Ludlings and Their Implications for Syllable Structure in Jinghpaw

KURABE, Keita
ILCAA, Tokyo University of Foreign Studies

The aim of this paper is twofold: first, to provide a descriptive account of ludlings (or language games) in Jinghpaw, a Tibeto-Burman language spoken in northern Myanmar and adjacent areas of China and India; and second, to explore what implications they have for syllable structure in the language. The language makes use of two mechanisms for ludlings: substitution and insertion. The former replaces the onset or rhyme of real words with other subsyllabic constituents in a systematic way, while the latter, which is usually realized in combination with substitution, inserts a copy of the preceding syllable after every syllable boundary of each real word. Ludlings in Jinghpaw, since they can be described on the basis of the syllable or subsyllabic constituents as their pertinent reference units, can serve evidence in arguing for or against particular empirical questions that come up in relation to syllable structure. This paper investigates the phonemic status of the diphthong [ui], the hierarchical organization within the syllable, the psychological reality of the syllable, and word-initial NC (nasal-consonant) sequences based on both ludling data and other types of data from a variety of sources.

Keywords: Jinghpaw, ludling, language game, syllable structure, phonology

1. Introduction*

The value of ludlings (or language games) is widely acknowledged in the linguistic literature. Because they are systematic and rule-governed operations, ludlings are often referred to as sources of external evidence in phonological debates in relation to arguments such as abstract underlying representations, phonological rule ordering, the psychological reality of rules, tonal melodies, and syllable structure (see Davis 1994; Bagemihl 1995;

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Vaux 2011, and the references therein). Arguments based on ludlings on their own are sometimes inconclusive, but, as noted by Davis (1994), ludling evidence becomes stronger especially when it is consistent with other types of linguistic evidence.

Jinghpaw (ISO 639-3: kac), a Tibeto-Burman language of the Sino-Tibetan language family spoken in northern Myanmar and adjacent areas, exhibits a unique set of ludlings, which systematically alters the phonological forms of real words, phrases, or sentences to ludling equivalents, which are not used in the ordinary language. These ludlings, mostly used by children and younger speakers, have a sociocultural function to disguise what the speaker is saying so as to facilitate private and playful communication between those who know the system. In spite of their practical value for linguistic analysis, ludlings in the language have not systematically been explored in prior studies. Also, very little attention has been paid to the study of ludlings in the area of Tibeto-Burman linguistics in general.

With this background, the present paper, based on first-hand data gathered through original fieldwork, attempts to address Jinghpaw ludlings with a twofold goal: first, to provide a descriptive account of ludlings in Jinghpaw (§3); and second, to explore how they can shed light on questions that arise as to syllable structure in the language (§4–7). With these goals in mind, the present paper is laid out as follows. Section 2 offers a brief overview of Jinghpaw phonology as a background to the following sections. Section 3 provides a description of several types of ludlings, including substitution-type (§3.1) and insertion-type ludlings (§3.2). Using ludling data as a point of departure, Sections 4 through 7 address a range of empirical questions of syllable structure in the language, examining arguments for or against the phonemic status of a certain diphthong (§4), syllable-internal structure (§5), the syllable as a phonological constituent (§6), and word-initial NC (nasal-consonant) sequences (§7). The remainder of this section presents a brief account of Jinghpaw and its speakers, and language play phenomena in the written sphere.

The Jinghpaw speakers traditionally inhabit upland areas in northern Myanmar and adjacent areas of China and India. Most speakers today live in Myanmar. Their language, showing a special relationship to the Luish languages, belongs to the Bodo-Konyak-Jinghpaw branch within Tibeto-Burman. Of particular importance is the fact that the language serves as a lingua franca among the Kachin people, who are linguistically diverse people speaking more than ten mutually unintelligible languages of Tibeto-Burman. In spite of this internal linguistic diversity, they constitute more or less a single sociocultural complex with many shared traits, such as the intra-Kachin marriage alliance system with fixed correspondences between clans that go beyond linguistic boundaries (for an overview of the languages of the Kachin, see Kurabe, in press). Jinghpaw is a syllable-tone language with an iambic prosodic pattern. Its morphology is analytic and agglutinative. Compounding and reduplication are especially productive word-formation processes. The word order is strictly verb-final, where verbs or strings of verbs are placed at the end of clause. Jinghpaw is a dependent-marking language both at the clausal and NP levels with a nominative-accusative case-marking pattern.

Language play phenomena in Jinghpaw are not restricted to the spoken language, which will be illustrated in Sections 3 to 7. Two types of written language play I am aware of are mirror writing and candle writing. Mirror writing is produced by writing letters in the opposite direction so as to make them a mirror image of normal writing. This type of writing in reverse is used with the intention to secure private communication. Writers with good command of mirror writing can automatically produce handwritten mirrored texts. Candle writing is employed to print letters on paper using a candle as invisible ink. It is especially practiced in order to send secret messages. The message becomes visible when the recipient sprinkles the paper with some kind of powder, such as battery dust.

2. Phonology

This section sets out to provide a brief descriptive account of Jinghpaw phonology, including syllable structure. Jinghpaw has over thirty consonant phonemes, given in (1). The consonant /h/ is marginal in the sense that, in addition to loanwords, it is predominantly restricted to ideophones and interjections in the native phonology. Each sonorant has a corresponding preglottalized series, whose phonemic status is established by minimal pairs, such as /maŋ/ 'corpse' vs. /ʔmaŋ/ 'be dark' and /wàn/ 'be coiled' vs. /ʔwàn/ 'fire'.[1]

(1) Consonants
/p, t, k, ʔ, b, d, g, ph, th, kh, ts, dz, c [tɕ], j [dʑ], s, ɕ, (h), m, n, ŋ, ʔm, ʔn, ʔŋ, r, l, ʔr, ʔl, w, y [j], ʔw, ʔy [ʔj]/

Six monophthongs, given in (2), are contrastive in Jinghpaw; this is a modest number by mainland Southeast Asian standards (Enfield 2018: 53–56). The language does not have a phonemic contrast of vowel length. The vowel /ə/ is special in that it does not occur in closed syllables or in word-final positions. In spite of its restricted distribution, it should be given phonemic status based on near-minimal pairs such as /kani/ 'opium' vs. /gəni/ 'mother-in-law'. All phonetic diphthongs (i.e., [ai, oi, ui, au]) can be interpreted as sequences of a vowel plus a final consonant phonologically (i.e., /ay, oy, uy, aw/), given that they do not occur in closed syllables (see also §4).

[1] This paper treats a preglottalized sonorant as a single consonant, not a consonant cluster. This interpretation has an advantage in simplifying syllable structure. Jinghpaw syllable structure, as will be described below, can be generalized as C(C)V(C). Treating a preglottalized sonorant as a consonant cluster requires one more slot for syllable structure (i.e., CCCVC), where only a glottalized stop occurs. The glottal feature occasionally drops in the speech of younger speakers.

(2) Vowels
/i, e, a, o, u, ə/

Jinghpaw, as is typical of neighboring languages, is a syllable tone language with four contrastive tones in smooth (sonorant-final) syllables, as given in (3): L (low-falling), M (mid-level), H (high-level), and F (high-falling). Checked (stop-final) syllables, by contrast, allow either short high or low tones, which are represented in (3) by Lq (Low-stopped) and Hq (High-stopped). The asymmetry has a phonetic underpinning: in general, the articulation of contour tones requires a sufficiently longer duration and higher sonority (see Zhang 2004).

