L2 Inflectional Morphology and Prosody: The Case of L1 Bengali Speakers of L2 English

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Abstract

This study is set in the context of the persistent omission of functional morphology by adult second language speakers, which often remains in evidence at high levels of proficiency and end-state grammars. The aim of this thesis is to examine the spoken suppliance of inflectional morphology by adult first language speakers of Bengali, as spoken in and around Dhaka, Bangladesh, and to do so in the phonological framework of the Prosodic Transfer Hypothesis. An initial analysis of the prosodic representation of Bengali inflectional morphology, in contrast to that in English, finds that the acquisition task for Bengali speakers should, on the one hand, be facilitated according to the availability of required second language prosodic representation to transfer to the interlanguage grammar. On the other, however, a mismatch is found between the minimality requirements of the prosodic word and the moraic structure below the level of the prosodic word.

A small group of learners from beginner to advanced participated in a semi-spontaneous elicitation task, grammaticality judgement test and elicited imitation task. The data were analysed for evidence of suppliance of inflection (in accordance with the Prosodic Transfer Hypothesis) and for signs of transfer of Bengali minimality requirements and subsequent repair on English 'sub-minimal' stems. The results of the experiments in this study found that by advanced proficiency, first language Bengali speakers appeared to reap the benefits of transfer of first language prosodic representation. However, though observation of suppliance rates on different stem types during the developmental stages may at first not seem to support the outcome, depending upon the interpretation of the strong and weak versions of the Prosodic Transfer Hypothesis, asymmetrical suppliance rates at lower levels may, in part, be phonologically influenced by the availability of the required prosodic representation and adjustment to the moraic structure of the second language.

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Abbreviations

∅	zero morpheme
1	first person
1P	first person
2	second person
2FAM	second person familiar
2HON	second person honorific (polite)
2ORD	second person ordinary
2PL	second person plural
3	third person
3HON	third person honorific (polite)
3SG	third person singular agreement
ALTE	Association of Language Testers in Europe
AoA	age on arrival
ASR	Automatic Speech Recognition
C	consonant
CAE	Cambridge English Advanced
CASSL	Computer Assisted Spoken Language Learning
CEF/CEFR	Common European Framework of Reference for Languages: Learning, Teaching, Assessment
CPE	Cambridge English Proficiency
C_1	first consonant
C_2	second consonant
CLF	classifier
DCB	Dhaka colloquial Bengali
EMPH	emphatic clitic
ESOL	English for Speakers of Other Languages

EU	European Union
F	female
FCE	Cambridge First Certificate
FDH	Fundamental Difference Hypothesis
FFR	Full Functional Representation
FRH	Feature Reassembly Hypothesis
Ft	foot
F1	formant 1
F2	formant 2
GEE	Generalized Estimating Equations
GJT	grammaticality judgement test
H	high alternation
HAB	habitual
IAST	International Alphabet of Sanskrit Transliteration
ID	identity
IELTS	International Language Testing System
IH	Interpretability Hypothesis
INT	intensifier
IPA	International Phonetic Alphabet
IPF	imperfect
Irreg.	irregular (verb)
Irreg. PT	irregular past tense
KCB	Kolkata colloquial Bengali
KET	Cambridge Key for Schools
L	low alternation
LoR:	length of residence
LOC	locative
LV	long vowel
L1	first language

L2	second language
M	male
Mono	monomorpheme
MSIH	Missing Surface Inflectional Hypothesis
NS	native speaker
NS Control	native speaker control (group)
NSB	native speaker of Bengali
NSE	native speaker of English
OEHS	onset of an empty-headed syllable
OQPT	Oxford Quick Placement Test
PET	Cambridge English Preliminary
Pl Noun	plural noun
PPh	phonological phrase
PRF	perfect
PRFP	perfect participle
PRS	present
PROG	progressive
PST	past
PT	past tense
PTH	Prosodic Transfer Hypothesis
PWd	prosodic word
P	person
QCF	Qualifications and Credit Framework
QICC	Corrected Quasi Likelihood under Independence Model Criterion
Reg.	regular (verb)
Reg. PT	regular simple past tense
S	Sylheti (dialect)
SCB	Standard colloquial Bengali
SE	standard error

SfL	Skills for Life
SLH	Strict Layer Hypothesis
SV	short vowel
T	tense
T, T(a),T(b)	Transfer, Transfer(a), Transfer(b)
UG	Universal Grammar
UK	United Kingdom
UR	underlying representation
V	vowel
VL	vowel length
VP	verb phrase
V_1	first vowel
V_2	second vowel

*	unacceptable
/ /	phonemic transcription
[ ]	phonetic transcription
-	morpheme boundary in a transcription or gloss line
.	within a word denotes a stem altering morpheme
·	syllable boundary
=	clitic
μ	mora
σ	syllable
ψ	stem
ω	prosodic word

Chapter 1

Introduction

1.1 Background to the current study

The context to the current study is the ongoing and well-documented debate in second language acquisition regarding the variable production of inflectional morphology (e.g. tense, number and agreement) and function categories (e.g. auxiliaries and determiners) by adult second language (L2) learners (e.g. White, 2003; Gass, 2013). Both within and outside the field of generative second language acquisition, the variable suppliance of L2 functional morphology remains a source of debate. In generative linguistics, the focus tends towards whether or not the L2 learner can access functional features that have not first been acquired in the L1, as well as the nature of the relationship between competence and performance.

The ever growing body of generative-based research which looks to explain this persistent variable suppliance of functional morphology by L2 learners, can be loosely divided into two branches. On the one hand is the assumption that omission of functional morphology is indicative of an impaired or defective syntax and the inability to instantiate L2 functional categories which are not already present in the L1 (e.g. Hawkins and Chan, 1997; Hawkins and Liszka, 2003). On the other is the proposal that the required L2 functional categories can be transferred or acquired (possibly through on-going access to Universal

Grammar) and according to this account, omission of functional morphemes is considered (at least partly) to be down to the influence of other factors. These include, amongst others, issues with prosodic representation (e.g. Goad et al., 2003; White, 2003), the reassembly of formal features (e.g. Lardiere, 2008), phonotactic constraints (e.g. Davidson, 2006), word-final cluster reduction (e.g Lardiere, 2003), and mapping from the syntax to the surface morphology (e.g. Prévost and White, 2000).

It is also commonly reported that alongside variable suppliance of functional morphology in spoken production is a dissociation with respect to underlying knowledge of the required syntactic functional categories and features. This might be measured by way of a grammaticality judgement test (GJT), analysis of written prose, or evidence of syntactic movement and checking of another feature (e.g. raised subject in DP, case checked by TP) implicating the specification of another feature (i.e. finiteness in TP). According to Lardiere (2007, p.203-204), the L1 Mandarin speaker known as Patty, frequently omits inflection on regular simple past, as shown in (1a), third person singular agreement, shown in (1b) and plural nouns, shown in (1c). However, what was found to be more striking was the apparent target-like nature of syntactic configurations. This was seen in pronominal case marking and case marking on subjects, as shown in (2a) and the position of adverbs, as in example (2b). As this could not be accredited to L1 transfer, it was taken to implicate the presence of Tense in the syntax.[1]

(1) a. I *call* Bill this morning and nobody *answer*

b. because he *understand* a lot

c. I borrow a lot of *book* from her

(2) a. maybe they don't want us to use it after office hour

b. his brother never came here

The task for adult learners of an L2, is seemingly at odds with the ease with which

[1]The selected examples given in (1) and (2) are reproduced from Lardiere (2007, p.204) along with the author's italicisation.

child learners acquire the same morphology (e.g. Fromkin et al., 2013). Variability in the suppliance of L2 inflectional morphology is seen to be more prevalent in spoken than written production (e.g. White, 2003; Hawkins and Liszka, 2003), and indifferent to the mode of learning; naturalistic or explicit classroom-based instruction and exposure to positive evidence (e.g. Lardiere, 2003). Yet functional morphology most often imparts grammatical meaning (e.g. tense and aspect) and is often overtly pronounced, with a morphophonological form (e.g. Slabakova, 2016). Considering this, it is not unreasonable to posit that the cause of such patterns of omission of functional morphology by adult L2 learners may, at least in part, be due to difficulties with phonological representation.

With this in mind, the current study attempts to contribute to the literature with a study based on the spoken suppliance of inflectional morphology by L1 Bengali speakers of L2 English, tested in the light of the Prosodic Transfer Hypothesis (Goad et al., 2003; Goad and White, 2006, 2004). The rationale for this is two-pronged. Bengali is a relatively under-researched language in L2 acquisition studies, and one aim of this study is to provide a rigorous analysis of Bengali inflectional morphology, not only with respect to the prosodic representation of L1 Bengali inflectional morphology, but also in relation to prosodic word minimality requirements and moraic structure. The reason for this is to extend the analysis of the transfer of L1 prosodic representation in L2 inflectional morphology, to examine whether transfer of L1 constituents below the prosodic word also interact with the suppliance of L2 inflectional morphology. Following the theoretical analysis of Bengali inflectional morphology with respect to prosodic representation, a comparative analysis is made between the relevant prosodic structures required in English and Bengali. The experimental data for this study is collected from a small group of L1 Bengali speakers from Beginner to Advanced proficiency level. The reason for a range of proficiency levels is to provide opportunity to observe developmental stages which may inform whether L1 transfer of prosodic constituents, both at and below the level of the prosodic word, is in any way systematic. That is, whether any mismatch between the L1 and L2 moraic structure and minimality requirements is addressed before affixation is represented with respect to the prosodic word.

1.2 Research questions

The research questions with which this study proceeds are summarised as follows:

(3) a. Are the predictions of the PTH regarding the suppliance and omission of inflectional morphology and transferability of prosodic representation supported by the data from L1 Bengali speakers?

b. Is there evidence of transfer of L1 minimal word requirements and moraic structure to the interlanguage, alongside prosodic representation of inflectional morphology? If so, can this help define prosodic word boundaries and identify prosodic representation of L2 inflectional morphology?

1.3 Overview of the thesis

This thesis proceeds as follows: Chapter 2 begins with a description of the prosodic representation of affixation in English with respect to the PTH (Goad et al., 2003; Goad and White, 2006, 2004), and provides a brief summary of some of the findings from previous studies. In Chapter 3, attention turns to the linguistic structure of Bengali, particularly with respect to the system of inflectional morphology and prosodic representation. As contrast is made between the L1 and L2, the prosodic representation of inflectional morphology in the Sylheti dialect is also discussed, as a number of Bengali speakers tested in this study are also speakers of the Sylheti dialect. Chapter 4 then outlines the methodology relevant to two experimental studies. In the first study, Experiment 1A, tests L1 Bengali speakers on the suppliance of inflectional morphology in spoken productions and Experiment 1B compares performance on a GJT with the spoken suppliance rates. The second study, Experiment 2, asks whether there is evidence of L1 transfer of minimality requirements and whether prosodic boundaries can be determined with the measurement of phonetic vowel length in a tetrad of minimal words, both with and without inflectional morphology. Chapter 5 then reports the results of Experiment 1, and the implications of the results are discussed within this chapter. Similarly, Chapter 6 reports on the results from Experiment 2, also with interim discussion of the relevance of the results. The main findings are summarised in Chapter 7, and conclusions are drawn in Chapter 8.

Chapter 2

Background to the study

2.1 Introduction

This chapter provides an overview of the theoretical background and some of the issues related to the acquisition of functional morphology by second language learners. Attention is then paid to the theoretical background of the Prosodic Transfer Hypothesis (PTH), particularly in relation to the prosodic structure of functional morphology in English. This is then considered in relation to the prosodic representation of functional morphology in Mandarin and Turkish, and the role of transfer of L1 phonological representations with respect to the task of second language acquisition (L2) of inflectional morphology.

2.2 Adult acquisition of L2 functional morphology: Some current perspectives

The many difficulties surrounding adult (L2) acquisition are often presented in contrast to the apparent ease and speed with which children acquire the primary language(s) (e.g. Orfitelli, 2012; Campos-Dintrans, 2011; O'Grady, 2005). With respect to syntax, it is reported that somewhere between the age of two to three and a half years, English-speaking children transit through a null-subject stage, and emerge with an adult-like grammar in both comprehension and production (Orfitelli and Hyams, 2012). Phonologically, although child early word productions may be non target-like in terms of segmental, syllable or morphological structure, they are nevertheless argued to be well-formed minimal words (Demuth, 1996). Speech perception is polarised toward the phonemic inventory of the ambient language from as early as six months of age (e.g. Kuhl et al., 1992; Strange and Shafer, 2008). In contrast, it is argued that the perception and production of L2 phonemes which are not shared with the L1 becomes increasingly difficult for adult L2 learners (e.g. Kuhl, 1993; Flege, 2003), and the difficulties in the suppliance of L2 functional morphology, with which this thesis is concerned, often persist to advanced or end state levels of proficiency.

Of particular interest with respect to the current study is the incidence of consonant cluster reduction, particularly obstruents in word-final position. This is well-documented in both child and adult acquisition literature. For example, Ingram (1974), Johnson and Reimers (2010) and Ohala (2008) discuss L1 syllable reduction; Tarone (1987), Sato (1987) and Weinberger (1987) reference the role of L1 transfer, markedness and universal development processes in L2 syllable reduction. However, whilst deletion is shown to be in evidence in the simplification of syllable-final obstruent clusters in both child L1 and adult L2 productions (e.g. Weinberger, 1987; Johnson and Reimers, 2010), Weinberger (1987) states that epenthesis is more common in adult L2 than child L1 data. Weinberger (1987, p.403) proposes that the way adult L2 syllable-final cluster simplification is achieved (i.e. by epenthesis or deletion) is related to the type of elicitation task, and presumably discourse. In his study of L1 Mandarin speakers of English, Weinberger (1987) reported that there were more instances of deletion than epenthesis when learners were presented with a word-list task compared to a paragraph-reading or story-telling task. This is explained in terms of the greater difficulty caused in the recoverability of ambiguous forms resulting from deletion compared to that presented with cluster simplification by epenthesis. In other words, the level of phonological intelligibility required by the task determines whether clusters are simplified by epenthesis or deletion. Furthermore, Weinberger (1987) proposes that cluster reduction is also related to the level of proficiency in the L2; cluster simplification by deletion preceding that by epenthesis in relation to the instantiation of 'recoverability' in the interlanguage. According to this theory, Weinberger (1987, p.413) posits that recoverability in child L1 acquisition is attained alongside phonetic accuracy, negating the need to simplify clusters via epenthesis in ambiguous contexts.

Other studies related to L2 consonant cluster reduction also focus on linguistic and non-linguistic factors. Hansen Edwards (2006) considers the influence and interaction of linguistic (internal) and social (external) factors in the acquisition of L2 English onset and coda consonants by two adult L1 speakers of Vietnamese. Reporting on target-like production, absence, epenthesis or feature change, Hansen Edwards (2006) notes that the accurate production of singleton consonants in coda position precedes the production of the same consonants in syllable-final clusters. As well as confirming this finding, particularly in the deletion of syllable-final fricatives (disallowed in the L1), Osburne (1996) also found that an L1 Vietnamese speaker of L2 English was more likely to retain a grammatical marker in a CC or CCC coda cluster, indicating the influence of the linguistic environment on cluster production. With respect to L1 variation in the production of, for example, past tense /t, d/ deletion or /s, z/ plural marking, Wolfram (1985) reports that Vietnamese subjects who had resided in the US for over four years (compared to up to three years) patterned similar to some varieties of English spoken by L1 speakers, notably past tense inflectional morphemes were deleted in consonant clusters which were followed by another consonant, and overall greater deletion of syllable-final consonant clusters in monomorphemic forms over simple past tense forms.

Returning to the issue of divergence between child and adult language acquisition, in the absence of pathological disorder or deprivation to linguistic exposure, child L1 acquisition is also often called-upon to exemplify successful linguistic accomplishment in contrast to the (controversial) non native-like attainment of adult L2 learners.[1] Whilst such

[1] This is controversial with respect to the arbitrary nature of the Critical Period Hypothesis (Penfield and Roberts, 1959; Lenneberg, 1967) and what measure of performance constitutes a native-like grammar.

comparisons are often drawn between child acquirers and adult L2 learners with regard to spoken language, child acquisition of language is clearly not restricted to the spoken mode. Children exposed to sign languages also follow the same developmental stages as children exposed to spoken language whilst acquiring a set of grammatical rules and mental lexicon. One way to explain the learnability (or acquirability) of language across modalities, despite poverty of the stimulus, is access to Universal Grammar (UG); in simple terms, an innate set of universal linguistic principles and grammatical properties (e.g. Hornstein and Lightfoot, 1981).

The Fundamental Difference Hypothesis (FDH) (Bley-Vroman, 1989; Bley Vroman, 2009) claims that child L1 and adult L2 acquisition achieve different levels of underlying competence; child acquisition is always reliably complete and the speakers of the same L1 arrive at the same grammar, unlike fossilisation and divergent non-target like grammars seen in adult L2 learning. Whether adult learners have continued access to UG, and if so what kind of access, is a continued source of debate in current accounts of variable suppliance of L2 functional morphology, although Bley Vroman (2009), in a revised version of the FDH, continues to reject the possibility of adult access to UG, positing that as all languages involve *move*, *agree* and *merge*, the L2 learner has everything available in the L1 for the resetting of parameters without recourse to UG.

Grouped under the umbrella of 'representational deficit' are those theories which presume any property not already present in the L1 cannot be represented in the L2 grammar; variable suppliance of L2 morphology is attributable to missing syntactic features, and instances of suppliance are mechanical reproductions gleaned from the target-language (Tsimpli and Roussou, 1991; Hawkins and Chan, 1997; Hawkins and Hattori, 2006; Tsimpli and Dimitrakopoulou, 2007). Alternatively, theories which assume characteristics of the L2 are attainable, whether or not they are similarly available in the L1, can be grouped under the 'full functional representation' umbrella. In contrast to 'representational deficit' accounts, 'full functional representation' theories propose that variable

See, for example, Slabakova (2016, Chp. 4) for an overview, including current issues and theories.

suppliance of functional morphology does not reflect the true extent of the learner's knowledge of L2 syntax and morphology, and variable suppliance is explainable by other, non-syntactic based, differences between the L1 and the L2 (Prévost and White, 2000; Lardiere, 1998a,b, 2007; Lardiere, 2008; Goad et al., 2003; Goad and White, 2004, 2006). A brief look at some of the leading theories embodied within each of the representational deficit and full functional representation approaches are outlined next, followed by a more in-depth description of the PTH.

2.2.1 Representational Deficit accounts

I **The Interpretability Hypothesis**

Looking more closely at some of the arguments in favour of a representational deficit account, recently revised versions of the Interpretability Hypothesis (IH) (Hawkins and Hattori, 2006; Tsimpli and Dimitrakopoulou, 2007) claim that it is not possible for L2 uninterpretable features to be acquired by adult language learners if they are not already in the L1. Interpretable features are those such as [definiteness] and the *phi* features on nouns (person, number and gender) which carry meaning, whereas uninterpretable features are those which trigger syntactic movement and morphological agreement, such as *phi* features on case, adjectives and verbs. For example, [± PAST] is an uninterpretable syntactic feature for past (also written [*u*PAST]), which triggers certain syntactic conditions such as the requirement of an obligatory and nominative subject, and the positioning of the verb in the VP. It is the trigger to mark the verb with the appropriate morpheme *-ed*, signifying past tense, but which is erased following checking and matching. In this account, allowing for L1 transfer to the interlanguage but without access to UG, only the uninterpretable features which are already present in the L1 will be available in syntactic operations in the L2 (via the interlanguage). It is clear to see that if Hawkins and Hattori (2006) and Tsimpli and Dimitrakopoulou (2007) are on the right lines, and if adult L2 learners are unable to acquire uninterpretable features which are not already available and parameterised in the L1, then suppliance of functional morphology will be unavoidably affected, even at high levels of proficiency.

Hawkins and Hattori (2006) argue that when an uninterpretable feature is not available (because it has not been selected in the L1, and access to the UG feature inventory is no longer viable in post-critical period adulthood), then the required L2 representation can be constructed from what is available, presumably from that which has already been selected in the L1, allowing some non target-like convergence with the required structure. This is illustrated in the context of the uninterpretable feature which stimulates wh-movement in English interrogatives by very advanced L1 Japanese speakers. As Japanese does not have a strong wh-feature to instigate movement (Japanese is a wh-in-situ language), it was found that learners interpret L2 wh-movement within the L1 wh-in-situ representation, proposing that L2 adult learners do not have access to features which are not already selected by the L1.

These findings are particularly relevant with respect to the results from an earlier study (Hawkins and Liszka, 2003). In this study, it was found that L1 Mandarin speakers produced verbs marked for past tense less consistently than L1 German or L1 Japanese speakers. As English tense (T) is accompanied with the uninterpretable feature [±PAST], it was argued that the lower suppliance rates for L1 Mandarin speakers was due to the absence of the uninterpretable feature [±PAST] in the L1. Hawkins and Liszka (2003) argue that not only are irregular verbs associated with a past form (explaining the higher suppliance rate on irregular verbs), but as learners supply word-final consonant clusters on past participle forms (100%), which encodes perfectivity and not tense, the source of omission and variability in the suppliance of past tense morphology is not phonological but morphosyntactic. However, there is some criticism of this analysis as put forward by Goad and White (2006, p.244-245), who argue that if the problem is truly related to the absence of the formal features for uninterpretable T, then, they argue, both irregular verbs and regular verbs should be equally affected. It was reported that tense was supplied 84% of the time on irregular past tense verbs compared to 63% of the time on regular past tense verbs.

