one's head up and down or in and out to look around' by Street (1989).

(28) *ku* *pangkuy* *pana-ka*
ku pangkuy pana-ka
NC_{anim} snake that-Foc
danthadumnum=wurran
dam-dhadumnum=wurran
3sgS.POKE(19).nFut-poke.head(RDP)=3sgS.MOVE(6).nFut
'That snake is poking his head in and out looking around.' (Street, 1989)

To account for these combinations involving movement in an LCS account, different LCSs would be needed as different valencies as well as different path requirements are involved even for the linear movement usage of POKE(19). Because the range of combinations of lexical stems with POKE(19) is large, using different LCSs for all the minor differences is not feasible. The basic problem for an LCS account is that LCSs cannot capture the core semantic meaning of POKE(19) in these different combinations. This is also the case for other classifier stems.

Finally, it is not clear how to incorporate lexicalized combinations of classifier and lexical stems, i.e., combinations in which the selecting factors are not detectable, into an LCS account. A lexicalized combination has been given in (2); (29) provides another example involving the classifier stem POKE(19). Although the meaning range of the classifier stem POKE(19) is well studied thanks to Barone-Nugent (2008), so far no determining factor could be established which licenses the use of the lexical stem *riwiye* 'pollute' with it.

(29) *kura* *nga-riwiye-nu*
NC_{water} 1sgS.POKE(19).Fut-pollute-Fut
'I will pollute the water.' (Street, 1989)

If such lexicalized combinations were to be incorporated into the LCS system, an LCS for the classifier stem and an LCS for the lexical stem would have to be stipulated to account for the combination. In contrast, TCL is more suited to incorporating lexicalized combinations as part of the fine-grained semantic type hierarchy.

To sum up, the combinatorial possibilities of the semantics of classifier and lexical stems is much higher in Murrinh-Patha than what has been described by Wilson (1999) (and the additions in Wilson (2006)) for Wagiman. This is due to the wide range of meanings which are associated with one classifier stem. In many cases a LCS decomposition is too detailed to account for the combinatory possibilities. That is, LCSs require the specification of the valency, the path requirements etc., while probably all that the classifier stem POKE(19), for example, denotes is that it has something to do with linear movement and a pointed end of a long object. In contrast to the LCS account, the type account is especially targeted at defining such classes of types and defining the behavior of the combinations accordingly. That is, the explanatory power of the type-driven approach lies in the possibility of grouping the lexical items into various types so that statements can be expressed for more than one lexical item.

7 Conclusion

This paper discussed complex predicate formation in Murrinh-Patha and proposed an analysis which uses a fine-grained semantic type hierarchy. This system models the fact that classifier stems have a rather general meaning which allows them to combine with a wide range of different lexical stems. In this system, classifier stems can have multiple different types while lexical stems usually have only one type. The grouping into types allows us to define possible combinations of classifier and lexical stems according to the defined subtypes.

The paper further looked at approaches for complex predicate formation involving lexical conceptual structures and discussed Wilson's (1999) approach for Wagiman in detail. It was discussed that such an approach using the compatibility of the LCSs of classifier and lexical stems does not yield the required explanatory power for Murrinh-Patha complex predicate formation, as many different fusion rules and LCSs would have to be defined to account for the variety in the data.

This is not to say that LCSs are not useful in determining the meaning contributions of some of the classifier and lexical stem combinations. But they cannot be used elegantly to determine whether classifier and lexical stem combinations are grammatical or ungrammatical as the combinatory rules for Murrinh-Patha are much more diverse than the rules for Wagiman.

However, the type-driven and LCS accounts can probably be combined to provide more insight into the process of complex predicate formation in Murrinh-Patha. That is, the type hierarchy could be used to define templates of LCSs for the classifier and lexical stems and how they combine. For example, a template LCS for the caused contact complex predicates could be defined in which the classifier stems fill in the slot for the instrument and the lexical stems fill in the result state. Further research is needed to pursue this approach. Future research will also include establishing what other semantic concepts play a role in Murrinh-Patha complex predicate formation.

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