(3) Tones
L /à/ [31], M /a/ [33], H /á/ [55], F /â/ [51], Lq /àq/ [1q], Hq /áq/ [5q]

Basic syllables exhibit the linear structure given in (4). C_1, which is obligatory, may be any consonant in the inventory (1) when C_2 is not filled. Onsetless syllables are dispreferred in the language. Two sonorants, /r/ and /y/, may optionally fill C_2 when preceding consonants are bilabial or velar stops or nasals (for more details see §4). Nine consonants may optionally occupy C_3, where /k/ is mostly restricted to loanwords. Each syllable carries a tone as a suprasegmental feature with four contrasts in smooth syllables and two in checked syllables.[2]

(4) Syllable template: $\sigma = C_1(C_2)V(C_3)/T$
a. C_1 any consonant from (1)
b. C_2 /r, y/
c. V /i, e, a, o, u, ə/
d. C_3 /p, t, k, ʔ, m, n, ŋ, w, y/
e. T /à, a, á, â, àq, áq/

The examples in (5) illustrate the types of syllable structure outlined above.

(5) Examples of syllable structure

a.	CV	yu	‘see’
b.	CVC	duŋ	‘sit down’
c.	CCV	pru	‘come out’
d.	CCVC	khruŋ	‘be alive’

[2] The language also has a special syllable that consist of a single nasal. For its phonemic status, see Section 7.

Monomorphemic words in the language are predominantly monosyllabic or disyllabic. Disyllabic words, as typical with many Mon-Khmer and some Tibeto-Burman languages, tend to take the form of the iambic "sesquisyllabic" structure (Matisoff 1973), consisting of a heavy syllable preceded by a light syllable with reduced phonemic possibilities: it is always headed by /ə/; it does not carry a contrastive tone; it does not permit some initial consonants such as /dz, n, ŋ, r/; it does not allow a complex initial; it does not allow a final consonant. Examples of sesquisyllabic words include:

(6) Sesquisyllabic words
  a. ləgo 'foot'
  b. ɕəta 'moon'
  c. gəlo 'make'
  d. məkhrèt 'scratch'

3. Ludlings

This section illustrates several types of ludlings in Jinghpaw. As noted earlier, they are especially practiced by children and younger speakers as a special register to facilitate private and playful communication within a group of people acquainted with the system. The games consist of operations that convert phonological forms of real words to ludling equivalents in a non-random, systematic manner. It is often the case that ludling operations are applied to a whole sentence rather than a single word in normal usage. Ludlings except those associated with numerals (§3.1) are fairly productive in that they are in principle applicable to any given sentence as long as they do not derive very long or highly complicated sentences. Speakers with a good command of ludlings can easily alter a new sentence to a language game sentence, and recover the original meaning with no difficulty. Typological studies show that ludlings often involve one or more of the following four mechanisms: insertion, rearrangement, substitution, and deletion (Laycock 1972; Davis 1994; Bagemihl 1995). In terms of this phonological typology, the main ludling mechanisms exploited in Jinghpaw are substitution (§3.1) and insertion (§3.2).

3.1. Substitution games

Substitution, which is typologically not as common as insertion or rearrangement (Davis 1994; Botne and Davis 2000), is a mechanism whereby a part of a real word is replaced with a specific segment or group of segments. Jinghpaw exhibits several types of substitution games that target subsyllabic constituents such as the onset and rhyme. First, let us examine a substitution game that takes the rhyme as its target of application. In this ludling, rhymes of words in the actual language are systematically replaced by other rhymes, leaving tones intact. Any rhyme can be used as a game form. The word *sa* 'go, come', for example, may be rendered in the ludling as *se*, *soy*, or *say*. When polysyllabic inputs are involved, replacement may take place for every rhyme of each syllable (e.g., *gəlo* > *goyloy* 'make', *gùmrà* > *gòyròy* 'horse') or for the last rhyme (e.g., *gəlo* > *gəloy*, *gùmrà* > *gùmròy*). According to my consultants, the latter treatment is more preferred because replacing all rhymes sometimes makes ludling words not easily recoverable. More examples include:

(7) Simple rhymes

	Input	-e type	-oy type	-ay type	Meanings
a.	w**à**	w**è**	w**òy**	w**ày**	'return'
b.	n**i**	n**e**	n**oy**	n**ay**	'PL'
c.	t**â**	t**ê**	t**ôy**	t**ây**	'Q'
d.	pr**u**	pr**e**	pr**oy**	pr**ay**	'come out'

Note that the substitution language game operates on the rhyme rather than a single segment. This is illustrated by the fact that both simple (i.e., V) and complex rhymes (i.e., VC) are treated in the same manner. To illustrate this, compare the rhyme substitution game targeting simple rhymes (7) with those targeting complex rhymes (8).

(8) Complex rhymes

	Input	-e type	-oy type	-ay type	Meanings
a.	r**áy**	r**é**	r**óy**	r**áy**	'thing'
b.	m**aw**	m**e**	m**oy**	m**ay**	'wonder'
c.	kh**om**	kh**e**	kh**oy**	kh**ay**	'walk'
d.	phr**íŋ**	phr**é**	phr**óy**	phr**áy**	'be full'

This ludling, as noted above, usually takes the whole sentence rather than a single word as its target of application. As an illustration, consider the following (10a–d), which are output sentences of the input in (9). In these examples, we see that when the real word involves the same rhyme as its ludling equivalent, both the input and output superficially take the same forms (e.g., *gò* > *gò* 'TOP').

(9) Input sentence

*ŋ**ay**=g**ò*** *s**a**=n**a***.
1sg=TOP go=IRR
'I will go.'

(10) Possible output sentences

a. *ŋ**o**=g**ò** s**o**=n**o**.*
b. *ŋ**e**=g**è** s**e**=n**e**.*
c. *ŋ**oy**=g**òy** s**oy**=n**oy**.*
d. *ŋ**uy**=g**ùy** s**uy**=n**uy**.*

Jinghpaw also exhibits ludlings that manipulate the onset. In one type of onset substitution game, the onset of a real word is systematically replaced by the voiceless fricative /s/. The word *yú* 'rat', for example, has a ludling form *sú*. As with the rhyme substitution game, when the word begins with /s/, the ludling form is superficially the same as that of the real word (e.g., *seŋ* > *seŋ* 'store'). The onset substitution game, as with those targeting the rhyme, is applied with no reference to the internal structure of the onset: both simple (i.e., C) and complex onsets (i.e., CC) are replaced with the single phoneme /s/. The words *khá* 'be bitter' and *khrìt* 'fear', for example, are realized in the ludling as *sá* and *sìt*, respectively. This can be observed in the additional examples given in (11) and (12) below. When polysyllabic inputs are involved, replacement usually takes place for every onset of each syllable (e.g., *gùmrà* > *sùmsà* 'horse'). This substitution game is typically played in combination with an insertion-type game. We will revisit it in Section 3.2.

(11) Simple onsets

a. **ŋ**à > **s**à 'live'
b. **l**ày > **s**ày 'pass'
c. **t**am > **s**am 'look for'
d. **y**áʔ > **s**áʔ 'now'

(12) Complex onsets

a. **py**o > **s**o 'be pleased'
b. **ny**aw > **s**aw 'cat'
c. **phr**oŋ > **s**oŋ 'escape'
d. **khr**àt > **s**àt 'fall'

Hanson (1896: 28–29, 1906: 126–127) reports another type of onset substitution game that operates on numerals, although it is not known by my consultants. This ludling is mostly used by children at play when counting stars or small objects. Examples given by Hanson are incomplete but can be summarized as follows:[3]

[3] Examples are rendered in the transcription system used in the present paper.