2.2.2 Full Functional Representation accounts

If it is assumed that syntactic functional categories and features are available to the L2 learner, regardless of whether the required categories and features are already present in the L1 (either by L1 transfer or access to UG), there is no need to doubt that L2 learners can achieve a target-like syntactic representation. Under this account, something else must be responsible for the well-attested variable suppliance of L2 functional morphology by adult L2 learners. Unlike the rather gloomy outlook put forward by the Interpretability Hypothesis (IH), whereby the lack of featural representation in the L1 equates permanent, lifelong problems with the suppliance of certain types of functional morphology, the Full Functional Representation accounts (FFR) offer the potential for target-like productions of L2 functional morphology. There are, however, a number of possible L1-centred explanations regarding the cause of variable suppliance assuming syntactic competence is not impaired or deficit. Amongst other L1-based theories, omission could be caused by difficulties with mapping the (available) L2 syntactic representation onto the surface morphology of the L2 as in the Missing Surface Inflectional Hypothesis (MSIH) (Prévost and White, 2000), or with problems regarding how features are assembled in the L1 and L2 as proposed in the Feature Reassembly Hypothesis (FRH) (Lardiere 1998a,b, 2007, 2008) or equally, the result of L1 phonological transfer as presented in the Prosodic Transfer Hypothesis (Goad et al., 2003; Goad and White, 2004, 2006). A brief description of the main arguments for each of these proposals is set out as follows.

I **The Missing Surface Inflectional Hypothesis**

According to the MSIH, there is no representational defect with regards to syntax, but a problem in the mapping of representations (which are not defective) on to the L2 morphology at the surface (i.e. phonological) level. The MSIH in part draws upon both child and adult L1 and L2 acquisition patterns. The non-suppliance of target finite verbs and the suppliance of bare verbs being relatable to problems with the computation of the realisation of the target inflection; an issue with performance rather than insufficiency of representation. The omission of inflection on this account is better explained as difficulties, therefore, in mapping between abstract features and surface morphology in the L2 (e.g. Haznedar and Schwartz, 1997; Prévost and White, 2000).

II **The Feature Reassembly Hypothesis**

Again assuming that suppliance of functional morphology in spoken production under-represents underlying knowledge of syntactic categories and features, the Feature Reassembly Hypothesis (FRH) (Lardiere 1998a,b, 2007, 2008) explains variable production of functional morphology in terms of acquisition of L2 formal features. As features encode semantic, phonological and syntactic information, it is highly likely that the L1 feature bundles will differ from those of the L2. The acquisition process therefore requires assembly or reassembly of features, and in many situations, may require multiple mapping between the different uses of a feature and its associated lexical item. The difficulties learners experience in the production of L2 inflectional morphology is relative to how successful learners can be in the reassembly of features in different configurations, in comparison to how they have been initially assembled on lexical items in the L1. The reassembly of features in the interlanguage is directly influenced by L1 transfer with access to UG in the developing the interlanguage grammar.[2]

III **The Prosodic Transfer Hypothesis**

Of particular relevance to the current study is the PTH. The PTH also reports on the phenomenon of missing inflection in production which contrasts with syntactic knowledge of required morphosyntactic features. Whilst the MSIH claims that omission of inflection is not representational but computational, the PTH contends that missing inflection is, in fact due to issues with representation, but representation with respect to prosody and the prosodic representation of inflectional morphology. Variable suppliance or omission of functional morphology is not considered to represent linguistic knowledge, and difficulties in the suppliance of functional morphology

[2]Based on Full Transfer Full Access (FTFA) (Schwartz and Sprouse, 1996).

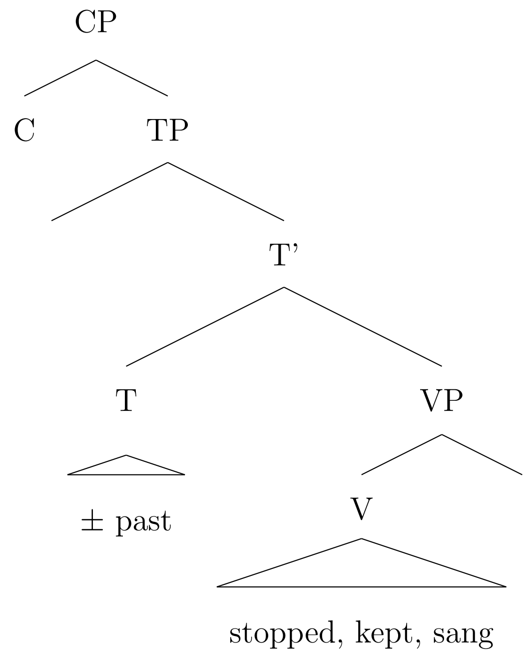
can be attributed to L1 transfer of prosodic representation. If the required prosodic representation for L2 inflectional morphology is disallowed in the L1, then it is the difficulties learners have in the building and licensing of such representations from existing structures in the L1 which can, at least partly, explain the omission and variable suppliance of functional morphology in L2 productions (Goad et al., 2003; Goad and White, 2004, 2006).

The rest of this chapter focuses on the theoretical background to the PTH, particularly the arguments for prosodic representation of inflectional morphology in English, and with examples of prosodic representation from Mandarin and Turkish, as explicated by Goad et al. (2003) and Goad and White (2004, 2006).

2.3 The Prosodic Transfer Hypothesis

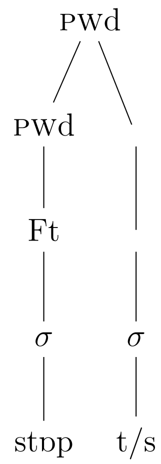
Central to the PTH is the proposal that required L2 prosodic representations which are not available in the L1, can create difficulties for the second language learner in the spoken production of L2 functional syntactic categories of tense, agreement, number and determiners. Taking the example of simple past tense in English, White (2009, p.63) illustrates that from a morphosyntactic perspective, the tense head (T) only selects according to whether the condition is [± PAST], regardless as to whether the verb is regular or irregular, past or present, as illustrated in (4). In other words, there is no syntactic difference between the selection of a verb with respect to its tense or regularity of the stem verb.

(4)



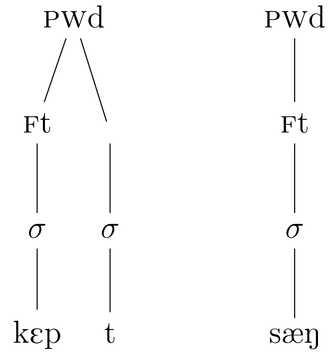
At the same time, however, the prosodic representation of regular and irregular verbs is pointedly different; regular simple past verbs (also third person singular agreement and plural noun agreement) are structurally represented in a PWd adjoined representation, as shown in (5) for *stopped* and *stops*.

(5)



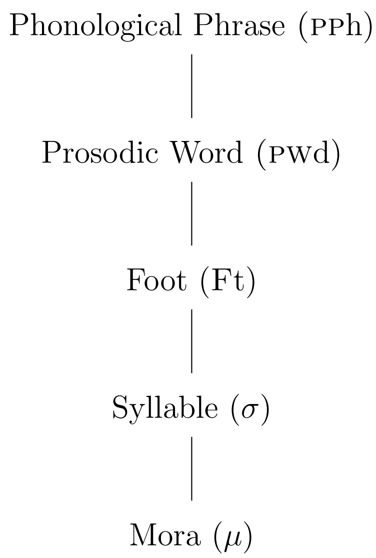
Whereas irregular verbs, both pseudo-inflected such as *kept*, suppleted or ablaut forms such as *sang* are represented in a PWd internal representation, as are monomorphemic monosyllabic words as shown in (6).

(6)



Whether English inflectional morphology is prosodically represented either in a PWd adjoined or PWd internal structure, or whether functional morphology such as determiners are prosodified in a free clitic structure (Goad and White, 2004), is determined according to the prosodic hierarchy and constraints on relations between constituents. Drawing upon Prosodic Phonology (Nespor and Vogel, 2007; Selkirk, 1997), the hierarchy of constituents is in its most unmarked form when it is strictly layered, with each constituent falling below the level of the one above. The lower levels of the prosodic hierarchy are illustrated in (7), adapted from Nespor and Vogel (2007) and Selkirk (1997).

(7)



The prosodic hierarchy was initially considered to be under the control of the Strict Layer Hypothesis (SLH), marking a stringent ordering between layers, whereby a constituent in an upper category must dominate a lower constituent in the layer below. However, a softening of the SLH allowed that violations can occur according to four violable constraints

(Selkirk, 1997), two of which are relevant in determining the prosodic representation of functional morphology according to the PTH, reproduced from Goad et al. (2003, p.247). These constraints are shown in (8).

(8) a. EXHAUSTIVITY (EXHAUST): No C^i immediately dominates a constituent C^j, $j < i-1$ (e.g., no PWd immediately dominates a σ);[3]

b. NONRECURSIVITY (NONREC): No C^i dominates C^j, $j = i$ (e.g., no PWd dominates a PWd).

Put simply, EXHAUST operates in the domain of relations with respect to the layers in the hierarchy; no dominating constituent should skip a layer. In practice, for example, a foot should not immediately dominate a mora avoiding the syllable level. Similarly, NONREC defines the type of constituent which may be dominated by another, specifically rejecting domination of a constituent by a constituent of the same type (e.g. a PWd should not dominate a PWd). A cursory look at both prosodic representations required for English inflectional morphology; PWd adjoined in (5) and PWd internal in (6), clearly illustrates that these constraints are violated. The PWd adjoined representation violates both EXHAUST and NONREC, whereas the PWd internal representation violates EXHAUST.

2.3.1 The prosodic representation of English tense and agreement

The explanation for the prosodic representation of affixation in English is motivated by a number of constraints, some of which are violated in order to preserve higher ranking constraints, such as CONSTITUENTBINARITY (BINARITY), which stipulates that constituents are maximally binary ensuring that there are never three or more positions in the rhyme. This is shown in (9), reproduced from Goad et al. (2003, p.248) with reference to Kaye et al. (1990, p.199).

[3] Where C^n = some prosodic category (Selkirk, 1997, p.192).

(9) CONSTITUENTBINARITY (BINARITY): All syllabic constituents are maximally binary.

Goad et al. (2003, p.248) argue that within the PWd, internal rhymes are rarely more than a two-position rhyme, as shown in (10a) and (10b), although ternary rhymes are permissible in word-final position as shown in (10c). The examples given in (10) and (11) are reproduced from Goad et al. (2003, p.248).

(10) a. fr**an**.tic

b. *fr**ank**.tion

c. fr**ank**

Goad et al. (2003) argue that if the structure in (10c) could be represented as a ternary rhyme, then there would be no reason to disallow ternary rhymes in a PWd internal position. Instead, it is proposed that the final consonant of words of this shape is syllabified as the onset of an empty-headed syllable (OEHS). The syllabification of (10c) is shown in (11). In this analysis of Government Phonology (e.g. Kaye et al., 1990), inflection is not assigned to a coda, and word-final consonants (including inflectional consonantal morphemes) must be represented in the onset, which must be followed by a nucleus.

(11) fran.k∅ (*frank*)

In order to explain this further, it is necessary to turn to the situation for irregular verbs. It is argued that (pseudo-inflected) irregular verbs in the past tense also adhere to BINARITY, but in this case, unlike the regular verbs, it is achieved by a process of vowel shortening, as shown in (12) with the irregular verb *keep* (12a) and *kept* (12b).

(12) a. kiːp [kiːp]PWd '*keep*'

b. kɛp.t∅ [kɛp.t]PWd '*kept*'

c. *kiːp.t∅ [kiːp.t]PWd

d. *kɛpt [kept]PWd

The structure in (12c) is not permissible as it contains a PWd internal ternary rhyme (branching nuclei and coda), and the example in (12d) a ternary rhyme. The legitimate form is the example shown in (12b), which involves a shortened vowel and an OEHS as in [kɛp.t∅] (Goad et al., 2003; Goad and White, 2008). The vowel shortening which occurs in closed syllables is instigated in Government Phonology (e.g. Kaye et al., 1990; Charette, 1991) with respect to the coda licensing principle. That is, a branching rhyme is possible when there is a following consonant in the onset position, in both word-final and word-internal positions, but an onset must be followed by a nucleus, which may or may not have phonetic content. In this respect, an empty nucleus is silent, whereas a nucleus with content is voiced. However, whether a language allows word-final empty nuclei is subject to parametrisation. Some languages, (e.g. Italian) do not license word-final empty nuclei, and the nucleus must be filled and phonetic content realised. Other languages which license empty nuclei (e.g. English, Bengali) may allow both word types; word-final consonant with a silent nucleus or vowel-final words with a voiced nucleus. Of those languages which allow word-final consonants, a further category is made according to whether they permit just a single consonant word-finally (e.g. Korean, Bengali) or a consonant cluster (e.g. English, French). With respect to the current study, first, both Bengali and English allow word-final empty nuclei, which is of significance in relation to the prosodic representation of inflectional morphology in which English, but not Bengali, prosodifies inflectional morphology, in both PWd internal and PWd adjoined representations as the OEHS. Secondly, whereas English allows word-final consonant clusters, Bengali does not. However, as will also be seen, word-final consonants are not treated in the same way by English and Bengali in terms of moraic structure.

It might be questioned, with respect to prosodic representation, why regular simple past tense verbs of a certain shape could not be prosodified within the PWd. It is possible, for example, that a regular verb stem with a long vowel or diphthong (which is never shortened) and a consonantal affix (e.g. regular past tense -ed, as in *arriv-ed*) could erroneously be prosodified (by an L2 learner) within the PWd, as shown in *[ə.raɪ.v∅.d∅]$_{\text{PWd}}$ (Goad and White, 2006, 2008). Another universal constraint, however, prevents adjacent empty nuclei within the PWd as set out in (13), prohibiting such prosodic representation. This forces the inflectional morpheme to be adjoined to the PWd, [[ə.raɪ.v∅]$_{\text{PWd}}$d∅]$_{\text{PWd}}$ (Goad et al., 2003, p.249), in violation of the constraints EXHAUST and NONREC. In other words, the violation of the constraints EXHAUST and NONREC is in the interests of preserving BINARITY.

(13) Adjacent empty nuclei are prohibited within the lower PWd/stem
Goad et al. (2003, p.249) with reference to Kaye et al. (1990, p.200).

Finally, it is necessary to clarify that within the analysis put forward by Goad et al. (2003), it is not possible for the inflectional morpheme in regular verbs to be attached directly to the phonological phrase (PPh), as in *[[ə.raɪ.v∅]$_{\text{PWd}}$d∅]$_{\text{PPh}}$. This is explained with reference to the difference in environment between an inflected stem and a stem with a 'free clitic' (Selkirk, 1997), examples cited by Goad et al. (2003, p.249) provided by Hayes (1989, p.207), as illustrated in (14).

(14) a. visit -ed *visited*
b. visit it *visit it*

In (14a), Hayes (1989) states that the stem-final [t] can be lightly aspirated, whereas in (14b), it cannot. This difference could not be captured if the prosodic representation was the same, indicating that the inflectional morphemes *-ed*, *-s*, but not the clitic *it* is adjoined to the PWd.

2.3.2 Interim summary

To summarise, with respect to English prosodic representation of regular and irregular verbs, both EXHAUST and NONREC constraints are concurrently violated in order to produce inflectional morphemes which are adjoined to the PWd; EXHAUST is violated as a PWd immediately dominates a syllable (σ) avoiding the layer of the foot (Ft), and NONREC is violated as a PWd immediately dominates another PWd (5). English irregular past tense is, however, according to Goad et al. (2003), prosodified PWd internally in both pseudo-inflected forms (sleep-slept) and ablaut forms (fall-fell), and EXHAUST but not NONREC is violated (6). The prosodic representation for English simple past tense and agreement, as proposed by Goad et al. (2003); Goad and White (2006, 2008), is summarised in Table 2.1, with specific reference to the test categories relevant to this study.

PWd representation	Inflectional morphology	Example
PWd internal	simple past (irregular verbs)	slept
PWd adjoined	3rd person singular agreement	(s/he) stops'
PWd adjoined	simple past (regular verbs)	stopped
PWd adjoined	plural noun agreement	dogs

Table 2.1: Required prosodic representation: English inflectional morphology.

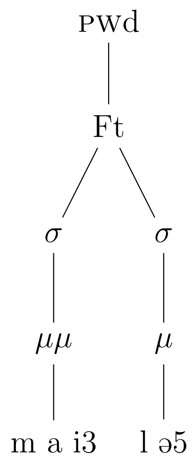
Production of English irregular simple past requires a violation of EXHAUST as a PWd directly dominates a syllable, but it does not violate NONREC. Production of English regular simple past and verbal and noun agreement requires a simultaneous violation of both EXHAUST and NONREC, as a PWd directly dominates a syllable and a PWd directly dominates a PWd. Both PWd adjoined and PWd internal structures prosodify inflectional material as an OEHS. In the following section, the availability of required prosodic representation for English tense and agreement is considered in relation to Mandarin and Turkish, both of which have been tested according to the PTH.

2.3.3 The prosodic representation available in Mandarin

Mandarin is a frequently tested language with respect to the variable suppliance of L2 (usually English) inflectional morphology. It does not overtly mark tense, so there is no morphological equivalent to the English past tense marker *-ed*. There are, however, verbal affixes which mark aspect, and *-le* marks the Mandarin perfective aspect; specifying events viewed as a single entirety or specific event. The perfective can also be expressed without the affix *-le*, and although *-le* does not denote past tense, it is often seen to be referring to past time as a consequence of perfective events being reported post-event (Li and Thompson, 1981).

Goad et al. (2003) analyse Mandarin perfective marker *-le* (PERF) in a PWd internal prosodic representation, and it is proposed that affixation is never represented in a PWd adjoined configuration, and as such is not available in Mandarin (Goad and White, 2006, p.248). This has implications regarding availability of L1 Mandarin prosodic representation to transfer to the interlanguage, and the requirements of L2 English. The PWd internal representation for the Mandarin perfective marker *-le* in the form *mai -le* 'bought already' is shown in (15), adapted from Goad et al. (2003, p.248). Tone is marked from 1-4, and 5 is neutral.

(15)



In this example, evidence that the affix is incorporated into the PWd, as in the example *mai -le* 'bought already' is according to the foot structure and the placement of the neutral tone. Goad et al. (2003, p.250) state that foot-initial syllables are bimoraic, stressed and tone-bearing (e.g. *mai*3) and following syllables that are PWd internal are monomoraic, unstressed and neutral (e.g. *-lə*5). In relation to English PWd internal representation, the Mandarin form does not violate the SLH. This is because unlike English, the inflection is incorporated into both the PWd and the foot (Ft), so that in Mandarin, the constraint EXHAUST is not violated.

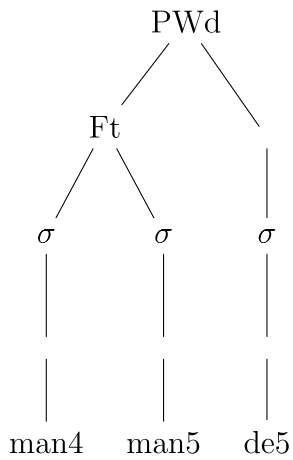
However, in relation to a potential PWd adjoined representation, as required for English regular past tense verbs (Reg. PT), third person singular agreement (3SG) and plural noun (Pl Noun), Goad et al. (2003) propose that L1 Mandarin speakers can build this representation from existing L1 structures. Mandarin allows the violation of both NONREC and EXHAUST, but not simultaneously (Goad et al., 2003). Although it was originally proposed that prosodic representations which were not available in the L1 were not available for transfer to the interlanguage Goad et al. (2003), a revised version of PTH allows that under certain circumstances, it is possible to build representations unavailable in the L1 (Goad and White, 2006). The conditions under which L2 target representations are proposed to be built are reproduced in (16).

(16) a. when they can be built through combining L1 licensing relations

b. when they involve L1 structures being licensed in new positions
Adapted from Goad and White (2004, p.127) and Goad and White (2006, p.247).

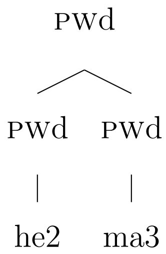
For L1 Mandarin speakers, Goad et al. (2003, p.252) propose that under very unusual circumstances, a violation of EXHAUST is possible, whereby a PWd directly dominates a syllable. This is illustrated in (17), with an example taken from Goad et al. (2003, p.252) and Li and Thompson (1981, p.32). This shows a process of reduplication of an adjective to form a manner adverb *man*4-*man*5-*de*5 'slowly'. Here, the right-hand syllable of a three syllable PWd is prosodified outside the foot.

(17)



Furthermore, as is common cross-linguistically, a lexical compound involves a violation of NONREC, as a PWd directly dominates a PWd. This is illustrated in (18), *he*2-*ma*3 'river horse = hippopotamus'. This example is reproduced from Goad et al. (2003, p.252) and Li and Thompson (1981, p.49).

(18)



For L2 inflectional morphology which requires a PWd adjoined representation, Goad and White (2006) argue that with more advanced proficiency, speakers can potentially build the PWd adjoined representation by minimally adapting existing L1 structures. This means combining the structures shown in (17) and (18), and then assigning the built representation to a new syntactic construction in the interlanguage (e.g. English Reg. PT, 3SG or Pl Noun). The implication of this analysis is that the task for L1 Mandarin speakers in acquiring the required prosodic representation for English inflectional morphology is potentially more complex than it might be for speakers of other languages.

2.3.4 Interim summary

The following points summarise the main task for L1 Mandarin learners of L2 English with respect to the production of English inflectional morphology in light of the PTH.

1. Although Goad and White (2004, p.127) and Goad and White (2006, p.247) refer to 'minimal adaptation', according to this account in order for L1 Mandarin speakers to facilitate a PWd adjoined representation, it involves two processes; both building and licensing, as set out in (16). In this respect, L1 Mandarin speakers must transfer a newly built representation from the L1, which must also be assigned to a new syntactic structure in the interlanguage. With reference to the stipulations set out in (16), if transfer is straightforward between the L1 and L2 prosodic representation and function, then this is a simple situation of 'transfer' (otherwise referred to as 'T'). Licensing an L1 structure to a new position in the interlanguage is slightly more involved with respect to stipulation (b), so this can be considered 'transfer and (b)' or 'T(b)', and the building of a prosodic representation from existing structures is more complex yet again with regards to stipulation (a), 'transfer and (a)' or 'T(a)'. For L1 Mandarin speakers, the process of making a PWd adjoined representation available in the interlanguage (to a newly formed syntactic category) is the most complex, 'transfer and (a) and (b)' or 'T(a,b)'. The PWd internal representation under this analysis, however, is 'T' or' T(b)' because it is available to transfer but should be licensed to a new position in the interlanguage, depending on the interpretation of conditions in (16). This is relevant to the current study in considering the complexity of transfer conditions and the weak and strong versions of the PTH.

2. The distinction between a weak and strong version of the PTH has seemingly evolved as different studies offered data from the input of languages other than Mandarin. It was initially proposed that the PTH took a representational deficit stance in relation to phonology; if a required L2 prosodic representation was disallowed in the L1, then it would create an insurmountable problem leading to omis-

sion and variable production. The possibility of minimal adaptation of existing L1 structures under specific circumstances was introduced in Goad and White (2004, 2006). This was further modified in Goad and White (2009), where it was proposed that adaptation may occur in circumstances other than those specified in Goad and White (2004, 2006). Snape and Kupisch (2010, p.536) refer to the strong (Goad and White, 2004, 2006) and weak (Goad and White, 2009) versions of the PTH respectively with respect to L1 Turkish speakers and the acquisition of L2 English determiners.

3. It is also possible that certain regular verb stems (either short VX or shortened VXC) are smuggled into a PWd internal representation, avoiding any of the transfer conditions set out above. However, Goad and White (2006) test for this and conclude that evidence from fortis release indicates that both long and short stemmed regular verbs are treated differently from irregular verbs, claiming that the PWd adjoined representation has been acquired.

4. If the 'strong' version of the PTH is on the right lines, then this analysis can account for the variability found within proficiency levels within L1 groups; Goad and White (2006, p.251) clearly state that this is dependent upon speakers being able to build and (re)license a new representation. It is possible that some learners, but not others, can build new prosodic structures from existing L1 structure, but why this would be discriminatory across individuals within an L1 group is unclear.

5. Unlike the PWd internal representation in English, the Mandarin PWd internal representation does not violate EXHAUST and it does not force inflection into an OEHS.

6. In order to build a PWd adjoined representation in Mandarin, the representation for a lexical compound (which violates NONREC) must be combined with an infrequent structure used for creating an adverb from an adjective, which violates EXHAUST. Once these structures are combined, they must then be licensed to a new syntactic structure in the interlanguage grammar.

PWd representation	L1 morphology	Example
PWd internal	aspect (e.g. perfective)	*mai-lə* 'bought already'
PWd adjoined	-	-
PWd adjoined built from existing structures in the L1	reduplicated adjective lexical compound	*man-man-de* 'slowly' *he-ma* 'hippopotamus'

Table 2.2: Availability of prosodic representations for L1 speakers of Mandarin.

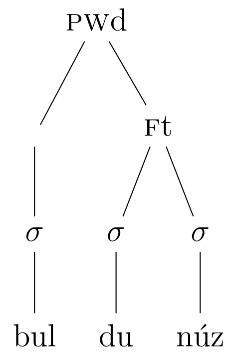
7. A summary of available L1 structure for the production of L2 tense and agreement inflectional morphology for L1 Mandarin speakers is set out in Table 2.2.

2.3.5 The prosodic representation available in Turkish

The production of articles by L1 Turkish speakers has been particularly well-studied and analysed in the light of the PTH, as Turkish does not specify the definite article, and English articles are prosodified directly adjoined to the PPh, unlike the Turkish indefinite article. In an early analysis of 'SD', an L1 Turkish speaker, White (2003) and Goad and White (2004) state that SD's production of right-edge morphology (e.g. Reg. PT, 3SG and Pl Noun) was significantly higher than that on articles. Of interest to the current study is how tense and agreement are prosodified in Turkish in comparison to English, and with respect to any minimal adaptations which may be required to L1 Turkish structures compared to those to be addressed by L1 Mandarin speakers.

Goad and White (2004, p.124) propose that Turkish tense, agreement and number is organised in a PWd internal prosodic representation, as illustrated in (19) for *bul -du -núz* 'you found'. The evidence for this is from vowel harmony and stress placement within the phonological word, as shown in (20). The examples are reproduced from Goad and White (2004, p.124-125).

(19)



(20) a. /bul -di -niz/ → [bul -du -núz]$_{\text{PWd}}$
find -PST -2PL
'you found'

b. /been -di -niz/ → [been -di -níz]$_{\text{PWd}}$
like -PST -2PL
'you liked'

c. [bul -dú]$_{\text{PWd}}$
find -PST
'he/she found'

Turkish has eight vowels which can be divided into two height classes as illustrated in Table 2.3, reproduced from Ewen and van der Hulst (2001, p.46). Whilst these vowels can freely appear in monosyllabic stems, restrictions apply when they are present in polysyllabic words, as set out in (21).

	[-back]		[+back]	
	[-round]	[+round]	[-round]	[+round]
(i) [+high]	i	y	ɨ	u
(ii) [-high]	e	ø	ɑ	o

Table 2.3: Classification of Turkish vowels according to height distinction.

(21) a. All vowels must have the same value for the feature [back].

b. A high vowel must have the same value for [round] as the directly preceding vowel (if any).

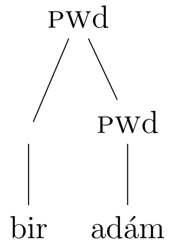
   Ewen and van der Hulst (2001, p.47)

In (20a), the stem vowel and both the tense and person morpheme vowels agree with respect to the feature [back], as they are [+back], and in (20b), the vowels are all [-back], as in the stipulation set out in (21a). In (20b), working from right to left, the high vowels /i/ agree with the preceding vowel with respect to roundness [-round] (/i/ to /i/; /i/ to /e/). Similarly in (20a), the high vowel /u/ also agrees in roundness [+round]. In this respect, vowel harmony is posited to work within the domain of the phonological word, and is taken as evidence that the affixation of tense and person in Turkish is PWd internal.

Further evidence is also taken from stress placement in Turkish (e.g. Ewen and van der Hulst, 2001; Goad and White, 2004). Turkish stress is placed on the last syllable of the prosodic word, with stress moving rightwards with the agglutination of each additional suffix (Özçelik, 2016, p.22). This is illustrated in (20c) and again, as Turkish stress is placed on the rightmost syllable once affixation is complete, as marked in (20a) and (20b), suggesting that the inflectional morphology is represented internal to the PWd and not adjoined to the PWd. Both stress placement and vowel harmony, therefore, indicate that Turkish tense, agreement and number are represented PWd internally.

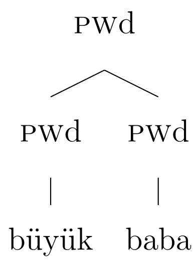
It is also proposed that a PWd adjoined representation is absent in Turkish, and therefore not available in the L1 to transfer to the interlanguage for the production of PWd adjoined L2 inflectional morphology. According to Goad and White (2004, p.126), there are two possible ways in which an L1 Turkish speaker may build a PWd adjoined representation (required for English simple past tense and agreement). One involves the inversion of an existing structure; PWd adjoined prefix (the representation for Turkish indefinite article) to a PWd adjoined suffix (ready for English simple past tense). This is illustrated in (22) from the example given in Goad and White (2004, p.127) *bir adám* 'a man', where vowel harmony is blocked outside the PWd. Here, an existing L1 structure is 'licensed to a new location in the interlanguage grammar' (Goad and White, 2004, p.127). According to Goad and White (2004), the required L2 structure is proposed to be available if the licensing relation can then be switched from the left-edge to the right-edge of the PWd.

(22)

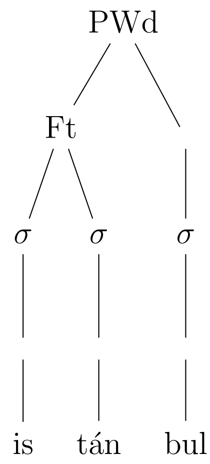


Alternatively, according to Goad and White (2004), it is possible for L1 Turkish speakers to follow a two-stage build (similar to the apparent build task for the L1 Mandarin speakers). In this scenario a Turkish compound noun structure violates NONREC, as a PWd dominates a PWd. For example *büyük* and *baba* to form 'grandfather' as in (23) from Goad and White (2004, p.127). This must then combine with a 'Sezer stem'. The 'Sezer stems' make up a subset of names, usually place and personal names, incorporated into the Turkish vocabulary from borrowings. In this vocabulary group, the final syllable is prosodified outside the foot (Ft) in order to avoid attracting the usual placement of stress, which, as Turkish is right-headed, is usually placed on the right-most syllable in the foot. This is illustrated in (24) with the place name *istánbul* 'Istanbul'. Finally this structure must then be licensed to a new syntactic structure in the interlanguage.

(23)



(24)



2.3.6 Interim summary

To summarise, Goad and White (2004) propose that a PWd adjoined representation can either be built by combining two existing structures 'T(a,b)', or by reversing a prefix structure to create the same representation on the right-edge of the PWd 'T(b)'. Either route provides the learner with a representation which violates the EXHAUST and NONREC constraints.

A summary of the available L1 structure for the production of L2 English tense and agreement inflectional morphology by L1 Turkish speakers is set out in Table 2.4. If the situation for L1 Turkish speakers is considered against the task ahead of L1 Mandarin speakers (Table 2.2), it can be seen that the Turkish PWd internal representation is used with tense, agreement and number marking compared to Mandarin PWd internal which only marks the perfect aspect. Similarly, the construction of Mandarin PWd adjoined representation involves the use of a less frequent structure (reduplicated adjective) compared to the options available for speakers of L1 Turkish.

PWd representation	L1 morphology	Example
PWd internal	tense, agreement, number	*bul -du -núz* 'you found'
PWd adjoined	-	-
PWd adjoined built from existing structures in the L1	indefinite article reverse the prefix to suffix position	*bir -adám* 'a man'
or	lexical compound + combine with Sezer stem	*büyük -baba* 'grandfather' *istánbul* 'Istanbul'

Table 2.4: Availability of prosodic representations for L1 speakers of Turkish.

2.4 Chapter summary

This chapter began with a brief overview of some of the current perspectives on the acquisition of inflectional morphology by adult L2 learners. This also included comparison to L1 child acquisition, and particular attention was paid to the similarities and differences between child L1 and adult L2 phonological acquisition and syllable-final consonant reduction. This is of relevance to the current study because as English tense and agreement is marked with a consonant, then it is a valid consideration that omission of inflection could simply be due to cluster reduction. The matter of consonant cluster reduction is considered within the experimental study presented here, and is returned to in the following chapters. Focus was then shifted to discussion of the prosodic representation of inflectional morphology according to the PTH. This was first considered with respect to the PWd internal and PWd adjoined representations of English inflectional morphology as detailed by Goad et al. (2003) and Goad and White (2004, 2006). As Mandarin and Turkish are languages which are often tested and analysed in relation to the PTH, the prosodic representation of inflectional morphology in both Mandarin and Turkish is considered with relation to the production of L2 English tense and agreement morphology. The conditions of minimal adaptation (Goad and White, 2004, 2006) are considered with respect to degrees of complexity of L1 transfer of prosodic structure, with straight transfer 'T' being less difficult than transfer when structures are licensed to a new place 'T'(b), or the most complex type of transfer when a new structure must be built from existing structures 'T(a)' and licensed to a new position 'T(a,b)'.

In the following chapter, the proposed structure for Bengali prosodic representation of inflectional morphology is discussed. However, unlike Mandarin and Turkish, stress placement does not provide such insight into the prosodic representation of affixation in Bengali. According to Khan (2008) virtually all studies of Bengali prosody report that Bengali is a stress-accent language (e.g. Ferguson and Chowdhury, 1960; Ray et al., 1966; Hayes and Lahiri, 1991; Klaiman, 1990); stress is placed on the word-initial syllable, and this is said to be 'inviolable' (Hayes and Lahiri, 1991, p.55). There is some disagreement. Maniruzzaman (2010, p.6), for example, argues that Bengali is a syllable-timed language, and Vijayakrishnan (2007) proposes stress placement on either first or second syllable. For an alternative view regarding stress placement in Bengali, Shaw (1984) and Vijayakrishnan (2007) propose that main stress may be placed on the first syllable unless the second syllable is closed and the first is not, in which case stress falls on the second syllable. The analysis here, however, takes the position of the majority and assumes that stress is placed on the word-initial syllable. The evaluation in the following chapter of prosodic representation of inflectional morphology in Bengali, therefore, looks away from stress placement and towards accounts of the diglossic nature of Bengali, particularly with reference to vowel height assimilation, minimal word requirements and the moraic structure of Bengali in relation to the marking of prosodic boundaries.

Chapter 3

Bengali inflectional morphology and prosodic representation

3.1 Introduction

Although still a relatively under-researched language, Bengali has been of the subject of a number of phonological studies, most notably the seminal studies on the phonemes of Bengali by Ferguson and Chowdhury (1960), Ray et al. (1966) and Kostić and Das (1972). More recently, attention has turned to dialectal analyses of phoneme inventories, including Khan (2010) on the Bengali phonemes as spoken in Bangladesh and Gope and Mahanta (2015) and Gope (2016) on the phonemes and phonology of the Sylheti dialect. Much interest has also been directed towards the intonational phonology of Bengali; Hayes and Lahiri (1991) report on Kolkota Bengali and Khan (2008) on Dhaka Bengali. Other studies have focused on Bengali with respect to the morphology and syntax of aspect (Rácová, 2010) and past actions and states (Rácová, 2009), although there is no specification regarding the dialect of Bengali under examination[1]. Sylheti-English bilingualism has been the subject of an ethnographic study in Leeds (Hamid, 2011) and voice onset

[1]Reference to the broad dialectal varieties of Bengali as spoken in Kolkata and Dhaka is in evidence in some of the more recent studies, including (Khan, 2008, 2010; Boyle David, 2015).

time acquisition in child sequential bilinguals (McCarthy et al., 2014). Rasinger (2007) provides a morphosyntactic, sociolinguistic and ethnographic analysis of Sylheti-English and Bengali speakers in East London. Another productive branch of linguistic research concerns corpus studies and technology; Bhattasali (2016) models Bengali word stress in a computational approach with respect to training an Automatic Speech Recognition (ASR) model, and Saha and Mandal (2013) conduct a contrastive analysis of the Bengali phonemic inventory with a view to developing a Computer Assisted Spoken Language Learning (CASSL) model. The current study undertakes a morphophonological analysis of L1 Bengali production of L2 English inflectional morphology within the Generative framework and with respect to the Prosodic Transfer Hypothesis Goad et al. (2003); Goad and White (2004, 2006).

One of the main aims of this study, then, is to test Bengali in the context of the PTH, and another is to provide a comprehensive account of the prosody of Bengali inflectional morphology in contrast to English inflectional morphology. With respect to the prosodic analysis of English and Bengali, the current chapter provides an overview of the linguistic background to Bengali in relation to the prosodic representation of Bengali inflectional morphology. It is proposed that both a PWd internal and PWd adjoined prosodic representation, the required representations for the production of the L2 English inflectional morphology tested in this study, are available to transfer to the interlanguage from Bengali. This chapter begins with some clarification over terminology and the relevance of dialects to this study. As speakers of Bengali are often speakers of other dialects, an illustration of some dialectal differences between standardised versions of Bengali and the Sylheti dialect, considered to be on the extreme of the dialectal continuum, are also presented. Examples of dialectal differences are provided with a comparison of consonant and vowel inventories. Bengali is a diglossic language, and this is briefly discussed in relation to phonological processes, essential to the understanding of how prosodic boundaries are determined.

A summary of some of the characteristics of the Bengali language relevant to the current study, including phonotactics and minimal word requirements of Bengali is also presented along with a brief description of the verbal morphology and the phonological process of vowel height assimilation, in relation to the production of L2 English inflectional morphology. The following section then describes the proposed interpretation of Bengali PWd internal and PWd adjoined representations, and as the Sylheti verbal morphology is quite distinct from that of Bengali, an analysis of the prosodic representation for Sylheti inflectional morphology is also reported. The prosodic representation of Bengali inflectional morphology is then considered in terms of the similarities to the target L2, ease of transfer and the production of L2 English inflectional morphology, as well as the relationship between the minimal word requirements and the transfer of L1 prosodic representation of inflectional material.

3.2 Bengali: Dialects, diglossia and orthography

Bengali is part of the Eastern Indo-Aryan sub-group of the Indo-European language family, derived from Sanskrit. It is the official, national language of the People's Republic of Bangladesh, and the state language of West Bengal, Tripura and Assam in the Republic of India. It is widely spoken across north-western South Asia, including the Indian union territory of the Andaman and Nicobar Islands. It is spoken worldwide, both as an L1 and L2, with significant diaspora populations in, for example, the United Kingdom (UK), United Arab Emirates, Canada and Saudi Arabia, to name but a few. As the national language of Bangladesh (1972, Constitution, Article 3), there are a reported 106,000,000 speakers of Bengali in Bangladesh according to the 2011 census.[2] It is the official language taught and used in primary and secondary schools, as well as in official contexts and government offices.

[2]Lewis et al. (2015, p.25, 28)

3.2.1 Dialect continuum

Linguistic accounts of Bengali often refer to a dialect continuum (e.g. Boyle David, 2015; Khan, 2008). Whilst Bengali (also known widely as Bangla) is often referred to as Standard Colloquial Bengali (SCB), it would also appear that SCB is synonymous with the Bengali language as spoken in and around Kolkata, which is representative of an idealised standard spoken Bengali, familiar across West Bengal. For example, Ferguson and Chowdhury (1960, p.22) introduce their phonological study on the structure of Bengali stating that it is a study 'of the Standard Colloquial Bengali (SCB) of the educated people of Calcutta'.[3] In more recent accounts, the influence of dialect variation on the standardised form of the language has brought about further subcategorisation of Bengali (SCB). Khan (2008, p.17) refers to Kolkata Standard Bengali and Bangladeshi Standard Bengali, and Boyle David (2015, p.9) distinguishes between Kolkata Colloquial Bengali (KCB) and Dhaka Colloquial Bengali (DCB). Referring to KCB and DCB, Boyle David (2015, p.9) states; 'These two dialects, while they differ in numerous small ways, are indisputably the same language: highly mutually intelligible and recognised by Bangla speakers as the standard in both speaking and writing.' The term Bengali is used in this study to refer to the language as spoken by the participants in this study based in both the UK and Bangladesh (i.e. DCB). Reference to KCB and DCB henceforth will be in order to draw attention to a particular feature relevant to one form or the other.

As well as the dialectal differences which may be found between KCB and DCB, there are a large number of other dialects spoken throughout the Bengali-speaking regions found across eastern South Asia, and within diaspora Bengali-speaking communities worldwide outside this geographical area. Some of the dialects, including Sylheti, are at extreme ends of this continuum, so much so, that there is on-going debate regarding their status as a language or dialect.[4] Assuming dialectal rather than independent language status, there are a number of sources which provide details of the Bengali dialects and classification

[3] See Ferguson (1959, p.337) on the 'standard-with-dialects' situation, whereby the variety of a particular region or group becomes superposed on a wider community.

[4] See, for example, Chalmers (1996, p.5) on the status of Sylheti.

systems, especially that which has been documented by Grierson (1928), and which is still considered relevant in more current discussions (e.g. Khan, 2008). Grierson (1928) distinguishes between a Western and Eastern Branch of Bengali, which do not correspond to geographical or national boundaries. Khan (2008) provides a comprehensive outline of the dialects as set out by Grierson (1928). For example, the Western Branch of Bengali includes four subcategories, one of which is the subcategory of Central Bengali, which includes Kolkata in India and Kushtia in Bangladesh. The Eastern Branch of Bengali includes the subcategory of Eastern Bengali, which includes Dhaka and Sylhet in Bangladesh and Cachar in Indian Assam. As dialects diverge most on aspects of phoneme inventory, allophony and inflectional morphology (Khan, 2008) as well as vocabulary (Chalmers, 1996), the influence of regional dialect may filter through to the standard Bengali (KCB or DCB) as spoken by individuals. The Sylheti dialect is of particular interest in this study, then, as a number of the UK-based participants are both Sylheti and Bengali (DCB) speakers, and the possible influence of Sylheti on the spoken production of L2 English inflectional morphology must be accounted for in this analysis.

3.2.2 Sylheti dialect

Sylheti is a widely spoken dialect by Bengali-speakers across, for example, Bangladesh, India and in the UK. The Sylhet region in the north-east of Bangladesh is illustrated in Figure 3.1.