(13) Numeral substitution game (adapted from Hanson 1896, 1906)

a.	lə**ŋ**ây	‘one’	>	dùm**b**ây	khə**b**ây	ŋə**b**ây
b.	lə**kh**ôŋ	‘two’	>	dùm**br**ôŋ	khə**b**ôŋ	ŋə**b**ôŋ
c.	mə**s**um	‘three’	>	dùm**br**um		
d.	mə**l**i	‘four’	>	dùm**d**i		ŋə**d**i
e.	mə**ŋ**a	‘five’	>	dùm**d**a		ŋə**d**a
f.	**kr**úʔ	‘six’	>	dùm**d**úʔ		
g.	sə**n**ìt	‘seven’	>	dùm**d**ìt		
h.	mə**ts**át	‘eight’	>	dùm**d**át		
i.	jə**kh**ù	‘nine’	>	dùm**d**ù		
j.	**ɕ**i	‘ten’	>	dùm**d**i		

Some numerals, as can be seen in (13), have more than one output. Outputs of the numeral substitution game, unlike those of other ludling types, appear not to be fully predictable, but the general rule is to replace the first syllable of disyllabic numerals with meaningless phoneme strings such as /dùm/, /khə/, and /ŋə/. Jinghpaw numerals are predominantly disyllabic. When monosyllabic numerals (e.g., ‘six’ and ‘ten’ above) are involved, the meaningless phoneme sequences are just prefixed to them. The ludling also involves the replacement of the last syllable onset with /b/, /br/, or /d/. Again, this substitution game does not look into the internal structure of the onset: both simple (e.g., ‘four’ above) and complex onsets (e.g., ‘six’) are treated in the same manner.

3.2. Syllable copying game

Typological studies show that ludlings that combine more than one type of mechanism are not uncommon cross-linguistically (Laycock 1972; Davis 1994; Bagemihl 1995). The s-substitution game, described in Section 3.1 above, is usually realized together with another mechanism: insertion, where a copy of the preceding syllable is inserted after every syllable of a real word. Thus, the complete form of this ludling is to insert a copy to each syllable boundary and to replace the onset of the copy with the voiceless fricative /s/. In what follows, this ludling is referred to as the “syllable copying game” for convenience. Some examples applied to monosyllabic words are illustrated in (14). Again, tones remain unchanged in ludling words. The copied syllables carry no identifiable meanings.

(14) Monosyllabic words

a. yú	>	yú-**sú**	'rat'
b. lum	>	lum-**sum**	'be warm'
c. pát	>	pát-**sát**	'mirror'
d. phrò	>	phrò-**sò**	'be white'
e. pràt	>	pràt-**sàt**	'period'

When applied to disyllabic words, the syllable copying game derives tetrasyllabic game words. The light syllable of sesquisyllabic words, as illustrated by (15d–f), is rendered in the ludling as a heavy syllable headed by /a/ with a default low tone.

(15) Disyllabic words

a. gùmrà	>	gùm-**sùm**-rà-**sà**	'horse'
b. ciŋkha	>	ciŋ-**siŋ**-kha-**sa**	'door'
c. dìŋsì	>	dìŋ-**sìŋ**-sì-**sì**	'bell'
d. gərà	>	gà-**sà**-rà-**sà**	'which'
e. ɕəta	>	ɕà-**sà**-ta-**sa**	'moon'
f. ləgú	>	là-**sà**-gú-**sú**	'steal'

The syllable copying game, as with the case of other ludling types, is usually applied to the whole sentence. This is illustrated by (16), where the first line is a sentence in the real language and the second is its ludling equivalent. As noted earlier, speakers with good command of ludlings can automatically convert real sentences into ludling sentences.

(16) Syllable copying game applied to the whole sentence

ŋay=mùŋ	*ɕàt*	*ɕá=ʔay.*
*ŋay-**say**=mùŋ-**sùŋ***	*ɕàt-**sàt***	*ɕá-**sá**=ʔay-**say**.*
1sg=also	food	eat=DECL

'I also had my meal.'

More examples illustrating the syllable copying game follow. Note that in some languages such as Tagalog, affixes sometimes become opaque to ludlings (e.g., Gil 1996). By contrast, the syllable copying game in Jinghpaw, which are applied to both grammatical and lexical items, do not discriminate between affixes, clitics, and roots.

(17)	*khàʔ=ni*	*lùʔ=ʔay.*	
	*khàʔ-**sàʔ**=ni-**si***	*lùʔ-**sùʔ**=ʔay-**say**.*	
	water=PL	drink=DECL	
	‘I drank a lot of water.’		

(18)	*naŋ=khray*	*khùm*	*phroŋ=ʔyô.*
	*naŋ-**saŋ**=khray-**say***	*khùm-**sùm***	*phroŋ-**soŋ**=ʔyô-**sô**.*
	2sg=alone	PROH	escape=SFP
	‘Don’t run away by yourself.’		

(19)	*khàʔ=dèʔ*	*khràt=màt=sám=ʔay.*	
	*khàʔ-**sàʔ**=dèʔ-**sèʔ***	*khràt-**sàt**=màt-**sàt**=sám-**sám**=ʔay-**say**.*	
	river=ALL	fall=COMPL=INFER=DECL	
	‘It looks like someone has fallen into the river.’		

(20)	*ɕá-pha*	*ʔə-raw*	*ɕə-law=gàʔ.*
	*ɕá-**sá**-pha-**sa***	*ʔà-**sà**-raw-**saw***	*ɕà-**sà**-law-**saw**=gàʔ-**sàʔ**.*
	eat-NMLZ	ADV-be.together	CAUS-turn.over=HORT
	‘Let’s stir food together (in cooking).’		

4. Phonemic status of the diphthong [ui]

From Sections 4 to 7, we will investigate four types of questions related to syllable structure in Jinghpaw based on data from both ludlings and other types of phonological phenomena. We now turn to the phonemic status of the diphthong [ui]. Phonetic diphthongs, because they consist of multiple segments, sometimes pose ambiguity as to how they should be analyzed at the phonological level. Ludling evidence can provide arguments about whether, say, the first part of the diphthong patterns as part of the onset or the rhyme (Davis and Hammond 1995). In the literature of Jinghpaw, analogous conflicts revolve around the phonetic diphthong [ui]. Hanson (1896) and Maran (1971) treat it as comprising a nucleus /i/ preceded by an on-glide /w/ that belongs to the onset (i.e., /wi/). By contrast, the phonetic string is treated as part of the rhyme by Dai and Xu (1992) and Kurabe (2017a), as either /ui/ or /uy/, respectively. The word [gùi] ‘dog’, for example, can be represented as /gwì/ by the onset analysis in contrast to /gùi/ or /gùy/ in the rhyme analysis. Compare more relevant examples:[4]

[4] Transcriptions of previous studies are slightly modified in accordance with the system used in this paper.

(21) Interpretation of the diphthong [ui]

	Onset analysis	Rhyme analysis		
[thui]	thwi	thui	thuy	'box'
[khui]	khwi	khui	khuy	'fish'
[lui]	lwi	lui	luy	'flow'
[dùi]	dwì	dùi	dùy	'sweet'

The onset analysis thus requires a third medial consonant /w/ in addition to the two medials /r/ and /y/ (see §2 above). Maran (1971), for example, gives many complex initials with /w/ such as:

(22) Complex initials with /w/ (Maran 1971: 163–164)
pw, tw, tsw, cw, kw, bw, dw, dzw, jw, gw, phw, thw, khw, hw, ɕw, mw, nw, lw, rw, yw

The rhyme substitution game (§3.1), however, provides an argument against the phonemic status of the medial /w/. The ludling, as exemplified earlier, replaces the rhyme of actual words, whether it is a simple or complex rhyme. For example, the words [sa] 'go' and [ŋai] '1sg' have the ludling forms [se] and [ŋe], respectively. When applied to the phonetic string [ui], the ludling systematically manipulates [ui] as a whole. This fact suggests that [u] belongs to the rhyme but not the onset.