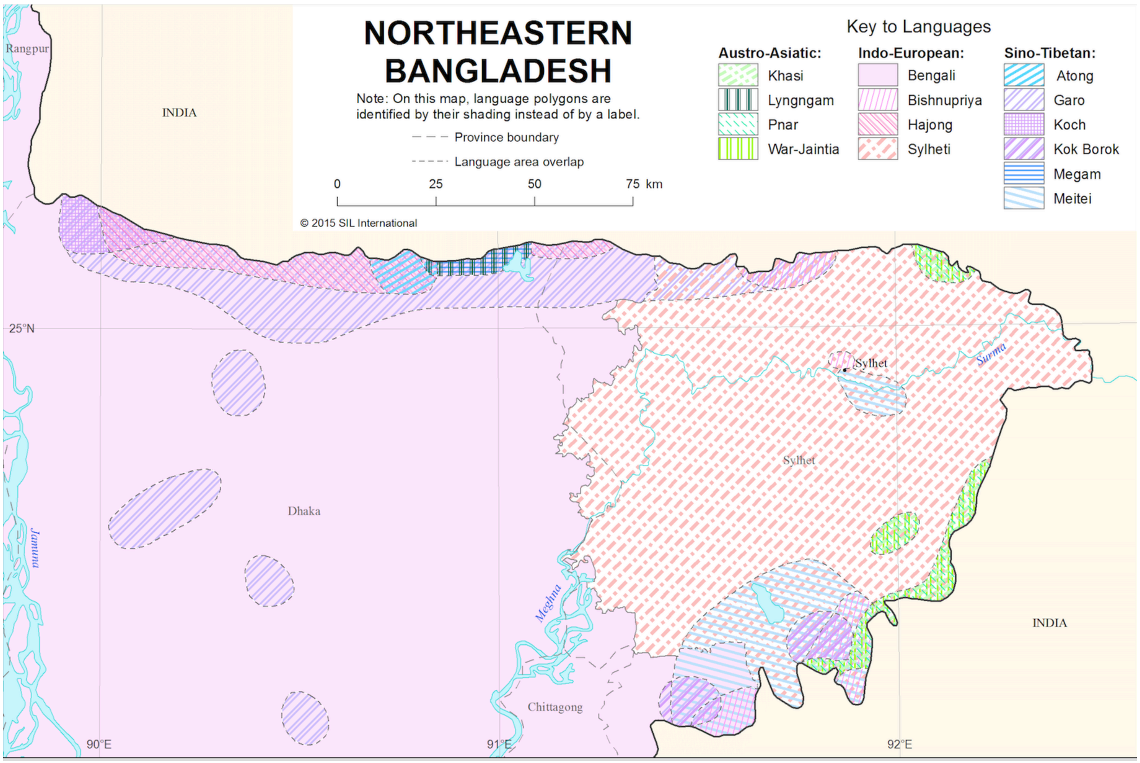


Figure 3.1: Sylhet District, Bangladesh. Ethnologue, 18th edition (Lewis et al., 2015). Copyright ©2015 by SIL International. Used by permission.

In this study, a number of the participants recruited in the UK were both Bengali and Sylheti speakers. It was reported (by way of student questionnaires) that within the family home both English and Sylheti, but rarely Bengali, was spoken. The participants in this study had all moved to England after the age of eighteen, and whilst in Bangladesh the participants reported speaking both Bengali and Sylheti, and were educated in Bengali. It was reported by a number of participants that they felt that Bengali was becoming the more popular language amongst younger people living in the Sylhet District, as it was reportedly seen (by some) to be more cosmopolitan than the local dialect. It was claimed that the established UK-born Bangladeshi community into which they settled, generally spoke both Sylheti and English, but rarely Bengali. However, within the wider community, it was reported that Bengali was spoken between the Bangladesh born L1 Bengali speakers with different dialects. With respect to Bangladesh-based Bengali speakers, it was also reported that, amongst other languages, Urdu, Hindi and English were also regularly spoken in urban areas, and this confirms earlier reports by, for example, Ray et al. (1966, p.1) and Ferguson and Chowdhury (1960, p.35).

To illustrate some of the dialectal differences between KCB, DCB and Sylheti, a partial section of the consonant and vowel phoneme inventories is briefly discussed in the following section. It should be noted that from a segmental perspective, L1 speakers of Bengali (across the dialects specified here) are well-placed in the production of the L2 English inflectional morphemes (*-ed*, *-s*).

3.2.3 Dialectal differences: A partial review of Bengali consonant and vowel inventories

3.2.3.1 Consonants

The segmental sound system of KCB is well documented, most notably by Ferguson and Chowdhury (1960), Ray et al. (1966) and Kostić and Das (1972), and more recently by, for example, Klaiman (1990), Radice (1994) and Barman (2009). That of DCB is relatively less widely reported, for example, Boyle David (2015), Khan (2010) and Thompson (2012). Sylheti is reported on by Chalmers (1996). The consonant inventory of stops and fricatives for KCB (Table 3.1) and DCB (Table 3.2) show greater similarity than differences. In line with the view that Sylheti is on the extreme of the dialect continuum, the stop and fricative inventory shows greater variation in comparison to both KCB and DCB (Table 3.3), having lost aspirated phonemes to a far greater degree than DCB, whereby the entire voiceless aspirated obstruents inventory /pʰ, t̪ʰ, tʰ, tʃʰ/, kʰ/ has disappeared. Furthermore, the bilabial voiceless /p/ and /pʰ/ and velar /k/ and /kʰ/ have also undergone spirantization, to /ɸ/ and /x/ respectively, expanding the fricative inventory (Gope, 2016).[5]

[5]Table 3.1 adapted from Ferguson and Chowdhury (1960, p.29), Table 3.2 adapted from Khan (2010, p.221) and Thompson (2012, p.11) and Boyle David (2015, p.18), and Table 3.3 adapted from Gope and Mahanta (2015).

	bilabial	dental	retroflex	palatal	velar	glottal
stop	p p^h b b^h	t̪ t̪^{h} d̪ d̪^{h}	ʈʈ^h ɖɖ^h	c c^h j ^{h}	k k^h g g^h	
fricative				ʃ		h

Table 3.1: Consonant inventory in KCB.

	bilabial	labio-dental	dental	alveolar	post-alveolar	palatal	velar	glottal
stop	p b b^h		t̪ d̪ t̪^{h} d̪^{h}		t d t^h d^h	c j c^h j^h	k g k^h g^h	
fricative		f		s		ʃ		h

Table 3.2: Consonant inventory in DCB.

	bilabial	dental	alveolar	retroflex	palatal	velar	glottal
stop	b	t̪ d̪		ʈ ɖ		g	
fricative	ɸ		s z		ʃ	x	h

Table 3.3: Consonant inventory in Sylheti.

3.2.3.2 Phonotactics

A brief digression is made here regarding any restrictions on the type of consonant allowed in syllable-final position and word-final consonant clusters in Bengali. This is primarily because the production of word-final clusters is a necessary phonological feature of English irregular pseudo-inflected verb forms, which are represented in a PWd internal representation. As mentioned in Chapter 2, Section 2.2, consonant cluster reduction is a feature of both child L1 and adult L2 acquisition, although the instances of epenthesis are seemingly more widely attested in adult L2 than child L1 productions (Weinberger, 1987). Another feature of L2 acquisition is the influence of the L1, and one of the potential confounds to be controlled for in studies testing for the suppliance of inflectional morphology, is the potential prohibition of consonant clusters in the L1. According to the analysis of inflection with respect to the PTH, this is only relevant with respect to (some) irregular simple past verbs which are prosodified within the phonological word. For inflection which is prosodified outside the PWd (e.g. Reg. PT, 3SG and Pl Noun) a cluster is not formed, even though consecutive consonants are visible in the surface string. In Bengali, consonant clusters are most common in medial position in a variety of combinations, less common word-initially and very rare word-finally (Boyle David, 2015, p.23) but there are no restrictions concerning which consonant from the phonemic inventory may appear in word-final position (Kostić and Das, 1972).

According to Dash (2015, p.257) borrowed words with consonant clusters are accommodated in the Bengali lexicon with the assistance of four phonological processes; prothesis, which interrupts word-initial clusters, as shown in (25a), epenthesis, which breaks clusters in medial or word-final position with the insertion of a vowel, as in (25b), epithesis, which adds a sound word-finally without changing the meaning, shown in (25c) or metathesis, which switches the order of the cluster to ease pronunciation (25d).

(25) a. 'school' → /iskul/

b. 'film' → /p^{h}ilim/or /filim/

c. 'aunt' → /anti/

d. 'desk' → /dekʃ/

Consonant clusters are also disallowed in Sylheti, and loan words are forced into a maximum CVC syllable. However, unlike Bengali, word-initial consonant clusters are not present in native Sylheti words, and two strategies are used to avoid word-initial consonant clusters in loan words (Goswami, 2013). If the loan word begins with a sibilant + stop cluster or sibilant + bilabial nasal (e.g. station, smack), then a vowel is inserted word-initially (26a) and (26b) via prothesis, or an epenthetic vowel is inserted (26c) and (26d).

(26) a. station → /iʃteʃɔn/

b. smack → /iʃmak/

c. class → /kelaʃ/

d. train → /teren/

As Bengali and Sylheti do not permit word-final consonant clusters, it is possible that problems in the suppliance of inflection on irregular (pseudo-inflected) verbs could be due to issues with prosodic representation or phonotactics. As a result, it is necessary to take a prohibition on consonant clusters and possible repair strategies into account in the study design and test stimuli, and this is briefly returned to in Chapter 4 Section 4.3.1.1.

3.2.3.3 Vowels

Returning to the comparison of segmental sound differences, the vowel inventory for DCB is the same as KCB without the nasal counterparts, as illustrated in Table 3.4.[6] Neither DCB nor Sylheti include nasalised vowels in the inventory, and nasality appears to vary across dialects of Bengali (Khan, 2010; Chalmers, 1996, p.222). In any event, Boyle David (2015) notes that nasal vowels may only take syllable initial position, and are far less frequent than their oral counterparts. For further discussion of the vowel system in KCB, Ferguson and Chowdhury (1960, p.42) provide a comprehensive account of both nasal and oral vowels.

KCB and DCB oral and KCB (nasal) vowels						
i (ĩ)						u (ũ)
	e (ẽ)				o (õ)	
		æ(æ̃)		ɔ(ɔ̃)		
			a (ã)			

Table 3.4: KCB and DCB monophthong vowel chart.

[6] Modified from Boyle David (2015, p.14) and and Thompson (2012, p.11).

The Sylheti vowel inventory is shown in Table 3.5, modified from Chalmers (1996). Similar to the consonant inventory, Sylheti is different to both KCB and DCB, consisting of five rather than seven vowels (Chalmers, 1996; Gope and Mahanta, 2015).

Sylheti vowel inventory				
i				u
	e		o	
		a		

Table 3.5: Sylheti monophthong vowel chart.

Gope and Mahanta (2015) propose that /æ/ has merged with /e/ and similarly /o/ with /u/, whereas Singha and Ahmed (2016) and Hamid (2011, p.33) claim the Sylheti vowel inventory consists of /a/, /i/, /e/, /o/ and /u/. Hamid (2011) suggests that of these five vowels, variations exist so that /o/, for example, may be realised as [o] or [ɔ]. Either way, what is clear from these reports is that the Sylheti vowel inventory is reduced to five vowels, and that the distance between /o/ and /ɔ/ and also /æ/ and /e/ has become allophonic rather than phonemic. For the purposes here, it will be assumed that /o/ remains phonemic within the inventory, and /ɔ/ has merged with /o/, although it could equally well be that /o/ has at some point merged with /u/ and /ɔ/ remains in the inventory.

Following this brief digression into dialectal differences between the consonant and vowel inventories illustrated here, there is evidence of degrees of variation between the dialects considered. As will also be seen in Section 3.4, with respect to the current study, the difference between Sylheti and DCB will again be considered regarding the prosodic representation of affixation of Bengali and Sylheti inflectional morphology.

3.2.4 Diglossia

Not only is Bengali on a continuum with regional dialects, but it is also a diglossic language in relation to the written and spoken forms. Bengali diglossia is realised with a High-Low distinction, where the High form is associated with written literature, and the Low form in conversation and familiar situations (Ferguson, 1959, p.328). The relevance of diglossia to the current study is, primarily, the insight which it allows into the otherwise opaque Bengali verbal inflection patterns, as illustrated by Lahiri (2000). This is particularly important in relation to describing how inflectional material is incorporated within and adjoined to the prosodic word in contemporary Bengali. In order to illustrate why this is so, the contextual background to Bengali diglossia is briefly outlined here.

According to Boyle David (e.g. 2015) and Thompson (2012), by the nineteenth century, a High form of the Bengali language *ʃadʰu bʰaʃa* (Shadhu Bhasha) meaning 'cultured language', had become the standard form of written literary Bengali. Based on the spoken language from some five hundred years earlier, it incorporated an older morphology with anachronistic inflections (Lahiri, 2000, p.74) and Sanskritized vocabulary (Boyle David, 2015, p.8) than was reflected in the spoken language of the day. However, during this period, a Low form *tʃolit bʰaʃa* (Cholit Bhasha) meaning 'current language', the colloquial language spoken by the educated classes from around Kolkata (also known as SCB), started to develop a growing literary presence. This was driven by writers and novelists of the time, including the renown dramatist, novelist, poet and Nobel laureate, Rabindranath Tagore (Boyle David, 2015; Thompson, 2012). By the twentieth century, the Low written form had more or less superseded the High written form (Boyle David, 2015), indicative of a blending of the educated speech and written form popularised in Kolkata SCB.[7]

[7]There are a number of sources which provide comprehensive histories of the language and developments leading to modern-day Bengali, including Chatterji (1926) and Mazumdar (1920). Brief, but detailed, historical accounts of the Bengali language are also provided by, for example, Lahiri (2000), Boyle David (2015), Klaiman (1990), Thompson (2012). For a discussion of Sylheti Bangladeshis in the UK, Hamid (2011) presents an ethnographic study of a community in Leeds, Rasinger (2007) on

Whilst the advanced state of diglossia which was in evidence in the nineteenth century would seem to be less apparent by the twentieth century, Boyle David (2015) proposes that the path of Bengali diglossia is not so clear cut, not least because of the more conservative nature of the non-standard dialects. The current diglossic situation of contemporary Bengali speakers is largely related, then, to how Shadhu Bhasha, the High form, has been incorporated into the written and spoken forms of the Low variety of Cholit Bhasha.

3.2.5 Orthography, transcription and the sound system in Bengali

Finally, a note on the orthography of Bengali regarding the transcription system used in this study. The Bengali writing system is derived from the ancient Indian script Brāhmī, and is typically described as an 'alphasyllabary' or an 'abugida', reflecting the more regular nature of syllable representation to sound (e.g. Boyle David, 2015, p.10). Bengali reads from left to right and does not distinguish between upper and lower case letters.[8] For the current study, a decision was made regarding how best to represent Bengali words in the present analysis, allowing for a transparent representation of morphology as well as a phonological reading. Boyle David (2015) addresses the conundrum of transliteration (which obscures pronunciation to all but the most well-versed on the script in question) and phonemic transcription (which can remove links to spelling and morphology), and opts to report both Bengali script and phonetic transcription. However, alongside the International Phonetic Alphabet (IPA) Boyle David (2015) also follows the conventions of the International Alphabet of Sanskrit Transliteration (IAST), which allows for easy cross-comparison with a number of other studies on Bengali, many of which adopt the IAST system. Other researchers, however, such as Kar (2009), adopt the IPA system,

Bengali-English speakers in East London, and Warner (1992) presents a study of Bengali language use by pupils enrolled in secondary school education.

[8]For a concise history and description of Bengali orthography, see, for example Klaiman (1990) and Boyle David (2015). Chalmers (1996, p.9) provides background to the once flourishing Sylheti Nagari script and Sylheti literature.

indicative of the variation of styles across the field.

The main differences between the IPA and IAST for the majority of translations required in this study is in the representation of stops and aspirated stops. The (bi)labials and dentals and velars are fairly similar other than the lower case /h/ rather than /^{h}/ representing aspiration as in (27).

(27) a. IAST = p ph, b bh, t th, d dh, k kh, g gh

b. IPA = p p^{h}, b b^{h}, t t^{h}, d ^{h} k k^{h}, g g^{h}

Retroflexes are represented with underdots in IAST, but the main difference is in the representation of the palatals (palatal-alveolar), as shown in (28).

(28) a. IAST = ṭ ṭh, c ch, j jh

b. IPA = ʈʈ^{h}, tʃ tʃ^{h}, ʤ ʤ^{h}

In this respect, a Bengali word could be represented in three different ways: transliteration according to IAST (29a), a phonemic representation according to IPA (29b), or a mixture of both IAST and IPA (29c).

(29) a. bojha

b. boʤ^{h}a

c. boj^{h}a

'to understand'

The preferred form which is adopted for the current study is a combination of IAST and IPA (29c). Essentially this is because it allows aspiration to be visible without impinging on the fact that the sound in 'jh', for example, is one phonemic unit, whilst providing the most transparent view of morphology and affixation relevant to this study. In this respect, a combination of phonemic transcription and transliteration will be used throughout this study, and although rather more unconventional, the combination of transliteration and IPA diacritics will be used to illustrate pronunciation within a single phoneme, as in /j^{h}/.

3.2.6 Interim summary

To briefly summarise, Bengali (as an umbrella term) is notable for its substantial dialectal variation, ranging from relatively minor differences between the standardised dialects of Dhaka (DCB) and Kolkata (KCB), to those on the extremes of the dialectal continuum, such as Sylheti. An example of dialectal difference is provided with a comparative review of the partial consonant and vowel inventories for KCB, DCB and Sylheti. Sylheti verbal morphology is returned to in Section 3.4, where dialectal differences are also very much in evidence. Speakers of Bengali are most often multilingual, and as dialects such as Sylheti have more or less lost their written form, it is not uncommon for a Bengali speaker to use more than one dialect in the spoken mode, but only the standard form in the written (e.g. Chalmers, 1996, p.10). The speakers of Bengali in the current study are all speakers of DCB (referred to as Bengali throughout this study), some of whom also speak Sylheti.[9] The diglossic nature of Bengali is relevant to the current study in providing insight into how current inflectional patterns emerged; the written form of the language providing a window into morphology which is no longer transparent in the spoken language (Lahiri, 2000). Of particular interest for the current study is the diachronic development leading to vowel alternations in modern day spoken Bengali, the origins of which would otherwise be quite opaque. This is returned to later in the description of PWd internal representation in the context of vowel raising in Section 3.4. The transcription of Bengali words in this study is illustrated through a commonly adopted practice which sees a combination of transliteration (IAST) and phonemic (IPA) notation.

[9] As briefly mentioned, there are other dialects spoken by the participants in this study, but the greatest concentration by far is that of speakers of Sylheti. This is particularly relevant with regards to the influence of other dialects on the Bengali speakers in this study, and this is returned to in both the methodology and approach to the analysis for this study.

3.3 Bengali: Key linguistic characteristics

Before turning to the prosodic representation for Bengali inflectional morphology, this section introduces some essential background language characteristics relative to the Bengali minimal word and also regarding moraic structure and the syllable. An illustrative description of the Bengali system of verbal morphology and the circumstances of vowel height assimilation follows, preparing the background to the discussion of prosodic representation of inflectional morphology in both Bengali and Sylheti in Section 3.4. Although the focus of this section is on Bengali linguistic characteristics, comparisons are drawn with English, where appropriate, in order to elucidate the acquisition task for L1 Bengali speakers of L2 English.

3.3.1 The bimoraic minimal word constraint and distribution of weight in the syllable

With reference to moraic theory of syllable weight (e.g. Hyman, 1985; Hayes, 1989), both Bengali and English are proposed to have a bimoraic minimal word requirement ($[\mu\ \mu]_{\mathrm{Ft}}$), as reported by, for example, Fitzpatrick-Cole (1990, 1996); Gordon (2013); Broselow and Park (1995).[10] A light syllable is made up of a single mora (monomoraic), whilst a heavy syllable is made up of two (bimoraic). A bimoraic minimal word must, therefore, consist of two light or one heavy syllable. Moras contribute to the weight of a syllable; a mora represents one segment, which is a contributor of weight. Not all segments contribute to weight, and some segments may be non-moraic or they may be moraic but extrametrical and therefore non-contributory to weight calculations. Onsets, or initial consonants are non-contributory to syllable weight (e.g. Ewen and van der Hulst, 2001).

Referencing McCarthy and Prince (1986), Fitzpatrick-Cole (1990) proposes that in Bengali, the Minimal Foot Constraint regulates the phonological processes of glide formation,

[10]See Garrett (1999) for an account which contests the relationship between a minimal word and foot structure.

vowel deletion and vowel lengthening in order to avoid subminimal monomoraic forms and ensure well-formed output (i.e. disyllabic form with two light syllables or or monosyllabic form with one heavy syllable). When glide formation or vowel deletion fails to create a well-formed output, phonetic vowel lengthening can be seen to operate in monosyllabic forms which are both open (CV) or closed (CVC), indicating that the final consonant is either non-moraic or moraic, but extrametrical in word-final position (Fitzpatrick-Cole, 1990, p.158). To illustrate this a series of examples follow, showing a selection of some of the environments in which vowel lengthening applies and does not apply. This begins with example (30), showing vowel lengthening in both open and closed monosyllabic words across word class.[11]

(30) a. /ca/→[caː]
'tea'

b. /am/→[aːm]
'mango'

c. /din/→[diːn]
'day'

d. /rag/→[raːg]
'anger'

e. /ca-s/→[caːs]
'want-2P(FAM)'

Vowel lengthening is not in evidence when the affix is vocalic and glide formation creates a bimoraic VV sequence, as shown in (31a), or if the root vowel is a diphthong as in (31b) or if the word is polysyllabic as in (31c).[12]

(31) a. /ca-i/→[cay]
'want-1P'

b. /boi/→[boy]
'book'

[11]Examples in (30) through to (33) are adapted from Fitzpatrick-Cole (1990), except (30b) and (31c) which are adapted from Thompson (2012).