(23) Rhyme substitution game applied to [ui]

a. [th**ui**]	>	[th**e**]	*[thue]	'box'
b. [kh**ui**]	>	[kh**e**]	*[khue]	'fish'
c. [l**ui**]	>	[l**e**]	*[lue]	'flow'
d. [d**ùi**]	>	[d**è**]	*[dùe]	'be sweet'

The phonemic status of the medial /w/ is also dispreferred by the syllable copying language game (§3.2). Recall that the s-substitution involved in the ludling manipulates the onset, whether simple or complex. For example, the words [kà] 'dance' and [kjà] 'be soft' are rendered in the ludling as [kà-sà] and [kjà-sà], respectively. When applied to the phonetic string [ui], the ludling does not operate on [u], as illustrated in (24), suggesting that it is not part of the onset.

(24) Syllable copying game applied to [ui]

a. [**th**ui]	>	[**th**ui-**s**ui]	*[thui-si]	‘box’
b. [**kh**ui]	>	[**kh**ui-**s**ui]	*[khui-si]	‘fish’
c. [**l**ui]	>	[**l**ui-**s**ui]	*[lui-si]	‘flow’
d. [**d**ùi]	>	[**d**ùi-**s**ùi]	*[dùi-dì]	‘be sweet’

The other disadvantage of the medial /w/ is that it complicates syllable structure, requiring three consonant slots in the onset position. For example, the word [prui] ‘tear’, which would be analyzed as /prwi/ in Maran’s (1971) system, requires three consonant slots for initial clusters (i.e., $C_1C_2C_3$) in contrast to two (C_1C_2) in the present study (see §2). In addition to the three lines of evidence given above, the fact that the medial /w/ can be combined with virtually all preceding consonants, as summarized in (25), further separates it from the genuine medials /r/ and /y/, which have restricted distributions. Rather, this property groups /w/ with vowels, because they are combinable with any preceding consonant (also see §5.2).

(25) Some possible initial clusters

	p-	t-	k-	c-	ɕ-	h-	m-	l-	y-
-r-	pr	*tr	kr	*cr	*ɕr	*hr	*mr	*lr	*yr
-y-	py	*ty	ky	*cy	*ɕy	*hy	my	*ly	*yy
-w-	pw	tw	kw	cw	ɕw	hw	mw	lw	yw

A final piece of evidence comes from the fact that the phonetic sequence [ui] never occurs in closed syllables. This property further suggests that it consists of a vowel followed by a final consonant: if it is an open syllable (i.e., /wi/), then there is no reason why it cannot be combined with a following consonant. Rather, this observation is suggestive of its phonemic status as /uy/, like other phonetic diphthongs in the language. Compare some possible syllable structures with some ill-formed ones:

(26) Well- and ill-formed syllables

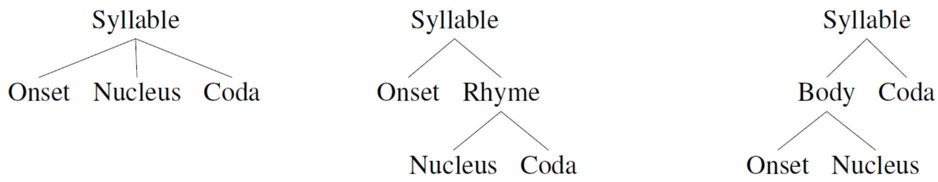
[a]	/a/	[sàt]	‘kill’
[i]	/i/	[sìt]	‘move’
[u]	/u/	[sùt]	‘wealth’
[e]	/e/	[sèt]	‘put on eyeglasses’
[o]	/o/	[sòt]	‘rub the feet’
[ui]	/uy/	*[suit]	
[oi]	/oy/	*[soit]	
[ai]	/ay/	*[sait]	
[au]	/aw/	*[saut]	

All in all, the rhyme and onset substitution manifested in the ludling have implications for the phonological configuration of the ambiguous phonetic string [ui]: they offer arguments against the phonemic status of the medial /w/. The ludling data, coupled with independent pieces of evidence from phonotactics, favors the view that the sequence comprises a vocalic nucleus /u/ and an off-glide /y/, which belongs to the coda.

5. Syllable-internal structure

A substantial body of phonological studies has focused on the subgrouping of segments within the syllable. Various models have been proposed, ranging from a flat structure with no subsyllabic constituents to a hierarchical internal structure (see Blevins 1995 and Bosch 2011 for overviews). Major models include: the flat model, including the ternary branching model (e.g., Hocket 1955; Kahn 1980); the onset-rhyme (right-branching) model (e.g., Halle and Vergnaud 1980; Selkirk 1982); and the body-coda (left-branching) model (e.g., McCarthy 1979; Wang and Cheng 2008).

(27) a. Flat model b. Onset-rhyme model c. Body-coda model



Syllables of mainland Southeast Asian languages are often said to have an onset-rhyme structure (Enfield 2018: 56). Studies demonstrating this position, however, are rather scarce. Many works provide templates for syllable structure (e.g., LaPolla 1996; Enfield 2007) and possible types of syllable structure (e.g., Okell 1969) without reference to, or discussion of, syllable-internal structure. The same situation holds for Jinghpaw. For example, Dai and Xu (1992: 5–7) and Dai (2012: 16–18), although giving a list of possible onsets and rhymes, do not provide any arguments in support of their onset-rhyme segmentation. Also, Kurabe (2017a), who provides a template of syllable structure, does not touch on issues associated with the internal structure of the syllable. In the remainder of this section, I present arguments in favor of the onset-rhyme model for the Jinghpaw syllable based on data both from ludlings (§5.1) and other linguistic phenomena (§5.2).

5.1. Substitution games and syllable-internal structure

Previous studies have shown that ludlings sometimes single out subsyllabic constituents as their target structure of application (Laycock 1972; Davis 1994; Blevins 1995: 215–216; Bosch 2011: 784, 792). Laycock (1972), for example, illustrates rearrangement-type ludlings where the rhymes of real words exchange positions to produce ludling words.

Along similar lines, the substitution-type ludlings in Jinghpaw, as described in Section 3.1, also operate on the subsyllabic constituent: onset or rhyme. There are no ludlings that are applicable to multisegmental domains other than these. In this light, the ludling provides a piece of evidence in favor of their reality as syllable-internal constituents. Recall first the substitution game that replaces the onset of every syllable with the voiceless fricative /s/. The s-substitution manipulates the onset irrespective of whether it is simple (i.e., C) or complex (i.e., CC). The ludling, singling out the onset as a whole, thus suggests its status as a subsyllabic constituent. Additional examples include:

(28) Simple onsets

a.	mù	>	**m**ù-**s**ù	'see'
b.	may	>	**m**ay-**s**ay	'be good'
c.	lam	>	**l**am-**s**am	'road'
d.	pát	>	**p**át-**s**át	'mirror'

(29) Complex onsets

a.	myú	>	**my**ú-**s**ú	'kind'
b.	nyuy	>	**ny**uy-**s**uy	'be faded'
c.	phrì	>	**phr**ì-**s**ì	'iron'
d.	khràp	>	**khr**àp-**s**àp	'weep'

Another substitution-type game, as described in Section 3.1, is the numeral substitution game. Since the present data are solely based on previous studies, they are admittedly not complete. Phonological patterns underlying this substitution game, however, suggest that the onset – rather than other types of multiple segments – is taken as the target structure of the ludling: it involves the onset, whether simple (e.g., 'one' below) or complex (e.g., 'six'), keeping the rhyme intact. Part of the numeral substitution game is replicated below for easy reference.