[12]Following Fitzpatrick-Cole (1990, p.158) Bengali glides are noted /y, w/ corresponding to /i, u/ and /Y, W/ corresponding to /e, o/.

c. /badam/→[badam]
'nut'

Similarly, if a vowel affix is added to a stem or root with the addition of a mora, then vowel lengthening is not invoked, as in example (32).

(32) a. /nɔt-i/→[nɔti]
'dancer-FEM'

b. /rag-i/→[ragi]
'angry'

However, vowel lengthening is required before a clitic (e.g. /i/ '[+EMPH]', /o/ 'too/also'), demonstrating that clitics attach to phonological words, as shown in (33). This is particularly relevant in determining where a prosodic boundary lies in the analysis of Bengali PWd representation of inflectional morphology (Section 3.4).

(33) a. /ca=i/→[caːi]
'tea=[+EMPH]'

b. /rag=i/→[raːgi]
'anger=[+EMPH]'

c. /bɔr=o//→[bɔːro]
'bridegroom=too'

According to Fitzpatrick-Cole (1990, p.167), vowel lengthening is the inevitable result of adding a mora; mora addition being the default setting to fulfil the bimoraic minimal word template, and vowel lengthening as the automatic response to fill the additional mora. In Bengali, a CVC monosyllabic (and monomoraic) word would, as a final option, automatically undergo post-lexical vowel lengthening in order to satisfy the bimoraic minimal word requirement and avoid a subminimal form in the output. As the minimal word relates to syllable weight, and whether word-final consonants are weight-bearing varies cross-linguistically, if a language specifies that final consonants do not contribute to the weight of the syllable, then the required minimal weight must be concentrated on the vowel. In English, the weight is distributed over the vowel and final consonant (nucleus and rhyme), so that in English, final consonants are weight-bearing and the smallest lexical word is CVC (Gordon, 2013, p.212). Although there are monosyllabic

English CVV words with a diphthong, as in (34a) or tense vowel in (34b), there are no monosyllabic CV words (34c), but there are monosyllabic CVC words, as in (34d).

(34) a. fly [flaɪ]

b. flea [fliː]

c. *pi [pɪ]

d. pip [pɪp]

Bengali and English differ, then, on how the mora contributes to the syllable weight (i.e. whether vowels and final consonants are moraic). Bengali has a CVV minimal word compared to English CVC, and, as illustrated by Gordon (2013, p.49), this can be schematised as shown in (35).

(35) $\sigma\,\sigma$ > CVV >CVC > CV

English, as a CVC language, allows any syllable shape to the left of its minimal word (i.e CVV, $\sigma\ \sigma$). Bengali does not permit a minimal word of the syllable shape CVC, which is to the right of its minimal word. A fundamental difference between Bengali and English minimal word requirements, then, is with respect to the distribution of syllable weight across the rhyme. In Bengali, syllable weight is distributed in the nucleus and not across the final consonant. This raises the question as to the extent to which minimal word requirements influence the shape of the minimal word to which L2 inflectional morphology may be attached by L1 Bengali speakers with L2 English.

3.3.1.1 Bengali phonetic vowel length

Of the differences between English and Bengali vowel systems, a couple are of note in relation to the current study, particularly with respect to the predictions for the suppliance of L2 English inflectional morphology. The first relates to vowel length. A short-lomg distinction between Bengali vowels /i, iː/, /u, uː/ and /a, aː/ is in evidence in vowel length distinction in Bengali orthography with short 'hrashya' and long 'dirgha' symbols.

This reflects the difference as mentioned in Section 3.2.4 regarding the traditional and more 'pure' written form of the language in comparison to the lower, modern-day spoken form. Whilst a long-short vowel form is still in evidence in the written form of Bengali, this is not phonemic (e.g. Mazumdar, 1920; Boyle David, 2015; Rahman, 2018).[13] However, in terms of pronunciation of the longer phonetically lengthened vowel as discussed in this section, it has been suggested that phonetic vowel lengthening in Bengali is more accurately described as a 'mid-long' vowel /iˑ/ in comparison to its lax /i/ vowel, and compared to English tense /iː/ and lax /ɪ/ vowels (e.g. Awal, 2013). However, to indicate Bengali vowel length in this study, the lengthmark /ː/ is used to denote a phonetically lengthened vowel.

3.3.1.2 Tense-lax distinction in English

Bengali has no phonemic distinction in vowel length contrast (e.g. Ferguson and Chowdhury, 1960). English vowels are subject to changes in both quantity and quality in the tense-lax or long-short opposition; lengthening in English is accompanied with tenseness. In articulation, tense vowels, such as the /iː/ in 'sheep' are closer, higher and longer than the more open, lower and shorter lax counterpart /ɪ/ in 'ship'. The tense vowel is bimoraic and the lax vowel is monomoraic, as illustrated in (34).

3.3.1.3 Pre-lenis lengthening in English but not Bengali

Before moving on to the verbal morphology of Bengali, it might also be noted that vowel length in English, as well as having a tense-lax distinction, is also sensitive to the surrounding consonantal environment. The first vowel in a polysyllabic form (e.g. dipper) is shorter in duration than that in a monosyllabic word (e.g. dip), both of which are still shorter than the vowel before the voiced consonant (e.g. dig). In English,

[13] Barman (2009) reports that there is some debate regarding the future of the short 'hrashya' and long 'dirgha' system of writing, with some linguists calling for reform of the writing system to bring it more in-line with the spoken language, and to adopt just one system of length marker.

this is particularly so regarding vowel length with respect to whether the word-final consonant is lenis (e.g. /b, d, g/) or fortis (e.g. /p, t, k/). Referred to variously as pre-fortis shortening or pre-lenis lengthening this describes the process whereby the vowel is shortened before a fortis consonant (e.g. Wells, 1995) or lengthened before a lenis consonant (e.g. Gussmann, 2002). It is open to discussion as to whether the mutation of vowel length in the environment of a following voiced or unvoiced consonant is a language universal (e.g. Maddieson, 1996), and it is possible that both these rules apply within a language, or there is an interaction between the two. In a perception study, Roberts et al. (2014) propose that there is no evidence to support a pre-fortis lengthening rule in English; a short vowel is not accepted before a lenis [g], but both a long or short vowel is accepted before a fortis [k]. Bengali is not subject to such environmental demands, where the crucial factor in a monosyllablic form is a (phonetically) lengthened vowel, whether or not there is a following voiced or unvoiced consonant (Roberts et al., 2014).

3.3.2 Verbal morphology

Typologically, the verbal morphology of Bengali is said to be agglutinating (Kar, 2009), mainly agglutinating (Mazumdar, 1920) or at least part agglutinating and fusional (Boyle David, 2015). According to Spencer (1991, p.38), English is a mixture of typologies; isolating with respect to inflectional categories, agglutinating regarding derivational categories and polysynthetic regarding compounding.[14] There is some disagreement over how Bengali verbs should best be classified. In most linguistic accounts of the Bengali verbal system, verbs are usually categorised according to the phonological shape of the stem, and typically classified into six or seven stem types. Inflection patterns are regular within the verb class, and this will be returned to in relation to vowel height assimilation (see Section 3.3.3). An example of verb classification with six classes is illustrated in Table 3.6, modified from Thompson (2012, p.73). In this example, Boyle David (2015, p.185) disagrees with the classification of dialectal variation in Class 6 (removed from

[14] Spencer (1991) refers to a continuum between typological categories, proposing that most languages do not conform to one category type, as typified in the case of English.

Class 5) stating that variation is not deemed a relevant factor in determining verbal conjugation classification.

Class 1	CVC, VC	dæk^h-	'see'
Class 2	CaC, aC	t^{h}ak-	'stay'
Class 3	CV	de-	'give'
Class 4	Ca	k^{h}a-	'eat'
Class 5	CaCa, CVCa, VCa	cala-	'drive'
Class 6	dialectal variants	ego-	'advance'

Table 3.6: Bengali verb classes.

Bengali roots are either monosyllabic (and monomoraic) or disyllabic (and bimoraic) (Klaiman, 1990, p. 501), as illustrated in example (36a) and (36b) respectively.

(36) a. jan- 'know'

b. g^{h}uma- 'sleep'

The verbal noun is marked with one of three endings /-a/, /-wa/ or /-no/, and this is the usual citation form (e.g. *dæk^{h}a* 'to see', *k^{h}awa* 'to eat' and *calano* 'to drive').

English verbs require an overt subject, agreement with the subject in person and number and are marked for tense, whereas Bengali verbs agree according to person (three are specified) and familiarity, but not gender or number (e.g. Boyle David, 2015; Klaiman, 1990). There is a clear order of suffixation for Bengali verbal inflection (e.g. Dash, 2015, p.121) as shown in (37).

(37) root - aspect suffix - tense suffix - person suffix

Overt pronouns can be omitted in Bengali, as person is encoded in the verbal inflection. Bengali pronouns are shown in Table 3.7, modified from Thompson (2012, p.69). As well as 1st, 2nd and 3rd person agreement, there is a distinction between levels of familiarity and politeness. There is some discussion regarding the terminology used to distinguish levels of formality as raised by Kar (2009, p.150). Klaiman (1990, p.501), for example, refers to the terms '2nd person despective' for 'familiar', and 'honorific' for 'polite'. However, irrespective of the terminology used, Bengali encodes three levels of politeness within the person suffix, and are shown here, with 'ordinary' denoting more familiarity than 'familiar'.

1st	2nd familiar	2nd ordinary	3rd ordinary	2nd and 3rd polite
ami	tumi	tui	se	apni, tini

Table 3.7: Bengali pronouns.

The person suffix is dependent upon the form of the tense or aspect marker directly preceding it. There are three tenses; past, present and future, and three aspects; perfect, imperfect (also referred to as the continuous) and conditional or past habitual (e.g. Boyle David, 2015, p.181). The perfect/imperfect is used as an expression of completion versus non-completion whilst perfective/imperfective is a $\pm$ temporal category, which is argued not to exist in Bengali (Boyle David, 2015). There is no overt morpheme to denote present tense. The consonantal inflectional suffixes are illustrated in Table 3.8, modified from Klaiman (1990, p.501) and Boyle David (2015, p.181).

Tense or aspect	marker
past tense; simple, imperfect or perfect tense affix	-l-
past tense; conditional, past habitual tense/aspect affix	-t-
present tense	∅
future tense	-b-
imperfect aspect (continuous)	-(c)chi-
perfect aspect	-ch-

Table 3.8: Bengali tense and aspect markers.

Tense and aspect is marked with both a dedicated suffix and personal suffux. The -ch- affix is attached to mark perfect aspect and the -(c)c^h- marks imperfect aspect. The /c/ is deleted in the imperfect when attached to a verb with a stem-final consonant. As well as overt marking of tense or aspect, for each pronoun, there are three personal suffixes to mark the finite verb forms for present, future and past. Bengali verbs do not mark number, so there is no differentiation between singular and plural subjects. Of particular interest to the current study, are the inflectional patterns for simple past, simple present and perfect and imperfect aspects. These are shown in Table 3.9, adapted from Klaiman (1990), Boyle David (2015) and Thompson (2012).

		1st	2nd familiar	2nd ordinary	3rd ordinary	2nd and 3rd polite
(i)	simple past -l- stems	-am	-i	-e	-o	-en
(ii)	simple present ∅	-i	-o	-is	-e	-en
(iii)	perfect/imperfect -(c)c^h- stems	-i	-is	-o	-e	-en

Table 3.9: Selected Bengali inflectional patterns for tense and aspect.

Line (i) shows the inflection pattern for the simple past tense, which is marked with the /-l-/ morpheme. When the root verb *boj^h^a* 'to understand' is inflected in the simple past in the first person (38), the root vowel is raised to the high form *buj^h^*-.

(38) buj^h -l -am
understand -PST -1
'I understood'

Similarly, line (ii) shows the inflection pattern for simple present tense, which does not have an overt marker, and this is illustrated with the verb *lek^h^a* 'to write' in the third person (polite) in (39a), third person ordinary in (39b), and the first person in (39c).

(39) a. lek^h -∅ -en
write -PRS -3.HON
'you/he/she writes'

b. lek^h -∅ -e
write -PRS -3.ORD
'he/she writes'

c. lik^h -∅ -i
write -PRS -1
'I write'

The inflection patterns in Bengali verbal morphology illustrate the phonological process of vowel raising. Whilst the examples in (39) clearly show that the first vowel is raised only in the presence of a high vowel in the inflectional morpheme, the raising of the vowel in (38) is less clear, as the vowel in the inflectional morpheme is not high, and yet the root vowel has raised from *boj*^{h}*a* 'to understand' to *buj*^{h}-. In the following section the diglossic origins of vowel height assimilation is discussed.

3.3.3 Vowel height assimilation

Although variously referred to as vowel height assimilation (Klaiman, 1990), monomorphemic alternation (Ferguson and Chowdhury, 1960), vowel mutation (Thompson, 2012), as well as vowel harmony (Radice, 1994) and vowel raising (Lahiri, 2000), the terms vowel height assimilation and vowel raising will be used (interchangeably) here to describe this phonological process which also reflects the morphological nature of Bengali vowel alternation.[15]

Bengali monosyllabic verb bases with non-high root vowels, such as *dæk*^{h}*a* 'see' (CVC), *dewa* 'give' (CV), *jana* 'know' (CaC) or *k*^{h}*awa* 'eat' (Ca) have two alternate forms; a 'low' form as illustrated in (40a) and a 'high' form shown in (40b). There is some disagreement over the status of /a/, which, according to Ferguson and Chowdhury (1960) alternates with either high-mid vowel /e/ or /o/, bypassing the nearest low-mid vowels /æ/ and /ɔ/ in the process, or, according to Klaiman (1990), the process of vowel height assimilation extends to the assimilation of non-high vowels (other than /a/) when the following vowel segment within the phonological word has a [+high] specification. Thompson (2012) excludes /a/ from the analysis, but Boyle David (2015) argues for the inclusion of low vowel /a/ and its high alternate form /e/ in any description of Bengali vowel raising, as

[15] Regarding terminology, Boyle David (2015) encapsulates these vowel alternations with reference to the lower vowel form as the primary stem and to the higher vowel form as the secondary stem, Klaiman (1990) refers to the vowel in the first syllable as the 'root vowel' and Fitzpatrick-Cole (1990, p.159) refers to the theory of Prosodic Lexical Phonology, and citing Inkelas (1991), differentiates between bare verbs as roots, which are bound, and bare nouns as stems, which are free.

the /a/ vowel mirrors the patterns of the other alternations.

(40) a. dæk^{h}- 'see'

de- 'give'

jan- 'know'

k^{h}a- 'eat'

b. dek^{h}- 'see'

di- 'give'

jen- 'know'

k^{h}e- 'eat'

The low root vowel alternates are predictable and are set out in (41).

(41) /o/ → /u/

/ɔ/ → /o/

/e/ → /i/

/æ/ → /e/

/a/ → /e/

However, there is no apparent reason on the surface as to why, in the example shown in (38), *boj^{h}a* 'to understand' should take the high alternate form in the simple past in the first person *buj^{h} -l -am* (understand -PST -1; 'I understood') rather than the low form **boj^{h} -l -am*. Lahiri (2000) provides a diachronic explanation for the presence of the high vowel alternate in non-present forms, including simple past forms, regardless of the following vowel (person affix). This relates to *ʃad^{h}u b^{h}aʃa* (Shadhu bhasha) the 'cultured language' or literary Bengali (see Section 3.2.4), which reveals in its written form an inflectional morpheme which is no longer visible in contemporary spoken Bengali. The underlying morpheme in question is the [+high] marker for the non-present simple tenses /-i-/ which raises the vowels in the root, but whilst it is retained and visible in the written form, has disappeared from the spoken language (Lahiri, 2000, p.75).

The underlying form of the non-past suffixes are therefore prefixed with the simple tense marker /-i-/ (as illustrated for the simple past tense in Table 3.10), which is subsequently deleted leaving behind the raised vowel.[16] However, whether as a floating affix or as a prefix to the tense and person affix, it is the underlying /-i-/ which triggers vowel raising to the high alternate root form. 'Thus, vowel raising, which was phonologically transparent earlier, is now opaque.' (Lahiri, 2000, p.76).

	1st person	2nd person familiar	2nd person ordinary	3rd person ordinary	2nd and 3rd persons honorific
pronoun	ami	tui	tumi	ʃe	apni & tini
past simple	-*i*-l-am	-*i*-l-i	-*i*-l-e	-*i*-l-o	-*i*-l-en

Table 3.10: Underlying forms of simple past suffix in Bengali.

This can be further illustrated with a comparative view of the stem patterns for the verb *boj^{h}a* 'to understand', as set out in the simple present and simple past tense forms, as shown in Table 3.11, adapted from Thompson (2012, p. 74). The high alternation (H) or the simple past tense, shown in line (2), is replicated across all finite verbs. Only in the present simple is there a variation between the high and low (L) forms relative to the height of the following vowel in the person affix.

[16]This could equally be explained as a floating affix, no longer visible in spoken Bengali, which leaves behind the high verbal base.

	1st person ami (a)	2nd familiar tumi (b)	2nd ordinary tui (c)	3rd ordinary se (d)	2nd and 3rd polite apni,tini (e)
(1) simple present	(H) buj^h-i	(L) boj^h-o	(H) buj^h-is	(L) boj^h-e	(L) boj^h-en
(2) simple past	(H) buj^h-l-am	(H) buj^h-l-e	(H) buj^h-l-i	(H) buj^h-l-o	(H) buj^h-l-en

Table 3.11: Inflectional patterns for *boj^ha* 'to understand'.

The verb form in line (1) column (a), *buj^h-i* 'I understand', clearly illustrates how the attachment of the [+high] person suffix /-i/ to the simple present form (which does not have an overt tense marker) causes the root vowel to raise from the low alternate form *boj^h-* (L) to its high alternate form *buj^h-* (H). Similarly, the verb form in line (1) column (b), *boj^h-o* 'you understand', does not undergo vowel height assimilation, as the person suffix /-o/ is not [+high], and does not trigger the process of raising. However, the verb form in line (2) column (a), *buj^h-l-am* 'I understood', does not have a high vowel, and yet the verb has raised to its high alternate form, with the help of the diglossic simple tense marker /-i-/. As the simple present tense does not have a tense marker, unlike the non-past tense markers, it stands to reason that the /-i-/ marker is unable to attach to the vowel initial person affix (see Table 3.9).

Whilst the vowel raising in forms such as *buj^h -l -am* 'I understood' can be seen to be as a result of a diachronic process, *buj^h-i* 'I understand' is evidence of synchronic vowel raising, as the vowel in the person suffix directly influences the root vowel. As the person affix also triggers vowel raising in the simple present tense, but only if the second vowel has the [+high] feature, then this provides further evidence that the role of the /-i-/ simple tense marker only applies within the phonological word, where there is no intervening prosodic boundary. Taking the example of adding a clitic (also see Section 3.3.1), it can be seen that the clitic =i (inclusive/emphatic) can only be attached once inflection and any vowel raising is complete as shown in (42) with *boj^h-* in the simple present first person. The clitic cannot attach to a subminimal word, and the vowel cannot be raised by a vowel following a prosodic boundary.[17]

(42) a. bujʰ -∅ -i =o
understand -PRS -1 =too
'I/we also understand '

b. *bujʰ -∅ =o -i
understand -PRS =too -1

Furthermore, as this only applies to monosyllabic roots and not to disyllabic roots, vowel raising is only possible between adjacent syllables. The relevance of this to the current study is the environments in which vowel height assimilation can occur, determining where prosodic boundaries are drawn with respect to the affixation of Bengali inflectional morphology.

3.3.4 Interim summary

In this section, Bengali minimal word requirements were discussed with respect to prosodic word boundaries, with evidence from vowel lengthening. Following Fitzpatrick-Cole (1990, 1996), vowel lengthening was shown to be the last case scenario to fill an additional mora, created in the event the output would be subminimal (i.e. monomoraic). Disyllabic forms, or verbs with vocalic affixes do not undergo vowel lengthening. However, monomoraic verbs before a vocalic clitic, such as *=o* 'also', undergo vowel lengthening, indicating that the minimal word requirements must be met before clitics can be attached. The evidence from the environments in which vowel lengthening applies and does not apply, as well as clitic placement, provides opportunity to test for prosodic word boundaries with respect to the prosodic representation of Bengali inflectional affixes.

Some of the differences between the behaviour of Bengali and English verbs were also considered in relation to, for example, the tense-lax distinction relative to bimoraic and

[17] A clitic cannot stand as a phonological word, and must be attached to a well-formed phonological word. It cannot instigate phonological processes, such as vowel height assimilation and is attached once all other phonological processes and derivational and inflectional affixation is complete.

monomoraic vowels. The Bengali verbal system was then discussed in relation to vowel height assimilation, a process which is not visible in contemporary spoken Bengali, but which has historical origins in the diglossic development of the language in written and spoken forms. Bengali vowel height assimilation is evident within the boundaries of a prosodic word, and this also provides further evidence, along with clitic placement, to establish where prosodic boundaries are drawn.

Attention now turns to the proposed prosodic representation for tense in Bengali with respect to the required prosodic representation for English inflectional morphology, particularly tense, third person singular agreement and plural noun agreement.

3.4 Prosodic representation in Bengali

The following sections now focus on providing an outline of the prosodic representation of Bengali affixation in relation to the required prosodic representation of English tense, agreement and plural noun agreement in PWd adjoined and PWd internal representations. Following the review of the phenomenon of the minimal word (3.3.1) and vowel height assimilation in Section 3.3.3, this leads to the proposal that Bengali simple past tense is supplied in a PWd internal prosodic representation. Bengali present perfect and past perfect tenses are then considered in relation to the attachment of suffixation and clitics, leading to the proposal that Bengali affixation is represented in a PWd adjoined prosodic structure. This section concludes with the assumption that for L1 speakers of Bengali, both required prosodic representations for the production of L2 English tense and agreement inflectional morphology (PWd internal and PWd adjoined) are available in the L1 to transfer to the interlanguage.