(30) Numeral substitution game

a.	lə**ŋ**ây	>	dùm**b**ây	'one'
b.	lə**kh**ôŋ	>	dùm**br**ôŋ	'two'
c.	mə**s**um	>	dùm**br**um	'three'
d.	mə**l**i	>	dùm**d**i	'four'
e.	mə**ŋ**a	>	dùm**d**a	'five'
f.	**kr**úʔ	>	dùm**d**úʔ	'six'

The same holds for the rhyme substitution game, as described in Section 3.1. The ludling, which systematically operates on both simple (i.e., V) or complex rhymes (i.e., VC), can only be accounted for with reference to the subsyllabic constituent rhyme. Again, the ludling does not target structures straddling the onset-rhyme boundary. Examples include:

(31) Simple rhyme inputs

a. s**à**	>	s**è**	s**òy**	'send'
b. l**i**	>	l**e**	l**oy**	'be heavy'
c. j**ú**	>	j**é**	j**óy**	'thorn'
d. c**ò**	>	c**è**	c**òy**	'spoon'

(32) Complex rhyme inputs

a. p**ay**	>	p**e**	p**oy**	'left'
b. s**áw**	>	s**é**	s**óy**	'oil'
c. s**èn**	>	s**è**	s**òy**	'one hundred thousand'
d. khr**ìŋ**	>	khr**è**	khr**òy**	'delay'

5.2. Other phenomena in favor of the onset-rhyme distinction

The subsyllabic constituents onset and rhyme also play significant roles in other linguistic phenomena in the language, including tone assignment, syllable weight, phonotactic constraints, meaningless couplets, rhyming in versification, and speech errors. In this section, we will examine these phenomena in turn, all of which consistently point to the onset-rhyme distinction of the syllable. Tone assignment in the language, as described in Section 2, is sensitive to the constituent structure of the rhyme. Smooth syllables, which are open or closed with nasals or semivowels, maximally accommodate four contrastive tones, in contrast to checked (stop-final) syllables, which only carry two contrastive tones. The onset, on the other hand, does not play any role in tone assignment. The tone distribution in relation to syllable structure is given in (33), where R stands for nasals or semivowels and O for obstruents.

(33) Tone distribution (adapted from Kurabe 2017b: 17)

	L	M	H	F
/CV/	+	+	+	+
/CVR/	+	+	+	+
/CVO/	+	−	+	−

The rhyme also plays a central role in the calculation of syllable weight: the rhyme but not the onset contributes to the syllable weight calculation, as with many other quantity-sensitive languages of the world (Gordon 2006). While vowel length is phonemically not contrastive in Jinghpaw (see §2 above), all vowels except /ə/ are phonetically realized as long in open syllables (i.e., [VV]) and short in closed syllables (i.e., [VR], [VO]), where [VV], [VR], and [VO] stand for a long vowel, a short vowel followed by a sonorant, and a short vowel followed by an obstruent, respectively. The categorical difference between light and heavy syllables is demonstrated not only by the phonetic grounds, but also by a range of quantity-sensitive phenomena: a minimal word requirement, where only heavy syllables (i.e., [VV], [VR], [VO], but not [V]) can constitute content words; a syllable template restriction, where phonetic long vowels are only allowed in open syllables; and weight-sensitive tone, where light syllables have a restricted tone inventory (see Kurabe 2017b for more details). Relevant examples are given in (34).

(34) Syllable weight

a.	Heavy	[VV]	/ka/	[kaː]	*[ka]	‘write’
b.	Heavy	[VR]	/kam/	[kam]	*[kaːm]	‘be willing’
c.	Heavy	[VO]	/káp/	[káp]	*[káːp]	‘be attached’
d.	Light	[V]	/kəwá/	[kəwáː]	*[kəːwá]	‘bamboo’
e.	Light	[V]	*/kə/			

Phonotactic constraints also serve as evidence in favor of the reality of the onset or rhyme as syllable-internal constituents. Known as “collocational restrictions within the syllable” (Fudge 1969) or “immediate constituent principle of phonotactics” (Selkirk 1982), positions within the syllable that form a constituent are usually more tightly bound with constraints. Analogous data in Jinghpaw, as summarized in (35) and (36), show that phonotactic constraints operate within the onset (i.e., C_1 and C_2) or rhyme (i.e., V and C_3). By contrast, there are no co-occurrence restrictions that hold between other types of multisegmental domains, say, between the initial consonant and vowel (i.e., C_1 and V). Relevant data thus suggest the constituent-hood of the onset and rhyme within the syllable.

(35) Well- and ill-formed onsets

	p-	ph-	b-	t-	th-	d-	kh-	g-	m-	n-
-r-	pr	phr	br	*tr	*thr	*dr	khr	gr	*mr	nr
-y-	py	phy	by	*ty	*thy	*dy	khy	gy	my	ny

(36) Well- and ill-formed rhymes

	-Ø	-p	-t	-k	-ʔ	-m	-n	-ŋ	-w	-y
-a	a	ap	at	ak	aʔ	am	an	aŋ	aw	ay
-e	e	ep	et	ek	eʔ	em	en	eŋ	*ew	*ey
-i	i	ip	it	ik	iʔ	im	in	iŋ	*iw	*iy
-o	o	op	ot	ok	oʔ	om	on	oŋ	*ow	oy
-u	u	up	ut	uk	uʔ	um	un	uŋ	*uw	uy

Evidence for the rhyme constituent can also be illustrated by co-compounds, a type of compound whose elements are in a relationship of coordination (Kurabe 2011), such as *gənù-gəwà* (lit. mother-father) 'parents', *ʔù-wàʔ* (lit. fowl-pig) 'livestock', and *jùm-məjàp* (lit. salt-red pepper) 'seasoning'. Co-compounds sometimes involve meaningless elements (called "couplets" in Hanson 1896: 68–69, and glossed "COUP" below), which exhibit phonological similarities to coupled elements. For example, the compound *nàmlò-nàmlàp* 'leaves' is comprised of a root, *nàmlàp* 'leaf', preceded by a meaningless couplet, *nàmlò*. Forms of couplets are not fully predictable, suggesting that they are stored in the mental lexicon, but they are usually disyllabic and share the phonological make-up CV(C).C(C) with their counterparts. Thus, forms of couplets typically involve rhyme substitution of the second syllable. To illustrate this, consider the additional examples given in (37). Again, the substitution holds true for the rhyme, irrespective of its complexity (i.e., V or VC).

(37) Co-compounds involving meaningless couplets

a. mən**ò**-mən**aŋ**	COUP-friend	'fruits'
b. kumph**o**-kúmph**áʔ**	COUP-gift	'gifts'
c. məl**iŋ**-məl**à**	forest-COUP	'forests'
d. ʔəɕ**u**-ʔəɕ**àn**	COUP-game	'game animals'
e. ɕət**in**-ɕət**ù**	urge-COUP	'urge'
f. ciŋkhr**òʔ**-ciŋkhr**aŋ**	COUP-mustard	'mustard plants'
g. ɕəbr**ìʔ**-ɕəbr**ay**	COUP-wage	'wages'

The rhyme also plays a salient role in the metrical strategy of versification in the language, which exhibits two types of phonological parallelism. The first is syllable counting, where a fixed number of syllables systematically occurs per line (Dai and Xu 1992: 446–448; Dai 2012: 417–423). The second is rhyming, where, as a boundary-marking cue, the right edge of each line is marked by a rhyming sequence (tones are sometimes ignored). This rhyming sequence corresponds exactly to the rhyme constituent within the syllable. As an example, consider the following heptasyllabic stanza from a verse composed by a native speaker.

(38) Heptasyllabic stanza

Jinghpaw text	English translation
*mòy gò ɕəta jan thàʔ py***o**,	It was pheasant under the moonlight before,
yáʔ gò shi phéʔ khrìt say ***lô***.	but now I fear it.

The rhyming pairs of words in (39) are additional examples found in verses gathered from an unpublished verse collection, compiled by native speakers.

(39) Rhyming pairs

a.	ŋ**à**	'live'	gìnr**à**	'place'
b.	ɕəg**ù**	'each'	d**ù**	'arrive'
c.	gəl**ay**	'change'	ɕ**áy**	'be different'
d.	gr**aw**	'more'	ɕəl**aw**	'stir'
e.	r**um**	'be confluent'	khr**um**	'agree'
f.	y**àŋ**	'if'	ʔ**àŋ**	'be in line with'
g.	mər**ìt**	'long for'	khr**ìt**	'fear'
h.	məl**àp**	'forget'	nìŋkh**àp**	'resist'

A final argument for the onset-rhyme segmentation comes from speech errors, which have been an interest in studies of the syllable and its internal-structure (Fudge 1987; Kubozono 1989; Bosch 2011). Since no prior studies have explored slips of the tongue in Jinghpaw, the present data are admittedly not conclusive. However, some spontaneous speech errors I am aware of appear to suggest that onsets, both simple and complex, tend to behave as a unit in substitution errors. This can be observed in some speech errors gathered from spontaneous speech, as seen in (40). Note that the exchanges of phonemes or groups of phonemes appear to operate on the onsets. More data from substitution errors and other types of errors such as blending should be accumulated in order to demonstrate this preference.

(40) Inputs and outputs of spontaneous speech errors

a.	də**g**úp	>	də**j**úp	'cover'
b.	khàʔ **l**ùʔ	>	khàʔ **g**ùʔ	'drink water'
c.	**l**əwan **l**ədàn	>	**g**əwan **g**ədàn	'quickly'
d.	**b**o jàʔ	>	**by**o jàʔ	'be stubborn'
e.	ʔə́**br**âŋ	>	ʔə́**b**âŋ	'PSN'

In short, substitution-type language games, singling out the onset or rhyme as their targets of application, support the view that the onset and rhyme are syllable-internal constituents, together with the fact that there are no ludlings that manipulate other multisegmental domains. There is also a significant amount of data that can be accounted for in terms of the onset and rhyme, including tone assignment, syllable weight, phonotactic constraints, meaningless couplets, rhyming in versification, and speech errors. Substitution-type games thus provide a source of evidence in support of the decomposition of the syllable into two subsyllabic constituents, onset and rhyme, coupled with other diverse lines of empirical evidence.

6. Syllable as a phonological constituent

The syllable is often viewed as a "building block" in the prosodic hierarchy (Selkirk 1982: 338). Its role, reality, and universality as a phonological constituent, however, is sometimes challenged. Chomsky and Halle, in their seminal paper in 1968, describe English without the syllable notion. There are also languages such as Gokana, an Ogoni language of Nigeria, which make very little use of the syllable (Hyman 2011). In previous works on Jinghpaw, the syllable often appears as a given category, but few studies have systematically explored the central role played by the syllable in the language. This section aims to offer arguments that support the relevance of the syllable to Jinghpaw phonology based on the ludling data (§6.1) and other types of data from a wide range of linguistic phenomena (§6.2).

6.1. Syllable copying game and its relevance to the syllable

Some types of ludlings make extensive reference to the syllable as their target structure of application (Laycok 1972; Davis 1994; Bagemihl 1995; Blevins 1995: 209). Rearrangement-type games, for example, sometimes constitute evidence in favor of the reality of the syllable, as in the Bantu language Luchazi, where ludling words are derived by exchanging the positions of the last two syllables (Davis 1994). Analogous arguments can be illustrated by the syllable copying language game in Jinghpaw. This ludling, as described in Section 3.2, involves two mechanisms of insertion and substitution. Because the insertion site exactly corresponds to the syllable boundary, the ludling provides one piece of evidence in support of the syllable as a phonological unit. Without the syllable notion, the ludling, in which speakers are required to divide words into pieces, would not be succinctly accounted for. Additional examples of the syllable copying game operating on monosyllabic words include:

(41) Syllable copying game on monosyllabic words

a. ɕá	>	ɕá-**sá**	'eat'
b. dàp	>	dàp-**sàp**	'ashes'
c. khyeŋ	>	khyeŋ-**seŋ**	'be red'
d. krúʔ	>	krúʔ-**súʔ**	'six'

The ludling also operates on polysyllabic words. The number of syllables in the derived words is double that of their inputs. Polysyllabic words in Jinghpaw, as noted in Section 2, are predominantly sesquisyllabic words composed of a light syllable followed by a heavy syllable. As noted in Section 3.2, light syllables are usually converted in the ludling to heavy syllables headed by /a/ with the default low tone. The ludling thus duplicates these disyllabic words to quadrisyllabic words. The following are additional examples:

(42) Sesquisyllabic words

a. ləmù	>	là-**sà**-mù-**sù**	'sky'
b. məraŋ	>	mà-**sà**-raŋ-**saŋ**	'rain'
c. gəlo	>	gà-**sà**-lo-**so**	'make'
d. ɕərín	>	ɕà-**sà**-rín-**sín**	'teach'

The syllable copying game is also systematically applied to other types of words such as fully disyllabic words consisting of two heavy syllables (43a–d), trisyllabic words (43e), and compounds (43f–g). Examples include:

(43) Other types of words

a. nùmla	>	nùm-**sùm**-la-**sa**	'ghost'
b. gìnkhàʔ	>	gìn-**sìn**-khàʔ-**sàʔ**	'divide'
c. bàynam	>	bày-**sày**-nam-**sam**	'goat'
d. sìŋko	>	sìŋ-**sìŋ**-ko-**so**	'wing'
e. pəlâmláʔ	>	pà-**sà**-lâm-**sâm**-láʔ-**sáʔ**	'butterfly'
f. wàn-lèŋ	>	wàn-**sàn**-lèŋ-**sèŋ**	'train'
g. khàʔ-ɕín-gòk	>	khàʔ-**sàʔ**-ɕín-**sín**-gòk-**sòk**	'shower room'

6.2. Other data in favor of the syllable

This section provides other types of data that demonstrate the reality of the syllable in Jinghpaw. Native speakers often have conscious knowledge about the syllable with respect to the syllable break and the number of syllables in a word (Blevins 1995: 209–210). The ability to segment words into syllables is reported to be significantly easier and acquired earlier than the ability to segment words into phonemes in language acquisition (Liberman et al. 1974). Jinghpaw speakers, trained or untrained to work with linguistics data, also appear to have intuitions about the syllable, where, as summarized in (44), fourteen out of fourteen speakers gave the consistent responses with respect to the number of syllables in the words in (44a–d).[5] These consistent answers suggest that speakers have the syllables in their mental representation.[6]

(44) Native intuitions

a.	yú	'rat'	one syllable
b.	ŋay	'1sg'	one syllable
c.	gəlo	'make'	two syllables
d.	pəlâmláʔ	'butterfly'	three syllables

Another oft-mentioned argument for the syllable as a phonological unit comes from phonological processes and/or constraints that take the syllable as their domain of application (Blevins 1995: 207–208). Jinghpaw has a phonological process of tone spreading, where a high tone spreads to the following low tone from the left to right. To illustrate this, consider the tone sandhi associated with the high-toned negative prefix *ń-* in (45).[7] Its high tone spreads to the adjacent low tone, turning it into a surface high-falling tone (45a–c). From examples (45c) and (45d) we see that the sound pattern requires reference to the syllable as its domain: tone does not spread onto non-adjacent syllables in the same word.

(45) Tone spreading

a.	ń-lù	>	[ń-lû]		'not get'
b.	ń-sà	>	[ń-sâ]		'not send'
c.	ń-dìŋsà	>	[ń-dîŋsà]	*[ń-dîŋsâ]	'not be old'
d.	ń-mədà	>	[ń-mədà]	*[ń-mədâ]	'not behold'

Related is a tone assimilation rule, where high-toned prefixes turn the following low-stopped tone to the high-stopped. As an illustration, consider the examples in (46). Although the surface forms are not the same, the tone spreading (45) and assimilation (46) can phonologically be interpreted as two realizations of a single process, given that they are

5 Because there are no terms corresponding to "syllable" in the language, I asked speakers how many "sound units" the given words have.