3.4.1 Prosodic representation pwd internal: Bengali simple past tense

It is proposed that Bengali simple past tense and person agreement are prosodically represented within the PWd. If this is indeed the case, then in relation to the production of L2 English inflectional morphology, the Bengali PWd internal representation is arguably ready to transfer to the interlanguage, and is available for the prosodic representation of English simple past tense (with irregular verbs). In Section 3.3.3, vowel height assimilation in Bengali verbs was shown to be triggered within the prosodic word following affixation with a [+high] vowel or as a result of the presence of the /-i-/ simple tense morpheme, no longer visible in spoken Bengali (Lahiri, 2000; Klaiman, 1990; Thompson, 2012; Boyle David, 2015). This forms the basis for the assumption that Bengali simple past (and person marker) is prosodified within the PWd, with the premise that vowel raising can only take place within the phonological word, without a prosodic boundary between the [+high] vowel in (V_2) position and the root vowel in (V_1) position. This is illustrated in (43) with Class 1 verb *dækʰa* 'to see', which is produced here in its high vowel form *dekʰ*- following vowel raising.[18]

(43) (dekʰ -l -am)ω
see -PST -1
'I saw'

Further evidence that vowel raising occurs within phonological words is with the placement of emphatic clitics. Bayer and Lahiri (1990), Lahiri (2000) and Fitzpatrick-Cole (1990, 1996) illustrate how clitics can operate with respect to prosodic word boundaries, as clitics can attach to phonological words (finite and non-finite verbs), but they cannot attach to roots. This is because roots do not have a prosodic structure according to Prosodic Lexical Phonology (Inkelas, 1991), as applied to Bengali by Fitzpatrick-Cole (1990, p.159). A monomoraic root or stem is not bimoraic until either inflectional mate-

[18] The examples from (43) through to (64) are created with reference to Fitzpatrick-Cole (1996), Bayer and Lahiri (1990), Klaiman (1990) and Boyle David (2015).

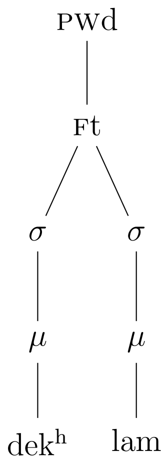
rial is added which also brings another mora (i.e. a vocalic affix) or lengthening of the root vowel is applied as a final repair to avoid a subminimal form at the surface level. The clitic =*o* ‘also’ is shown in the following examples. The first example shows a finite verb with the attached clitic, which is well-formed (44). However, in example (45), the clitic is not permissible when attached to a root.

(44) ((dek^h -l -am)ω =o)ω
see -PST -1 =also
‘I also saw’

(45) *(dek^h =o -l -am)ω
see =also -PST -1
‘I also saw’

The proposed prosodic structure for Bengali simple past tense is therefore a PWd internal structure. To summarise, this is based on the behaviour of vowel raising, which is instigated by a high vowel /-i-/ attached to the past tense marker, which is no longer pronounced in spoken Bengali.[19] The second indication of the status of a phonological word is the positioning of clitics, which can attach to a phonological word, but not to a subminimal (monomoraic) root. This is illustrated in (46) with the Class 1 verb *dæk^{h}a* ‘to see’ in its high form *dek^h-*.

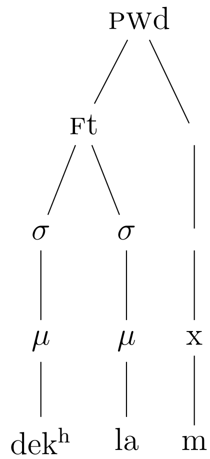
(46)



[19]This is the case for the simple past tense. In the case of simple present verbs, it is the vowel in the person affix which instigates raising if it is [+high].

In (46), the PWd internal representation in Bengali does not induce a violation of the constraint EXHAUST (i.e. no constituent dominates another constituent by skipping a level), but the status of the word-final consonant is unaccounted for in this structure. Assuming that the final-consonant is moraic but extrametrical, then it is feasible that it would be prosodified outside the final syllable, and attached directly to the structure by the PWd, as shown in (47).[20]

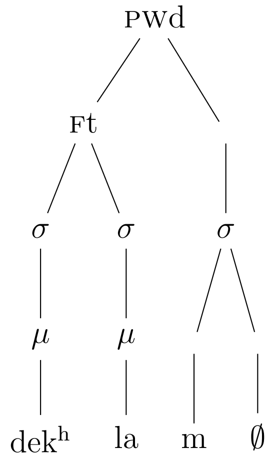
(47)



However, if the word-final consonant is not extrametrical, then it is also possible that the word-final consonant is prosodified as the onset of an empty nucleus as shown in (48). Either way, the final consonant is not extrametrical, but it does not contribute to syllable weight, as it is in the onset, and the syllable does not contribute weight, as the nucleus is empty. The cause of this emptiness could feasibly be because the consonant is not included in a foot, as a catalectic syllable, or the OEHS as in Government Phonology (Kaye et al., 1990).

[20]See Section 3.3.1 regarding the status of word-final consonants.

(48)



If this is the case, and if the final consonant is the OEHS, then this could also account for the prohibition of word-final consonant clusters in Bengali. Assuming Bengali licenses an empty nucleus similar to English (and this is tenable as both C final and V final words are attested in Bengali) but unlike English, only a single consonant is permissible in word-final position, then this would be in line with the coda licensing principle (Kaye, 1990). For the purposes of the current study, it will be assumed that the prosodic representation shown in (48) is illustrative of the affixation of tense in Bengali. In this respect, the prosodic structure involves a violation of EXHAUST as a PWd directly dominates a syllable.

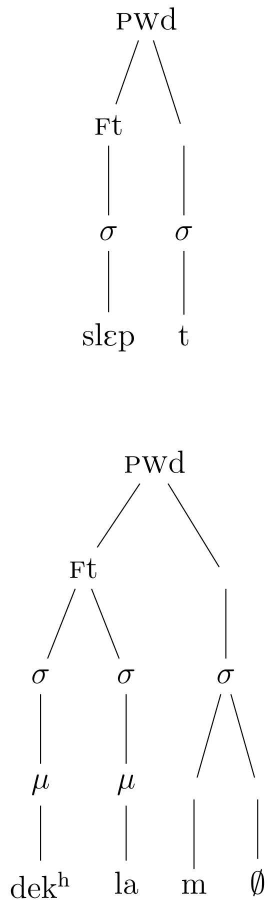
With respect to the prosodic detail of the segment at the level of the mora, one of the difficulties in addressing whether word-final consonants are non-moraic or moraic but extrametrical is related to the placement of stress in Bengali. At the end of Chapter 2, it was noted that unlike Mandarin and Turkish, Bengali stress is relatively unhelpful in determining prosodic structure. Bengali stress is overwhelmingly reported to be on the word-initial syllable (e.g. Khan, 2008; Ferguson and Chowdhury, 1960; Ray et al., 1966; Hayes and Lahiri, 1991; Klaiman, 1990) and quantity-insensitive (Hayes and Lahiri, 1991).[21] Alternatively, an observation of vowel lengthening activity in the proximity of a word-final consonant cluster may also reveal the status of final consonants, but again as clusters are disallowed, this is not feasible (Fitzpatrick-Cole, 1990).

Returning to the comparative prosodic structure for tense, the PWd internal represen-

[21] See Shaw (1984) for a different account.

tation for English irregular simple past and Bengali simple past are set out together in (49). Structurally, there is little difference between the prosodic representation in Bengali and English. The output in Bengali is invariably disyllabic, whereas in English irregular verbs are predominantly monosyllabic. Considering that simple past tense is both overtly marked in the L1 and L2, and that a PWd internal prosodic representation is available in the L1, it is proposed that the production of English simple past irregular verbs by L1 speakers of Bengali should be facilitated by the L1, and that transfer should be straightforward (T).[22]

(49)



English regular simple past tense, third person singular agreement and plural noun agreement is represented with a PWd adjoined prosodic representation. The following section now describes the suppliance of Bengali inflectional morphology in a PWd adjoined rep-

[22]As discussed in Section 2.3.4, with respect to access to prosodic representations in the interlanguage T = straightforward transfer, T(b) = transfer requiring licensing to a new position and T(a) = transfer requiring the building of a structure from L1 representations.

resentation.

3.4.2 Prosodic representation pwd adjoined: Bengali present perfect and past perfect tense

English regular simple past (as well as third person singular agreement and plural noun agreement) is proposed to be represented in a PWd adjoined prosodic structure (e.g. Goad et al., 2003). It is proposed in the current study that Bengali inflectional morphology can also be represented in a PWd adjoined structure, and the evidence for this is provided in the Bengali present perfect and past perfect tenses. This is illustrated here with the Bengali verb *dækʰa* 'to see' (high alternate form *dekʰ*-). To begin with the past perfect tense, the PWd adjoined structure is seen to be created in two stages; first the perfect participle /(i)-e/ attaches to the verb root in a PWd internal representation (with the /-i-/ vowel triggering the high alternate base), as shown in example (50). Secondly, this structure becomes the base for the perfect affix /-(c)cʰ-/, past affix /-il-/and person affix /-am/ (here illustrated in the first person), which attach to the PWd as illustrated in (51). The stem */dekʰ-e/* is also marked for the perfect aspect, in addition to the designated perfect affix /-(c)cʰ-/.

(50) (dekʰ -e)ω
see -PRFP
'seen'

(51) ((((dekʰ -e)ω) -cʰ -il -am)ψ)ω
see. PRF- PRF- PST- 1
'(I) had seen'

A small point to consider before proceeding further with the discussion regarding the prosodic representation of Bengali past perfect and present perfect tense, is the difference in the surface form of the past suffix /-l-/, highlighted in bold, when it is realised in the simple past tense, as shown in (52) and when it is realised in the past perfect tense, as in (53).

(52) dek^h **-l** -am
see -PST -1
'(I) saw'

(53) dek^h -e $-c^h$ **-il** -am
see. PRF -PRF -PST -1
'(I) had seen'

The suffixation of the /-i-/ vowel has been identified as the diglossic cause of PWd internal root vowel raising, allowing that this could also be a floating feature. Here, it is also possible to suppose that the underlying /-il-/ could have two surface forms; [l] and [il], or two UR of the past tense suffix /-l-/ (past simple) and /-il-/ (past perfect). Taking the formation of the past perfect tense in the first person, the perfect marker /-(i)e/ first attaches to the root *dæk^h-* 'see' as a suffix, and vowel raising takes place, reproduced here for ease of illustration (54). This causes an internal vowel change to the stem (from *dæk^h-*) and forms a prosodic word.

(54) dek^h -e
see -PRFP
'seen'

The aspect marker /-c^h-/ is then attached to the prosodic word as a clitic (Lahiri, 2000, p.86) with the past tense and first person marker suffixes /-il-am/ (55). This could indicate that the underlying /-i-/ vowel has to be pronounced in a condition where the /-i-/ does not instigate vowel raising.

(55) dek^h -e $-c^h$ **-il** -am
see. PRF -PRF -PST -1
'I had seen'

Alternatively, the /-i-/ vowel in (55), could be an inserted linking vowel to break the potential /-c^h-l-/consonant cluster (56), as illustrated by Bayer and Lahiri (1990, p.4) with the verb *mara* 'to beat or kill' as reproduced in (57). In this example, the clitic =o meaning 'too' or 'also' is attached word-finally, after affixation is complete.

(56) dek^{h} -e -c^{h} **-i** -l -am
see. PRF -PRF -LINK -PST -1
'I had seen'

(57) mer- e- ch- i- l- am- o
beat- [prt]- [prog]- [link]- [past]- [1pers]- too
'(I) have also BEATEN'

Reproduced from Bayer and Lahiri (1990, p.4)

Returning to the prosodic structure, it is first necessary to validate that the perfective participle is a PWd in order to illustrate how affixation can adjoin to the phonological word. Evidence of vowel raising shows that it has a PWd internal structure, further evidence of its status as an independent phonological word again comes from the placement of the clitic =o 'also'. The clitic can attach to a prosodic word, but not to a root (Bayer and Lahiri, 1990; Lahiri, 2000; Fitzpatrick-Cole, 1990, 1996). This is illustrated in examples modified from Fitzpatrick-Cole (1996) in (58) through to (61). The clitic attaches to prosodic words in examples (58), (60) and (61), but not in (59) as the verb stem is not a prosodic word until the perfect marker /-e/ is attached.

(58) ((dek^{h} -e)ω =o)ω
see -PRFP =also
'seen also'

(59) *((((dek^{h} =o -e)ω) -c^{h} -il -am)ψ)ω
see =also -PRF -PRF -PST -1
'I had also seen'

(60) (((((dek^{h} -e)ω) -c^{h} -il -am)ψ)ω =o)ω
see. PRF -PRF -PST -1 =also
'I had also seen'

(61) (((((dek^{h} -e)ω =o)ω) -c^{h} -il -am)ψ)ω
see. PRF =also -PRF -PST -1
'I had also seen'

Furthermore, examples (62) and (63) show that the clitic cannot be placed within the aspect-tense-person stem, indicating that the affixes for aspect, tense and person together constitute a stem, and cannot be interrupted with a prosodic boundary (Bayer and Lahiri, 1990, p.5). Examples modified from Bayer and Lahiri (1990, p.5).

(62) *((((dek^{h}-e)ω) -c^{h} -i =o -l -am)ψ)ω
see.PRF -PRF -LINK =also -PST -1
'I had also seen'

(63) *((((dek^{h}-e)ω) -c^{h} -i -l =o -am)ψ)ω
see.PRF -PRF -LINK -PST =also -1
'I had also seen'

This is also the case for the present perfect tense. Again, taking *dæk^{h}a* 'to see' in the first person, the placement of the clitic defines the prosodic word boundaries.

(64) ((((dek^{h}-e)ω -c^{h} -$\emptyset$ -i)ψ)ω =o)ω
see.PRF -PRF -PRS -1
'I have seen'

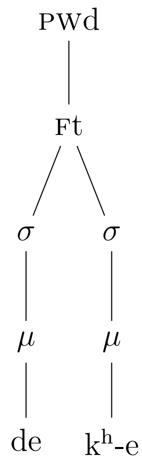
Further evidence for this analysis comes from the process of degemination. Degemination of the suffix /-(c)c^{h}-/ occurs when the affix follows a consonant-final verb stem, but a geminate follows a vowel-final verb stem. In the example given here, once the perfect participle /-e/ has attached to the verb stem, gemination is not in evidence and instead the suffix /-(c)c^{h}-/ is degeminated. As degemination is a process which is activated in the avoidance of consonant clusters between the syllable-final consonants and onset, the fact that gemination does not occur in a vowel-final environment as in *dek^{h} -e*, is a further indication that the attachment of the perfective participle creates a PWd, across which re-syllabification cannot occur (Fitzpatrick-Cole, 1996, p.313). This is illustrated in example (65), where the suffix /-(c)c^{h}-/ must be degeminated, as syllabification cannot operate across a PWd boundary, but in the event of a vowel-final stem as in (66) the consonant is geminated and syllabified within the PWd, as shown with the verb *k^{h}awa* 'to eat' in the present continuous (imperfect), adapted from Bayer and Lahiri (1990, p.6).

(65) *((dek^{h} -e)ω -cc^{h} -$\emptyset$ -i)ω = *de.k^{h}ec.c^{h}i
see .PRF -PRF -PRS -1
'I have seen'

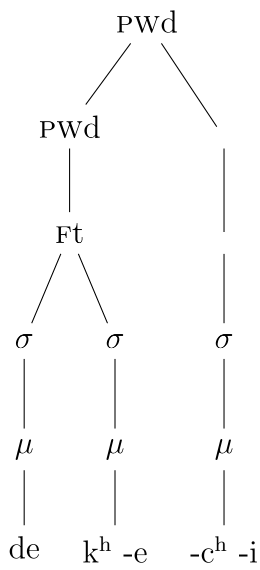
(66) (k^ha -cc^h -$\emptyset$ -i)ω = k^hac.c^hi
eat -IPF -PRS -1
'I am eating'

The two stages of construction; first the perfect participle and secondly the present perfect, is illustrated in (67) and (68) with the verb *dæk^{h}a* 'to see'. In the prosodic representation of the present perfect, there is violation of the constraint EXHAUST, where a PWd directly dominates a syllable. Again, if this is compared to the PWd adjoined representation for English regular simple past, reproduced in (69), it can be seen that the violation of EXHAUST is the same for both English and Bengali. Similarly, both English and Bengali violate NONREC, whereby a PWd directly dominates another PWd. However, whilst in English the affixation is syllabified as the OEHS, in Bengali the nucleus is filled with a vowel, and under the same analysis, the final consonant is not the OEHS.

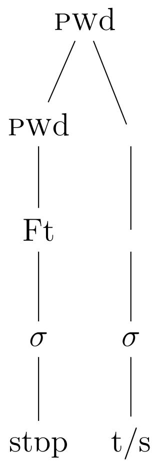
(67)



(68)



(69)



3.4.3 Prosodic representation: Number agreement on Bengali plural nouns

In English, regular simple past tense, third person singular agreement and plural noun agreement are all prosodically represented adjoined to the PWd, but it is proposed here that some markers of Bengali plurality can be represented in a PWd adjoined prosodic representation and others in a PWd internal prosodic representation. There are a number of different ways of expressing plurality on nouns in Bengali (Dash, 2015, p.53-54), as shown in (70), although these are not necessarily equally frequent in usage. For example, plurals can be formed in Bengali by simply dropping the indefinite singular classifier. When the classifier (/-*ʈi*/ is added to the numeral (/*æk*/ or /*ek*/ 'one') it creates an indefinite noun (Thompson, 2012, p.58), as illustrated in (70a). A numeral with a classifier creates a definite plural (70b), but without an indefinite singular classifier, a plural reading is given (70c). Examples (70a) and (70c) are modified and adated from Thompson (2012, p.58), example (70b) is reproduced from Thompson (2012, p.55).

(70) a. ek -ʈi pak^{h}i
one -CLF bird
'a bird'

b. pak^{h}i dui -ʈi
bird two -CLF
'the two birds'

c. pak^{h}i
bird
'birds'

A plural can also be formed by adding a plural marker. The choice of plural marker is influenced by the binary distinctions made in terms of number (singular or plural) according to the parameters of animacy and definiteness (Boyle David, 2015, p.53 and Klaiman, 1990, p.500). There is, however, debate regarding whether number markers belong to the class of affix or clitic (e.g. Boyle David, 2015). The relevance of this is with respect to whether, as an affix, the plural marker is incorporated into the prosodic word, or as a classifier, it is adjoined to the PWd in much the same way as a clitic. Of particular interest for this study, then, is the plural marker *-ra/-era* (an animate plural marker) and *-gulo/-guli* (an animate and inanimate plural classifier). Thompson (2012, p.57) suggests that there is a preference to use *-gulo/-guli* when reference is made to an inanimate noun, and that as well as marking plurality, *-gulo/-guli* can also impart definiteness. When the animate plural marker *-ra/-era* is added to a noun (*-ra* folllowing vowels and *-era* following consonants), it can create a definite or indefinite noun phrase, which is contextually dependent (Thompson, 2012, p.58), as shown in (71).

(71) pak^{h}i -ra
bird -PL
'(the) birds'

When, *-gulo/-guli* (both animate and inanimate plural classifier) is added to the noun, it encodes both plurality and definiteness (72).

(72) pak^{h}i -gulo
bird -CLF.PL
'the birds'

The plural classifier *-gulo/-guli*, unlike *-ra/-era*, can also follow quantifiers, such as *ɔnek* 'much, many', which can be used with both countable and uncountable nouns (Thompson, 2012, p.57, p.87), as shown in (73).

(73) ɔnek -gulo pak^{h}i
many -CLF bird
'many birds'

Further, whilst *-ra/-era* cannot be followed by case, *-gulo/-guli*, as a classifier, can be positioned between the noun and case marking, as illustrated in (74), example modified from Thompson (2012, p.53).

(74) gac^{h} -gulo -te
tree -CLF.PL -LOC
'in the trees'

According to Thompson (2012, p.59), as *-ra/-era* does not have the flexibility in positioning that is seen with other classifiers (including *-gulo/-guli*), *-ra/-era* 'is therefore classified as the nominative plural case marker for animate nouns'. Boyle David (2015, p.53) prefers to group Bengali plural markers with clitics rather than affixes, although with a caveat; the blanket term 'marker' allows for some ambiguity regarding either classification. Fitzpatrick-Cole (1996, p.310) puts forward that the Bengali plural marker *-ra/-era* is an affix, much like the person marker e.g. */-i/* '1st person'. This suggests that the plural marker *-ra/-era* would therefore be incorporated into a stem in a PWd internal prosodic representation, in the same way as a lexical affix, as shown in (75) and (76) as well as with a noun stem in (77), but unlike a clitic in (78). Examples (77) and (78) are reproduced from Fitzpatrick-Cole (1996, p.310).

(75) $(((\text{pak}^{\text{h}}\text{i})\psi\ \text{-ra})\psi)\omega$
bird -PL
'(the) birds'

(76) $((\text{lik}^{\text{h}}\ \text{-i})\psi)\omega$
write -1P
'(I) write'

(77) $(((\text{jɔgot})\psi\ \text{-e})\psi)\omega$
world -LOC
'world'

(78) $(((\text{jɔgot})\psi)\omega\ \text{=o})\omega$
world =also
'world also'

It is possible, however, that whilst *-ra/-era* is prosodified PWd internally, *-gulo/-gulu*, identified as a classifier (Thompson, 2012), is adjoined to the prosodic word in a PWd adjoined representation as illustrated in (79).