6 A reviewer suggested another possibility: the influence of the writing system on syllable counting. Although more investigation is required, at least three children who were no acquainted with the orthography also gave the same responses as adults.

7 For more detail on syllabic nasals, see Section 7.

in complementary distribution: one is realized in smooth syllables (45) and the other in checked syllables (46). The tone assimilation can be interpreted as a disassociation of the low tone and progressive spreading of the high (see Kurabe 2017b for more details). Again, as illustrated by (46c), the tone assimilation does not cross the syllable boundary.

(46) Tone assimilation

a.	ń-gàp	>	[ń-gáp]		'not shoot'
b.	ń-sàt	>	[ń-sát]		'not kill'
c.	ń-gàpsàt	>	[ń-gápsàt]	*[ń-gápsát]	'not kill by shooting'

Many languages also have phonological rules that refer to syllable edges as their loci, providing arguments for defining syllable-initial or syllable-final environments (Blevins 1995: 209). An analogous phenomenon in Jinghpaw is illustrated by the three-way distinction between voiceless, voiced, and aspirated stops (see §2). While they are fully contrastive at the left edge of the syllable, as illustrated by (47), only the first series are allowed at the right syllable edge. This distributional asymmetry sensitive to the syllable edge cannot be accounted for without reference to the syllable.

(47) Distributional asymmetry of stop series

a.	kà	'write'	cf.	yàk	'be difficult'
b.	gà	'word'	cf.	*yàg	
c.	khá	'be bitter'	cf.	*yàkh	

Syllables, as in many other languages (Blevins 1995: 209), can also be the target of certain morphological processes in Jinghpaw. The two processes of particular relevance here are partial reduplication and monosyllable-targeting prefixes. Reduplication in the language, as illustrated by (48), is manifested as partial reduplication, copying the last syllable of the base from left to right. Reduplication in the language is thus a morphological process that takes the syllable as its prosodic target. The multisegmental target of reduplication cannot be captured without reference to the syllable. Reduplication, as demonstrated by (48a–d), is employed to mark categories such as habituality, distributivity, indefiniteness, and plurality of interrogatives (see Kurabe 2017c). It also forms adverbs (48e) and concessive adverbial clauses (48f).

(48) Partial reduplication

a. yu	‘see’	>	yu-yu	‘see on a regular basis’
b. məli	‘four’	>	məli-li	‘four each’
c. ləŋây	‘one’	>	ləŋây-ŋày	‘some’
d. gəday	‘who’	>	gəday-day	‘who-PL’
e. ləwan	‘be quick’	>	ləwan-wan	‘quickly’
f. gìnsúp	‘play’	>	gìnsúp-súp	‘even if one plays it...’

Another syllable-sensitive morphological process is illustrated by prefixes that can only be added to monosyllabic bases. The monosyllable-targeting prefixes include the causative prefix *ɕə-* and the hypocorism (nickname) formation prefix *ʔá-*. To illustration, consider the causative derivation (49a–c), which shows that the causative prefix derives well-formed words only when added to monosyllabic bases. The same holds for hypocorism word formation, as illustrated by (49d–f), where the prefix *ʔá-* (which is realized as [ʔə́] when prefixed to monosyllables) can only be added to monosyllabic parts of a person’s name, *bràŋséŋ*. Here also, the syllable is indispensable in accounting for these sound patterns.

(49) Monosyllable-targeting prefixes

a. caŋ	‘be black’	>	ɕə-caŋ	‘blacken’
b. pyo	‘be pleased’	>	ɕə-pyo	‘amuse’
c. gəbu	‘be glad’	>	*ɕə-gəbu	
d. bràŋ	‘PSN’	>	ʔə́-brâŋ	‘Abrang (nickname)’
e. séŋ	‘PSN’	>	ʔə́-séŋ	‘Aseng (nickname)’
f. bràŋséŋ	‘PSN’	>	*ʔə́-brâŋséŋ	

The syllable also plays a key role in versification, which, as noted in Section 5.2, involves two metrical strategies to achieve phonological parallelism: rhyming and syllable counting. The latter parallelism is achieved when a fixed number of syllables, usually ranging from six to eight, systematically occurs in each line. This demonstrates that the numeric control of the Jinghpaw verse tradition is essentially syllable-based. This can be observed in an additional stanza from a verse in (50):

(50) Heptasyllabic stanza from a verse

mòy=ná	*lam=ni=phéʔ*	*mərìt,*
before=GEN	way=PL=ACC	long.for

‘I miss the old days,’

níŋthóy	*thòy=na*	*ŋay*	*nóʔ*	*khrìt.*
light	shine=NMLZ	1sg	still	fear

‘I still fear the light.’

The verse in (50) consists of 14 syllable-holders (51) with seven syllables per line. The numeric control in which the syllable once again plays a crucial role can be taken as evidence for the reality of the syllable in the language.

(51) Verse template for (50)

1	2	3	4	5	6	7
mòy	ná	lam	ni	phéʔ	mə	rìt
8	9	10	11	12	13	14
níŋ	thóy	thòy	na	ŋay	nóʔ	khrìt

A final argument in favor of the syllable as a phonological unit in Jinghpaw comes from text-setting in songs (Halle and Lerdahl 1993; Proto 2015), the arrangement of linguistic material (i.e., texts) to musical structure (i.e., tunes). The default text-setting algorithm in the language is based on the syllable: to assign each syllable to an available beat from left to right. This is illustrated by the following extract from a hymn song:

(52) Texts from a hymn song

gəbu-gəra	*ɕì-gà=gò*	*múŋ*	*mi=thèʔ*	*múŋ*	*mi*
joyful-rejoice	news-word=TOP	country	one=COM	country	one

dù=khrà,	*dìŋsì*	*dzòn-dzòn*	*ŋoy*	*gəra=ŋà,*	*ʔánthe=phéʔ*
arrive=till	bell	like-RED	sound	resound=CONT	1pl=ACC

khyé-lá=na	*ŋa...*
save-take=IRR	say

'Joyful news, like the bell, is ringing from one country to another, saying to save us...'

whose simplified text-to-tune assignment is illustrated by (53), where the symbol ♪ stands for a musical note, irrespective of its temporal duration. Observe that the syllables and notes have a one-to-one correspondence. The syllable-based text-setting suggests that, like poets, composers measure the length of words based on the syllable.

(53) Text-to-tune assignment of (52)

♪	♪	♪	♪	♪	♪	♪	♪	♪	♪	♪
|	|	|	|	|	|	|	|	|	|	|
gə	bu	gə	ra	ɕì	gà	gò	múŋ	mi	thèʔ	múŋ
♪	♪	♪	♪	♪	♪	♪	♪	♪	♪	♪
|	|	|	|	|	|	|	|	|	|	|
mi	dù	khrà	dìŋ	sì	dzòn	dzòn	ŋoy	gə	ra	ŋà
♪	♪	♪	♪	♪	♪	♪				
|	|	|	|	|	|	|				
ʔán	the	phéʔ	khyé	lá	na	ŋa				

To sum up, the syllable copying language game, where the insertion site corresponds to the syllable boundary, substantiates the relevance of the syllable in Jinghpaw phonology. The syllable also plays an essential role for generalizations about a wide variety of data from other linguistic phenomena. These include the speakers' intuition, tone spreading and assimilation, syllable-edge phenomenon, partial reduplication, prefixes sensitive to the number of syllables, numeric control in traditional verses, and syllabic text-setting in music. The ludling evidence, when taken together with these other sources of evidence, supports the reality of the syllable as a phonological constituent in the language.

7. Word-initial NC sequences

In addition to words composed of the syllable types summarized in Section 2, the Jinghpaw lexicon also contains a rich array of examples that exhibit word-initial NC (nasal-consonant) sequences, such as (54), where the nasal component is always phonetically homorganic with the following consonant in terms of the place of articulation.

(54) Word-initial NC sequences
- a. [mbo] 'glutinous rice'
- b. [ndai] 'this'
- c. [ɲdʑu] 'hate'
- d. [ŋkau] 'some'

NC sequences, which may exhibit various phonological configurations with respect to separability (separable or inseparable), syllabification (tautosyllabic or heterosyllabic), and segmenthood (unary or cluster), have been a focus of interest in the phonological literature (Herbert 1986; Downing 2005; Riehl 2008; Riehl and Cohn 2011, among others). Word-initial NCs also prevail in Southeast Asian languages (Henderson 1965; Ratliff 2015; Vittrant and Watkins 2019), where two types of NCs are fairly common: inseparable unary NCs (e.g., [ⁿgu] 'poor' in Tshobdun Rgyalrong) and heterosyllabic NC clusters (e.g., [ŋ̩.ka] in Belhare) in terms of Riehl and Cohn's (2011) terminology.[8] This section will investigate word-initial NCs in Jinghpaw based on a ludling (§7.1) and other phonological phenomena (§7.2). Since word-initial NCs in the language are extensively explored in Kurabe (2018), this section provides only a brief summary, especially focusing on the ludling.

7.1. Syllable copying game and word-initial NCs

Ludlings are sometimes recruited to gain insight into NC sequences. Hombert (1986: 177), for example, shows that NCs in Bakwiri, a Bantu language of Cameroon, are unary

[8] Examples are taken from Sun and Bstan'dzin Blogros (2019: 3) and Bickel (2017: 697), respectively.

segments based on a game of backwards language in which the order of the syllable in disyllabic words is reversed. The tone structure, when spoken backwards, remains unaffected. The behavior underlying the ludling, as can be seen in (55c) and (55d), supports the conclusion that Bakwiri NCs are unary segments.

(55) Backwards language in Bakwiri (adapted from Hombert 1986)

a.	**m**ɔ̀**k**ɔ̀	>	**k**ɔ̀**m**ɔ̀	'plantain'
b.	**kʷ**é**l**ì	>	**l**í**kʷ**è	'falling'
c.	**k**ó**mb**à	>	**mb**á**k**ò	'take care of'
d.	**k**ó**nd**ì	>	**nd**í**k**ò	'rice'

In contrast, the ludling in Jinghpaw treats NC sequences quite differently from that in Bakwiri. As described in Section 3.2, the syllable copying game is a fairly productive operation, as it is applicable to virtually all types of syllables in the language. Because the ludling involves the mechanism of insertion whereby words are broken up to syllables, it has implications about the syllable affiliation of the nasal component in word-initial NCs. When applied to them, the ludling produces outputs, as given in (56), by inserting a string of phonemes after the nasal component. The syllable copying game thus provides one line of evidence that favors the heterosyllabic cluster analysis for word-initial NCs.

(56) Syllable copying game applied to NCs

a.	[mbo]	>	[n-**sin**-bo-**so**]	'glutinous rice'
b.	[ndai]	>	[n-**sin**-dai-**sai**]	'this'
c.	[ɲdʑu]	>	[n-**sin**-dʑu-**su**]	'hate'
d.	[ŋkau]	>	[n-**sin**-kau-**sau**]	'some'

Unlike other examples described above, the inserted sequences are not fully predictable from the s-substitution by which the onset of real words is replaced by the voiceless fricative (e.g., *bo* > *bo-so* 'head'). This can be accounted for in terms of segmental phonotactic restrictions in the language, where expected forms such as [sn] are not allowed. The epenthetic vowel [i] is inserted in order to break up this undesirable sequence. The choice of the high front vowel as the epenthetic vowel may be because it is surrounded by dental consonants [s] and [n] or because, as in many languages with epenthesis (Hall 2011: 1581), it is a frequent and default vowel. The derivation process of (56a) may be represented as in:

(57) Derivation of the ludling form for [mbo]

Underlying	nbo
Insertion	n-n-bo-bo
s-substitution	n-sn-bo-so
Epenthesis	n-sin-bo-so
Surface	n-sin-bo-so

The output [sin], rather than other possibilities such as [sim], [siɲ], and [siŋ], is of interest in that it suggests that the underlying representation of the nasal component in NCs is /n/, not other allophones such as /m/, /ɲ/, or /ŋ/, all of which are possibly realized as surface forms in NCs (54). This view is also preferred in light of the fact that the nasal component in NCs is realized as [n] before [ʔ] and [h], which have no specific places of articulation in the oral cavity (e.g., [ǹʔau] 'cauldron' and [ńhó] 'not announce').[9]

7.2. Other phenomena in favor of the heterosyllabic analysis

As explored by Kurabe (2018), there are a range of evidence that work together to characterize word-initial NCs as being heterosyllabic, thus separable and clusters. Some of them are related to the phenomena observed in Section 6 above, in the discussion about the role and reality of the syllable. Here only a brief summary of them is in order. First, most native speakers perceive NCs as being heterosyllabic. Second, the sonority profile of NCs, where more sonorous segments are potentially followed by less sonorous ones, is dispreferred in terms of the sonority sequencing principle (Clement 1990). Third, the nasal component may carry a different tone than the following syllable. Fourth, a monosyllable-targeting prefix cannot be added to words involving NCs. Fifth, the nasal component is not copied in partial reduplication. Finally, when Jinghpaw is set to music, the nasal component is treated as a full-fledged syllable.

8. Conclusions

This paper explored ludlings in Jinghpaw and their relevance to its phonology. Substitution and insertion are the two major mechanisms made use of in the Jinghpaw ludling. The former replaces the onset or rhyme of real words with other subsyllabic constituents (§3.1). The latter, which is usually realized in combined with onset substitution, disguises words, phrases, or sentences by inserting a copy of the preceding syllable at every syllable boundary (§3.2). Using these ludling data as a point of departure, this paper addressed four types of questions in Jinghpaw phonology: the phonological configuration of an ambiguous phonetic diphthong [ui]; the hierarchical organization within the syllable;

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9 The nasal component in NC sequences becomes opaque to the rhyme substitution game described in Section 3.1. For example, the sentence *ŋay=gò n-sa=na* 'I will not go.' is rendered in the ludling as *ŋoy=gòy n-soy=noy*.

the psychological reality of the syllable; and the syllable affiliation of the nasal component in word-initial NC (nasal-consonant) sequences. The substitution-type game, coupled with independent evidence from phonotactics, provides evidence in favor of the view that the phonetic string [ui] belongs to the rhyme as a whole (§4). The substitution ludling also motivates the reality of the onset and rhyme as subsyllabic constituents, reinforcing arguments based on other types of phonological phenomena (§5). The insertion-type game, which takes the whole syllable as its target of application, is suggestive of the relevance of the syllable to Jinghpaw phonology, which is consistent with a wide variety of linguistic phenomena where the syllable plays a role (§6). The insertion ludling also shows that Jinghpaw NC sequences are heterosyllabic clusters, which is again congruent with other types of phonological evidence (§7). I hope that this paper will contribute to bringing about more studies on ludlings and related phenomena in other neighboring languages of Tibeto-Burman and mainland Southeast Asia.

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Abbreviations

1	first person
2	second person
ACC	accusative
ADV	adverbializer
ALL	allative
C	consonant
CAUS	causative
COM	comitative
COMPL	completive
CONT	continuous
COUP	couplet
DECL	declarative
F	falling tone
H	high tone
HORT	hortative
Hq	high-stopped tone
INFER	inference
IRR	irrealis
L	low tone
Lq	low-stopped tone
M	mid tone
NMLZ	nominalizer
O	obstruent
PL	plural
PROH	prohibitive
PSN	person name
q	stopped tone
Q	question particle
R	nasal or semivowel
RED	reduplicant
SFP	sentence-final particle
sg	singular
T	tone
TOP	topic
V	vowel

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