(79) $(((\text{pak}^{\text{h}}\text{i})\psi)\omega\ \text{-gulo})\omega$
bird -PL
'the birds'

In sum, it could be argued that when a plural classifier *-gulo/-guli* is selected, then Bengali plurality is expressed in a PWd adjoined representation. If the plural marker *-ra/-era* is selected, then Bengali plurality is potentially expressed in a PWd internal representation. In contrast, the English plural morpheme is always attached to the prosodic word in a PWd adjoined prosodic representation.

3.5 Verbal morphology and prosodic representation in Sylheti

In Section 3.2, Sylheti was considered in relation to a dialectal continuum and the phonemic inventory was compared to that in Bengali (both KCB and DCB). In the following section, the prosodic representation of Sylheti inflectional morphology is analysed in terms of vowel height assimilation, particularly regarding whether Sylheti verbs, like Bengali verbs, are subject to vowel height assimilation, and whether this can help determine how Sylheti verbs are prosodically represented.

3.5.1 Sylheti: Simple present and simple past

Although Sylheti verbs appear to fall into two main categories, dependent upon whether the stem is consonant or vowel-final, some similarities can be drawn to the classification system for Bengali verbs (see Section 3.3.2). In the case of a consonant-final Sylheti verb, such as *xor-* 'to do', the stem vowel does not raise from /o/ to /u/ (80a). Vowel height assimilation, however, can be seen in the Class 1 (CVC) Bengali verb *kɔra* 'to do' (80b).[23] Examples adapted from Thompson (2012, p.370) and Chalmers (1996, p.28).

(80) a. xor -∅ -i
do -PRS -1
'I do' (Sylheti)

b. kor -∅ -i
do -PRS -1
'I do' (Bengali)

Vowel raising does not take place in Bengali verbs in the simple present in the context of a non-high affix, as in the 2nd person familiar /-o/ (81a), but it does take place in the 2nd person ordinary with a high vowel affix /-i/ (81b). There is no expected distinction between the simple present forms in Sylheti according to the type of second person agreement, as the inflectional morpheme /-o/ is not a high vowel. This is shown in (81c) and (81d).

(81) a. kɔr -∅ -o
do -PRS -2FAM
'you do' (Bengali)

[23]Following Chalmers (1996), the Sylheti verbs included in this analysis are purposefully kept in the root rather than citation form in order to help distinguish between Sylheti and Bengali verbs.

b. kor -∅ -i
do -PRS -2ORD
'you do' (Bengali)

c. xor -∅ -o
do -PRS -2FAM
'you do' (Sylheti)

d. xor -∅ -os
do -PRS -2ORD
'you do' (Sylheti)

The same pattern occurs when the vowel-final Sylheti verb *de-* 'to give' is compared to the Class 3 (CV) Bengali verb *dewa* 'to give' in the simple present (first person). There is no evidence of vowel height assimilation in the simple present in Sylheti (82a), unlike that in Bengali (82b).

(82) a. de -∅ -i
give -PRS -1
'I give' (Sylheti)

b. di -∅ -i
give -PRS -1
'I give' (Bengali)

However, vowel raising does appear to occur in the simple past in the CV Sylheti verb *de-* 'to give' (83a), but not when the verb has a vowel-final stem of the Ca type (equivalent to Bengali Class 4 verbs), such as *xa-* 'to eat' (83b), or in CVC type verbs, such as Sylheti *xor-* 'to do' in the simple past tense (83c). With respect to (83a), the alternate stem vowel 'i' is present in all persons in the simple past tense. The vowel in (83b) is here assumed to follow that of Class 4 Ca verbs in Bengali, where the stem vowel does not alternate but changes to '-e' or '-ai' in different tense constructions.

(83) a. di -l -am
give -PST -1
'I gave' (Sylheti)

b. xai -l -am
eat -PST -1

'I ate' (Sylheti)

c. xor -l -am
do -PST -1
'I did' (Sylheti)

Vowel raising is, of course, in evidence in Bengali simple past *kɔra* 'to do' (84a) and *dewa* 'to give' (84b).

(84) a. kor -l -am
do -PST -1
'I did' (Bengali)

b. di -l -am
give -PST -1
'I gave' (Bengali)

Considering the examples presented here regarding the production of Sylheti simple present and simple past verbs, there is little evidence to suggest that vowel height assimilation occurs in Sylheti verbs. Vowel raising is only evident in the context of CV verbs with an 'e' final-stem. Chalmers (1996, p.28) notes that Sylheti verbs with a stem-final 'e' (such as Sylheti verb *de-* 'to give') alternate between stem vowel 'e' and 'i', and pattern differently from other (more ubiquitous) CV and CVC verbs. As there is no vowel lengthening in the present simple when there is a high vowel affix as shown in (80a), this casts doubt on the possibility that the Sylheti past tense marker /-l-/ is, like Bengali, also prefixed with a 'floating' or underlying /-i-/ marker, prompting the vowel height assimilation seen in (83a). Whilst there does not appear to be evidence for vowel height assimilation in the production of Sylheti verbs in the simple present or simple past, the production of the present and past perfect tenses is considered next.

3.5.2 Sylheti: Present perfect tense

When the Sylheti verb *de-* is compared to the Bengali verb *dewa* 'to give' in the present perfect, vowel raising is evident in both dialects (85) and this is also in evidence in the past perfect tense (86).

(85) a. di -s -∅ -i
give -PRF -PRS -1
'I have given' (Sylheti)

b. diy-e -c^h -∅ -i
give.PRF -PRF PRS -1
'I have given' (Bengali)

(86) a. di -s -l -am
give -PRF -PRS -1
'I had given' (Sylheti)

b. diy-e -c^h -i -l -am
give.PRF -PRF -link PST -1
'I had given' (Bengali)

However, as expected, there is no evidence of vowel raising in the present or past perfect form of Syhleti *xor-* 'to do' (87a) and (88a).

(87) a. xor -s -∅ -i
do -PRF -PRS -1
'I have done' (Sylheti)

b. kor-e -c^h -∅ -i
do.PRF -PRF -PRS -1
'I have done' (Bengali)

(88) a. xor -s -*i* -l -am
do -PRF -*link* -PST -1
'I had done' (Sylheti)

b. kor-e- c^h -i -l -am
do.PRF -PRF -link -PST -1
'I had done' (Bengali)

Assuming Sylheti has a bimoraic minimal word requirement similar to that in Bengali (Section 3.3.1), without a PWd marker, such as the highlighted perfective participle in Bengali (89), there is no clear evidence for a second mora denoting a well-formed minimal word in the Sylheti stem in (85a), (86a), (87a) or (88a). If the stem is not bimoraic and does not constitute a well-formed PWd, the inference is that inflection must be incorporated into the PWd. It is, of course feasible that a bimoraic minimal word requirement can be met through the creation of a mora, which is filled through vowel lengthening, or equally it could well be that in the case of Sylheti, there is no bimoraic minimal word requirement.

(89) **kor-e** -c^{h} -i -l -am
do.PRF -PRF -link -PST -1
'I had done' (Bengali)

3.5.3 Summary of analysis of Sylheti prosodic representation of inflectional morphology

Sylheti verbal inflection was analysed in relation to vowel height assimilation, a process which can help determine PWd boundaries in Bengali. It would appear that in the absence of consistent evidence of vowel height assimilation in Sylheti (in relatable contexts to those which are of relevance to vowel raising in in Bengali), it is not possible to indicate whether inflection is adjoined to the PWd, particularly with respect to Sylheti present and past perfect. However, this is not to say that a PWd adjoined prosodic representation is not available, or required, in the production of Sylheti inflectional morphology.

A point of interest is the apparent lack of vowel height assimilation with the Sylheti CVC verb *xor-* 'to do' in all instances of verbal inflection in this analysis. Superficially, this would seem to suggest that Sylheti vocalic inflectional affixes do not influence the height of the stem vowel. However, it is also plausible that with respect to the Sylheti vowel inventory (see Section 3.2.3.3), Sylheti /o/ has merged with /u/ (and /ae/ with /e/), as proposed by Gope and Mahanta (2015). Under this analysis, the Sylheti vowel inventory consists of five rather than seven vowels as reported in Section 3.2.3.3. Only non-high stem vowels would be subject to vowel raising; a verb with a high stem vowel (in this case the merged /o, u/) would not undergo vowel raising. Assuming the past tense marker is preceded with an underlying high vowel /*-(i)-l-*/, and *xor-* 'to do' has a high stem vowel, then this proposal is consistent with the behaviour of the stem vowel in (83c) *xor-l-am* 'I did' and also (83a) *di-l-am* 'I gave'. This could also explain the production in (80a) *xor-i* 'I do'.

This analysis does not explain why *de-i* 'I give' (82a) and *xai-l-am* 'I ate' (83b) do not show evidence of vowel raising. Vowel alternations are common across Bengali verbs in the case of non-high stem vowels, except when the vowel is /a/ (Lahiri, 2000, p.75). There is a possibility, therefore, that Sylheti verbs with /a/ stem vowels, such as *xa-* 'to eat', also operate differently from the other verb classes. The situation with *de-i* 'I give' (82a) may be explained by glide formation, whereby the affix is incorporated into the PWd and syllabified. The past perfect forms in (88a) and (88b), show that although there is a clear difference between the two dialects as inflection in Bengali is attached to a perfective participle which equates a PWd, there is similarity in syllabification between both Sylheti and Bengali, attaching the simple past and person marker with a vowel /-i-/, linking the inflection to the stem.

To conclude, further analysis is required in order to establish whether Sylheti simple past or perfect forms are represented in a PWd adjoined representation. However, Sylheti does show some similarity to Bengali in that verbs with an /e/ stem vowel do raise to /i/ in certain environments, and if Gope and Mahanta (2015) are on the right lines, it could be that vowel merging has, in some cases, such as the merging of Sylheti /o/ with /u/, become a more permanent feature of the Sylheti verbal system than is the case in Bengali. At this point, however, the analysis proceeds with consideration of the requirements of English inflectional morphology in relation to the accessibility of Bengali prosodic representation in the interlanguage.

3.6 An overview of Bengali prosodic representation and the suppliance of L2 English inflectional morphology

With reference to the discussions on Bengali prosodic representation of inflectional morphology, it has been proposed here that Bengali affixation is structured in both a PWd adjoined and PWd internal representation. This means that with respect to the demands of L2 English prosodic representation, the L1 provides a 'match' in terms of the required representations in the production of L2 English tense and agreement inflectional morphology. The situation for L1 Bengali speakers, therefore, is arguably unlike that facing, for example, L1 Mandarin speakers of L2 English. Bengali simple past inflection is incorporated into the PWd, and this mirrors the situation for English irregular simple past tense. For Bengali present perfect and past perfect tenses, the inflection is adjoined to the PWd, paralleling the situation for English regular simple past verbs and third person singular and plural noun agreement, although the representation of the functional morpheme differs. Both English and Bengali PWd adjoined representations violate NONREC and EXHAUST. In English, the consonantal inflectional morpheme is the OEHS. For Bengali, present and past perfect inflection is attached to a disyllabic perfect participle and the person marker for /*(c)chi*/ stems is always vowel-final (see Table 3.9); assuming the final consonant is an onset, in Bengali PWd adjoined representation for perfect morphology, the nucleus is always filled.[24]

[24]Under Government Phonology (Kaye et al., 1990; Kaye, 1990), the coda licensing principle states that a branching rhyme is possible when there is a following consonant in the onset position, but an onset must be followed with a nucleus. In this analysis both English and Bengali allow an OEHS, where the nucleus can be silent and words can be both vowel or consonant final. However, whilst English allows consonant clusters word-finally, Bengali only allows a single consonant in word-final position.

3.6.1 Prosodic representation in the L1 and L2: The required and the transferable in accordance with the PTH

The required prosodic representation for English inflectional morphology for regular simple past tense, third person agreement and plural noun agreement is PWd adjoined, whereas the irregular past tense requires a PWd internal representation. This is summarised in Table 3.12. Bengali inflectional morphology available to transfer to the interlanguage is also illustrated in Table 3.13. Note that as shown in line (4), plural noun agreement is proposed to be available in both the PWd adjoined and PWd internal representations, depending upon the choice of inflectional morpheme (Section 3.4.3).

PWd representation	tense	example
PWd internal	simple past (irregular verbs)	slept
PWd adjoined	simple past (regular verbs)	stopped
PWd adjoined	3rd person singular agreement	(s/he) stops
PWd adjoined	plural noun agreement	dogs

Table 3.12: Required prosodic representation for English tense and agreement.

As briefly discussed in Chapter 2, whether an L1 prosodic representation must undergo minimal adaptation or whether it is readily available for transfer, can be considered in terms of transfer type according to the conditions for minimal adaptation (Goad and White, 2004, 2006), in the light of a strong interpretation of the PTH. In the strong version, suppliance of inflectional morphology is dependent upon whether the required prosodic representation (unavailable in the L1), can be built under the conditions referenced in (91) and (92), and omission of inflection is due to the inability to build a new structure under the specified circumstances. For example, in (90) the transfer procedure is the most straightforward when there is a direct match between the L1 and the L2 (i.e.

	PWd representation	tense	example	gloss
(1)	PWd internal	simple past	buj^{h}-l-am	'I understood'
(2)	PWd adjoined	past perfect	buj^{h}e-c^{h}-i-l-am	'I had understood'
(3)	PWd adjoined	present perfect	buj^{h}e-c^{h}-i	'I have understood'
(4)	PWd internal & PWd adjoined	plural noun agreement	pak^{h}i-ra pak^{h}i-gulo	'(the) birds' 'the birds'

Table 3.13: Prosodic representations available for transfer from Bengali.

prosodic representation and functional morpheme match). In this study, Bengali PWd internal representation for simple past inflectional morphology, is a match with the L2 (irregular) simple past verbs. In this example, transfer of L1 PWd internal representation to the interlanguage is the most straightforward and accommodating in terms of the suppliance of L2 inflectional morphology.

(90) T = straightforward transfer from the L1 to the interlanguage (e.g. L1 and L2 represent the inflectional morphology in the same structure).

(91) T(a) = target representation achieved via transfer under the condition of 'when they can be built through combining L1 licensing relations'. For example, combination of a Mandarin compound (i.e. PWd dominate a PWd), and adverb structure (i.e. PWd dominate a syllable) produces a PWd adjoined representation otherwise not available in the L1 to transfer (Goad and White, 2006).

(92) T(b) = target representation achieved via transfer under the condition of 'when they involve L1 structures being licensed in new positions'. For example, 'flipping' adjunction from the left edge of the PWd, as in the prosodic representation of the Turkish article to the right edge of the PWd, required for English tense and agreement (Goad and White, 2004).

For the representation of L2 regular simple past verbs, Bengali prosodifies present and past perfect tenses outside the PWd. In some accounts of the PTH, this might be considered a transfer type 'T(b)', as described in (92). Bengali simple past tense is prosodified internal to the PWd, and therefore for the suppliance of inflection on English regular simple past verbs, the PWd adjoined prosodic representation should be minimally adapted and licensed to a new position in the interlanguage (i.e. present and past perfect tense is adjoined to the PWd, and suppliance of English regular simple past tense requires access to this structure). For example Cabrelli Amaro et al. (2018, p.512) propose that the Spanish person and number morpheme is structurally adjoined to the PWd, whilst Spanish tense, aspect and mood is prosodified internal to the PWd. In that study, it is proposed that the PWd adjoined structure must be minimally adapted by being licensed to a new position in the interlanguage for use with regular simple past tense morphology in English. In this respect, an available L1 structure which does not match with the same expression of functional morphology with the L2, must be re-licensed in order to do so.

Alternatively, a weak version of the PTH (Goad and White, 2009) allows that a prosodic structure which is not available in the L1 can be constructed in circumstances other than those referenced in (91) and (92). If a structure is present in the L1 and transferred to the interlanguage, then it is available for use in a new location, regardless as to whether it is licensed in that position in the L2 (or even in the L1). For illustration, Snape and Kupisch (2010, p.536) reference Turkish tense, which is prosodified in a PWd internal representation. The authors propose that it is feasible that the interlanguage grammar would allow some restructuring, so that functional morphemes other than tense (e.g. articles) could be represented in a PWd internal structure. In this version, it seems reasonable to assume that such restructuring in the interlanguage is not restricted to pre-existing L1 licensing relations, and that without the constraints imposed in the conditions of 'minimal adaptation', there is unbounded opportunity for learners to build or access required L2 structures. With respect to L1 Bengali speakers of L2 English, the PWd adjoined representation would therefore be available for use with different functional morphemes, and should be accessible to the representation of English regular simple past verbs (as well as third person agreement singular and plural noun agreement).

The situation for the suppliance of inflectional morphology for L1 Bengali speakers of L2 English, according to the strong and weak versions of the PTH, are interpreted as follows:

1 Strong version of the PTH:

   i Bengali PWd internal representation is available to transfer to the interlanguage grammar and represent English irregular verbs.

   ii Bengali PWd adjoined representation is available to transfer and to be licensed to a new position in the interlanguage grammar. Once it has been transferred and (re)licensed, it will be available to prosodically represent different functional morphemes from the L1 in the L2 (i.e to represent inflectional morphology of the simple past, third person singular agreement, plural noun agreement).

2 Weak version of the PTH:

   i The Bengali PWd internal representation is, as in the strong version, a straightforward transfer to interlanguage grammar and available to represent English irregular verbs.

   ii Bengali PWd adjoined representation is available to transfer and adapt to a new position in the interlanguage grammar and will be available to prosodically represent (multiple) different functional morphemes in the L2.

3.6.2 Interim summary

In the case of Bengali PWd adjoined prosodic representation, it would appear that there is little difference in the prospects of its availability to represent L2 inflectional morphology in either the strong or weak version of the PTH. This may, in part, be due to the interpretation and possible overlap between licensing under the strong interpretation and adaptation under the weak version. If the interpretation is assumed along the lines of Cabrelli Amaro et al. (2018), then Bengali PWd adjoined should be licensed to a new position in the interlanguage. If it is assumed along the lines of Snape and Kupisch (2010), then Bengali PWd adjoined representation is available for adaption in a new location in the interlanguage. As the PWd adjoined structure represents multiple functional morphemes in English (regular simple past, third person agreement and plural noun agreement), it would appear that the weak version would allow unfettered access once the structure is transferred to the interlanguage. In other words, there should be no difference between the suppliance of inflection across L2 inflectional morphemes which require the PWd adjoined representation. However, if the prosodic representation should be licensed to a new position in the interlanguage, this may restrict access according to functional morpheme, and differences may be seen across the suppliance of inflection of L2 inflectional morphemes which require the PWd adjoined representation.

3.6.3 Suppliance of L2 inflectional morphology: Minimal word and moraic structure

In most cases Bengali inflection, whether represented internal to or adjoined to the PWd adds a light (monomoraic) syllable to the output, as the person inflectional morpheme is vocalic and moraic, and a light syllable is represented with one mora.[25] The addition of inflection, therefore, creates a well-formed bimoraic verb (the verb root being monomoraic and subminimal), fulfilling the minimal word constraint. This is particularly so in the case of Bengali simple past tense. In the case of the present or past perfect tense, the inflectional morpheme attaches to an already well-formed bimoraic word (the perfect participle) creating a polysyllabic output. In Bengali, there are only a few examples where an additional mora, created through an inflectional morpheme, is representative of a heavy syllable (a heavy syllable is represented with two moras). This happens when the verb root ends in a vowel (e.g. $k^h a$- 'eat') and the 2nd person ordinary affix in the simple present, (VC) /-*is*/ is attached. In this case, the first vowel of the affix is deleted (under the analysis that a weak mora cannot branch) and the root vowel is subsequently

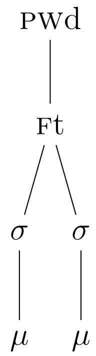
[25]In accordance with moraic theory for syllable weight (Hyman, 1985).

lengthened, creating a bimoraic monosyllabic output as shown in example (93).[26]

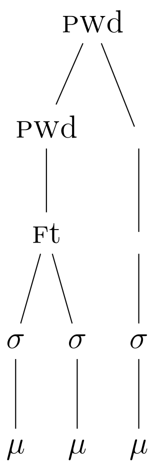
(93) /kʰa -is/→[kʰaːs] 'you eat'

The Bengali inflectional morpheme otherwise either creates a well-formed bimoraic disyllabic verb (94) as in the simple past inflectional morpheme, or attaches to a well-formed bimoraic disyllabic base form, as in the present or past perfect inflectional morpheme (95). As discussed in Section 3.3.1, the Bengali phonological word is minimally CVV, and final consonants are reported to be either non-moraic or moraic, but extrametrical.

(94)



(95)

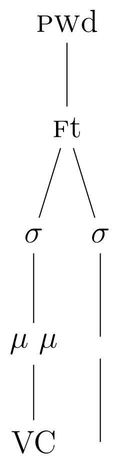


One of the tasks for the L1 Bengali speaker in the suppliance of inflectional morphology in L2 English applies to the accommodation of different moraic structure related to minimal word requirements. For the PWd internal representation illustrated in (96) and (97), the

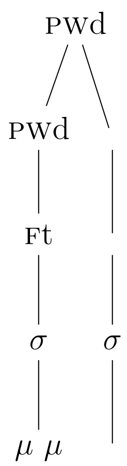
[26]This is explained with respect to Prosodic Lexical Phonology; roots do not undergo a cycle of phonological rules before affixation, whereas a stem does. The root + affix in the example $k^h a$ *-is* creates branching of the weak mora which is disallowed (Fitzpatrick-Cole, 1990, p.161).

L1 Bengali speaker must allow a non-moraic consonantal inflectional morpheme to be incorporated or attached to a word.

(96)



(97)



The potential for problems arises for an L2 English (C)VC root verb after the inflectional morpheme has been incorporated into the word, because without adding a mora, the output is subminimal according to L1 minimal word requirements. The vowel in the root is represented with one mora, but as Bengali does not associate moras with final-consonants, there is no second mora to create a bimoraic minimal word. At this point it is expected that a repair would be necessary to prevent output of a subminimal form, and epenthesis is one of the ways in which a disallowed syllable can be remedied. Epenthesis would not only fill and supply the required mora to create a well-formed bimoraic phonological word, but would also most closely replicate the shape of the (C)VC inflectional affix of the L1 (e.g. /*-l-am*/), whilst also avoiding a word-final consonant cluster. If L1 Bengali speakers accurately supply irregular simple past verbs in the target-like PWd internal representation, then productions such as /**kep-ət*/ may be attested, the confound being that this could be due to either avoidance of a consonant cluster or manipulation of the L2 moraic structure to fit the L1 minimal word template. An alternative repair could be to avoid the vowel shortening that applies in the irregular verbs of the pseudo-inflected forms, projecting instead a bimoraic structure on a long (tense) vowel (e.g. **kiːpt*), to satisfy the L1 minimal word requirements.[27] If learners apply the PWd internal representation as a non-target structure to accommodate regular simple past verbs (because PWd internal structure represents Bengali simple past tense), then it would be expected that an epenthetic vowel would also be attested as in /*stɒp -əd/.

Similarly, when L1 Bengali speakers are tasked with producing an L2 English PWd adjoined representation, the L2 English form is potentially problematic, as it may not fulfil the bimoraic minimal word requirements of the L1 with respect to moraic structure. This is particularly the case regarding regular simple past verbs (and third person singular agreement, although examples will be supplied in the case of simple past verbs), and more specifically regular past tense verbs with short (lax) vowels (e.g./ɒ/ *stɒp*) in contrast to those with long (tense) vowels (e.g. /iː/ *clean*) or diphthongs (e.g. /əʊ/ *smoke*). Whilst the long vowel forms or verbs with diphthongs would be bimoraic and therefore acceptable according to the L1 minimal word requirements, the short vowel verb stems would not as they would be considered monomoraic according to L1 moraic structure. Again, a likely solution is that epenthesis is applied to add a mora and repair the verb stems which are not bimoraic and therefore not acceptable according to L1 minimal word requirements (i.e. the repair of short vowel verb stems but not long vowel stems or those with a diphthong). The relevance of this to suppliance of inflection is as follows: if learners repair a short vowel subminimal verb stem with an epenthetic vowel, then it is more likely that inflection will be supplied, at some levels of proficiency. This is because

[27]Epenthesis was witnessed in the output of an L1 Bengali speaker participating in a pre-experimental stage pilot test. Almost every regular verb in the simple past tense was produced with a schwa and consonant /-ə*d*/ (e.g. stɒp -əd).

a vowel is made available to which the consonantal inflection can be attached, and also because attention is focussed on the short vowel verb stems. In contrast, the long vowel (and diphthong) verb stems would be considered well formed according to L1 minimal word constraints, and would not require immediate repair. As attention is not focussed on the long vowel verb stems, inflection is less likely to be supplied at some stages of proficiency, and the suppliance of inflection will be depressed on long vowel verb stems until later stages of proficiency.

3.6.4 Interim summary

The influence of L1 minimal word requirements will arguably focus attention on the well-formedness of the verb stem to which inflectional morphology is to be attached. The moraic structure determines whether a stem is considered well-formed or not, and the length of vowel is crucial in the calculation of mora and syllable weight. Learners will subsequently focus attention on verb stems which need repair, and these stems are therefore more likely to receive an extra vowel in fulfilment of an additional mora, providing the opportunity for inflection to be incorporated into an epenthetic syllable. As long vowel (and diphthong) verb stems are considered well-formed, there will be no need for repair, and attention will not subsequently be drawn to verbs with this stem shape, and as a result it is speculated that inflection is more likely be omitted on long vowel verb stems, at least at initial and lower levels of proficiency.

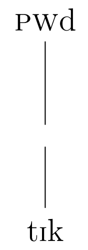
So far, the focus has been on a theoretical analysis of the prosodic representation of inflectional morphology in Bengali, and to a lesser degree, in Sylheti. This has been applied to the availability of Bengali prosodic representation, in relation to transfer to the interlanguage, in the context of the requirements of L2 English in the suppliance of inflectional morphology, specifically simple past tense, third person singular agreement and plural noun agreement. Suppliance of L2 English inflectional morphology is the main purpose of Experiment 1. Experiment 1A analyses suppliance of L2 English inflectional morphology in spoken production, and Experiment 1B measures the accuracy in recognising correct and incorrect examples of inflectional morphology in a GJT reading task. The prime purpose of Experiment 2 is to analyse where L1 Bengali speakers form prosodic boundaries in the representation of L2 inflectional morphology, and the theoretical background to Experiment 2 is discussed in the following section.

3.6.5 Determining prosodic boundaries in L2 productions

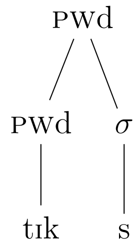
Experiment 2 attempts to determine whether L2 inflectional morphology is supplied in target-like prosodic representation. A possible scenario is that regular simple past (and third person singular agreement and plural noun agreement) are accommodated within the PWd internal representation. This is because it is a direct match with the L1 for tense, and if regular simple past verbs can be incorporated into the prosodic word, then it may naturally follow that other functional morphemes are also incorporated into the PWd. Assuming that L1 transfer of prosodic representation entails the transfer of L1 minimal word constraints, it has been predicted that one way to repair subminimal forms is with an epenthetic vowel. Alternatively, L1 Bengali speakers may apply vowel lengthening (and reject vowel shortening in irregular forms) as an automatic response to adding a mora in order to fulfil the L1 minimal word requirements. The relevance of this in relation to Experiment 1, and with reference to the PTH, is that instances (or absence) of vowel lengthening in L2 English by L1 Bengali speakers could potentially provide insight into the prosodic representation of the affixation of L2 inflectional morphology.

To illustrate this, an example of the tetrad of the token forms tested in Experiment 2 is set out with the base form 'tick' as follows. Example (98) shows the transition required from a PWd internal representation for a monosyllabic verb to a PWd adjoined representation in a monosyllabic verb+C affix (99). Example (100) illustrates the PWd internal representation required for a bimoraic disyllabic form and (101) illustrates the PWd adjoined representation for a monosyllabic verb+V(C) affix.

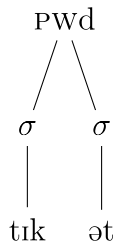
(98)



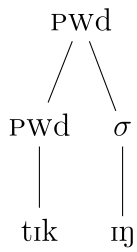
(99)



(100)



(101)



Vowel lengthening is considered in relative terms in this context, in that a bimoraic form will not show vowel lengthening but a monomoraic form would. It is predicted that if Bengali vowel lengthening is applied in the interlanguage as a transferred response to the strategy of adding a mora, alongside the transfer of L1 prosodic representation (at lower proficiency levels at least), then lengthened vowels will be in evidence in some, but not all instances of production of a tetrad of tokens. This is illustrated in (102).

(102) a. [tiːk]ω
'tick'

b. [[tiːk]ω -s]ω
'tick -s'

c. [tiːk -s]ω
'ticks'

d. [tik -ət]ω
'ticket'

e. [tik -ɪŋ]ω
'ticking'

f. [[tiːk]ω -ɪŋ]ω
'tick -ing'

An English monomoraic monosyllable word, would according to the L1 Bengali minimal word requirements, undergo mora addition and vowel lengthening in order to ensure a bimoraic output (102a). According to Fitzpatrick-Cole (1990), this is an automatic response which steps in to fill the space made by creating an additional mora to avoid a subminimal form, and different from a repair strategy such as epenthesis. Epenthesis is predicted in this study as a way to avoid a disallowed syllable shape. This would result in a target-like prosodic representation (PWd internal), but non-target like in the insertion of a mora and vowel lengthening within the PWd. Similarly, as shown in (102b), vowel lengthening is predicted to address the monomoraic lower PWd before affixation, although it is equally feasible that a non target-like PWd internal representation could accommodate the inflection in (102c). In this case, it is predicted that vowel lengthening would still apply post-lexically once affixation is complete, as there is no second mora. There is no prediction for vowel lengthening in disyllabic and bimoraic monomorphemes as shown in (102d), as the L1 minimal word requirement is fulfilled within the PWd. For verbs with a V(C) affix, there is again an option that the inflection is absorbed within the PWd as illustrated in (102e). In this example, vowel lengthening is not predicted as vowel lengthening as a repair strategy would apply after affixation, and the affixation supplies the required second mora to create a bimoraic minimal word. However, if the affixation is adjoined to a PWd, then it is predicted that vowel lengthening will first take place in the lower PWd, to allow affixation to adjoin to a well-formed PWd, as shown in (102f).

3.7 Consolidation

Before moving on to discuss the experimental aspects of this study, it is worth taking the opportunity to first consolidate the language background and theoretical linguistic analysis reported here so far. This study was motivated by the PTH, which provides a phonological explanation for the well-documented issues adult L2 learners have with the production of inflectional morphology in spoken discourse. Rather than being attributed to phonotactic issues, such as the permitted sequence of consonants, the PTH proposes that omission of L2 inflectional morphology is related to the way in which inflection is incorporated or attached to the PWd in the L1. For example, research on the PTH has proposed that Mandarin does not represent inflectional morphology in a PWd adjoined representation, although the PWd adjoined structure can be constructed by combining two different representations in Mandarin and re-licensing to a new position in the L1 (Goad and White, 2006). The PWd adjoined representation is a required structure for English simple past tense, third person singular agreement and plural noun inflections, and if this structure is not available in the interlanguage, then it is predicted that omission and variable production of the obligatory inflection will prevail. Later studies suggested that prosodic representations may be more fluid than initially proposed, and that the existence or construction of a required representation may be more readily available and interchangeable with different constructions in the interlanguage (Goad and White, 2009). This in turn has created the distinction between a 'weak' and 'strong' version of the PTH.

The current study attempts to contribute to the experimental data in relation to the PTH by including Bengali, a relatively under-researched language in generative second language acquisition, first by analysing the prosodic representation of inflectional morphology in Bengali, and secondly by testing the spoken production of L2 English inflectional morphology by L1 Bengali speakers. The analysis of vowel height assimilation and other factors, such as the placement of clitics and the diglossic nature of Bengali, led to the proposal set out here that Bengali has both PWd internal and PWd adjoined prosodic representations. Unlike, for example, speakers of L1 Mandarin, L1 Bengali speakers are predicted to be able to take advantage of L1 transfer of prosodic representation to the interlanguage, which are required for the production of L2 English inflectional morphology. However, whether the Bengali prosodic representations are available in the interlanguage under the terms of the 'strong' or 'weak' version of the PTH is subject to further analysis. The Bengali PWd internal representation is proposed to be directly available for L2 inflectional morphology once transferred to the interlanguage, which is considered a straightforward transfer or 'T'. The Bengali PWd adjoined representation is required for present and past perfect tenses, but depending on the version of PTH, is either openly available (T 'weak' version) or must be licensed to a new position (T(b) 'strong' version). Either way, the situation for L1 Bengali speakers appears to be far more facilitative in terms of L1 transfer of prosodic representation than it does for an L1 Mandarin speaker of L2 English. In Experiment 1, suppliance of L2 English inflectional morphology by L1 Bengali speakers is tested according to whether (a) there is any delay in the production of inflection which requires a PWd adjoined representation compared to a PWd adjoined representation, and (b) whether it s possible to discern whether transfer is more akin to a weak or strong version of PTH.

However, whilst the prosodic representation of Bengali inflectional morphology appears to be facilitative, there is some possible discrepancy with respect to the minimal word requirement of Bengali and English, and this is relative to the prosodic structure below the level of the PWd, at the level of the mora. Whilst Bengali PWd internal and PWd adjoined prosodic representations are theoretically available to transfer to the interlanguage, the Bengali minimal word (minimally CVV) presents a potential hiccup. With respect to the PWd internal representation, in all but a few isolated cases, the Bengali inflectional morpheme of tense and person marker brings an additional mora to the otherwise monomoraic verb stem, fulfilling the bimoraic minimal word requirement. In English, however, the verb stem is also potentially monomoraic (if the stem vowel is a short or lax vowel), but the English inflectional morpheme does not come attached to a mora. In this respect, according to L1 Bengali minimal word requirements, English inflection internal to the PWd would be considered subminimal. Similarly, Bengali PWd adjoined prosodic representation attaches direct to a well-formed minimal word (the perfective participle creates a bimoraic minimal word), and in this respect there is again a mismatch between the English and Bengali PWd, if the stem vowel is a short or lax vowel. Experiment 1 also asks whether the stem vowel (short vowel/long vowel) has any bearing on whether inflection is supplied more consistently, and that if attention is drawn to a potentially subminimal form, whether inflection is more likely to be applied with the help of an epenthetic vowel.

As Bengali subminimal stems undergo vowel lengthening under certain conditions, it is also possible to further investigate the potential for transfer of L1 minimal word requirements to L2 English forms. An overarching question which is addressed in Experiment 1 and Experiment 2 is whether L1 transfer of prosodic representation necessarily entails transfer of prosodic constituents, namely moraic structure, below the level of the PWd, and whether this, as well as transfer of L1 prosodic representation, has any bearing on whether inflectional morphology is supplied more accurately or not. In this respect, Experiment 2 focuses on minimal tetrads, which are predicted to undergo vowel lengthening according to where the prosodic boundary is drawn. This analysis of potential vowel lengthening may in turn be able to inform as to whether L2 English inflection is supplied in a target-like prosodic representation.

Finally, as Bengali is generally considered to be on a dialectal continuum, and as a number of participants in this study are also speakers of the Sylheti dialect, it was also considered provident to analyse prosodic representation of inflectional morphology in Sylheti, in order to establish whether there were similarities or differences which should be controlled for in the analysis. However, there was no conclusive evidence to suggest that Sylheti differs greatly from Bengali, or that Sylheti follows the same patterns as Bengali, although there are some parallels which deserve further investigation. The statistical analysis incorporates whether participants are also speakers of the Sylheti dialect, but otherwise, the Sylheti dialect is not further analysed in this study.

3.8 Chapter summary

The prosodic representation of Bengali inflectional morphology has been discussed in relation to that in English, and the linguistic background for the proposed availability of a PWd adjoined and PWd internal prosodic representations has been analysed and discussed. This has taken into account the diglossic nature of Bengali, as well as the system for verbal morphology and the phonological process of vowel height assimilation and moraic repair with subsequent vowel lengthening. The dialectal variation of Bengali has also been considered, and some differences between dialects have been highlighted, both phonological and morphological. A further exploration of Bengali minimal word requirements and moraic structure has been considered in relation to that in English, with respect to how constraints below the level of the prosodic word interact with the transfer of L1 prosodic representation of affixation. The following chapter provides an introduction to the two small experimental studies which constitute the second part of this study, beginning with an overview of the predictions for the suppliance of L2 English inflectional morphology by L1 Bengali speakers.

Chapter 4

Methodology

4.1 Introduction

The main purpose of this study is (a) to analyse the prosodic representation of Bengali inflectional morphology with respect to that in English (and where relevant with the Sylheti dialect) and (b) to test the predictions of the PTH in the suppliance of L2 English inflectional morphology by a small group of L1 Bengali speakers. A further, overarching aim is to test whether transfer of L1 constituents, particularly moraic structure below the level of the prosodic word, also plays a role in the suppliance of L2 inflectional morphology. This is particularly with reference to minimal word requirements, especially when there is a mismatch between the L1 and the L2. The research questions are restated in (103).

(103) a. Are the predictions of the PTH regarding the suppliance and omission of inflectional morphology and transferability of prosodic representation supported by the data from L1 Bengali speakers?

b. Is there evidence of transfer of L1 minimal word requirements and moraic structure to the interlanguage, alongside prosodic representation of inflectional morphology? If so, can this help define prosodic word boundaries and identify prosodic representation of L2 inflectional morphology?

This study is divided into two parts. The first experiment tests the suppliance of inflectional morphology by L1 Bengali speakers with respect to the required L2 prosodic representation and the availability and transferability of prosodic structures in the L1. The overall suppliance results are then considered against those from a grammaticality judgement test (GJT), to establish whether suppliance of inflection is commensurate with syntactic knowledge. This is to test whether it is possible to eliminate the cause of omission of inflection as a deficit in syntactic representational knowledge of the required structures, and to implicate a phonological fault. To ascertain whether the transfer of L1 minimal word requirements and moraic structure is at play, the suppliance of inflectional morphology within the verb categories of tense and agreement is further explored by analysing suppliance of inflection by vowel length and voicing quality of the stem-final consonant. The second experiment tests whether prosodic boundaries, and subsequently prosodic representation of affixation, can be determined. This is tested by assuming the application of L1 minimal word requirements and constraints, involving vowel lengthening in some permutations of sets of tetrads of inflectional forms. An overview of the predictions and study design follows.

It is assumed that as L1 Bengali speakers have access to the required prosodic representations, by high levels of proficiency any (minimal) adjustment to the PWd adjoined representation will be complete and there will be no difference in suppliance rates between inflectional morphology supplied in a PWd adjoined or PWd internal representation.[1] At lower levels of proficiency, the following predictions are made.

1. In terms of transfer of L1 prosodic representation of affixation (PTH), the context of an overview of spoken suppliance of L2 inflectional morphology and in a comparison of spoken suppliance in relation to syntactic knowledge of underlying representation of inflectional morphology:

   (a) Spoken suppliance of inflectional morphology will be greater on irregular simple

[1]Depending on the weak or strong version of the PTH, the PWd adjoined representation may either need to be licensed or adapted to a new position in the interlanguage.

past verbs than regular verbs, third person singular agreement or plural noun agreement because the prosodic representation PWd internal (required for L2 irregular past tense verbs) is readily available for transfer to the interlanguage.

(b) Syntactic knowledge and representation of L2 inflectional morphology will be greater than suppliance of inflectional morphology in spoken production, and the GJT scores will be higher across all verb categories than is in evidence in overall spoken suppliance data.

2. With respect to transfer of L1 minimal word requirements and moraic structure in the context of the suppliance of inflection on regular simple past tense verbs there are two predicted outcomes; learners will produce inflection more consistently on short vowel verb stems with the inclusion of an epenthetic vowel, or there will be no evidence of epenthesis and learners will produce inflection on short and long vowel verbs equally.

   (a) If there is no evidence of epenthesis as a phonological repair strategy, it is predicted that learners will address minimality requirements by resorting to L1 strategies; an additional mora will repair the subminimal short vowel verb stem, and the stem vowel will be lengthened to fill the vowel. As there is no additional vowel to which a consonantal affix can be attached, suppliance of inflectional morphology will be equally depressed on short and long vowel verb stems, until the differences in moraic structure and minimal word requirements are resolved between the L1 and L2. Alternatively, repair of moraic structure will instigate noticing, and inflection will be added to the repaired stem more consistently than to the unrepaired (well-formed) stem.

   (b) If vowel lengthening as a result of mora repair is in evidence in the suppliance data, then it is also predicted that ablaut irregular simple past verbs will be inflected more consistently than pseudo-inflected verbs, or pseudo-inflected verbs will be produced without vowel-shortening in order to retain the moraic structure of a well-formed verb. Rather than dropping either the first or second consonant of a word-final consonant cluster, it is predicted that pseudo-inflected verbs will be supplied in the infinitive.

3. With respect to whether L1 Bengali speakers produce L2 inflectional morphology in a target-like prosodic representation, incidence of vowel lengthening as an outcome of L1 repair of moraic structure across a set of minimal tetrads (e.g. tick, tick-s, ticket, tick-ing) is tested to determine prosodic boundaries.

   (a) If vowel length is common across all forms except the disyllabic monomorpheme (e.g. ticket), affixation is represented in a target-like PWd adjoined prosodic representation, even if output is not target-like pronunciation.

   (b) If vowel length is greater in the stem (e.g. tick) and stem+C (e.g. tick-s) than in the stem+V(C) (e.g. tick-ing) and the disyllabic form (e.g.ticket), then affixation is not supplied in a target-like prosodic representation.

   (c) If vowel lengthening is a result of mora repair, then the voicing status of stem-final consonants should not influence the repair strategy and all stem-final environments should be treated the same.

This chapter proceeds as follows. In order to elucidate the research questions and predictions, a schematic outline of the study design is shown in Table 4.1. Then, the L1 Bengali-speaking subject population is discussed. The subjects for Experiment 1 and Experiment 2 were recruited from the same geographical area, but with different participants in each experiment. The background to the recruitment of participants is relevant across both experiments. The discussion then focuses on the two experiments, which are discussed in turn.

Testing for	Evidence
(a) Transfer of L1 prosodic representation	spoken suppliance of inflectional morphology (simple past, agreement, plurality)
(b) Syntactic representation or phonological difficulties	spoken suppliance of inflectional morphology and GJT
(c) Transfer of minimality requirements and moraic structure	spoken suppliance of inflectional morphology a) inflection according to stem vowel duration b) evidence of epenthesis
(a) Target-like prosodic representation of affixation	prosodic boundaries and the PWd a) evidence of pre-boundary vowel lengthening across sets of tetrads

Table 4.1: Outline of test design for Experiment 1 and 2.

4.2 Participants: L1 Bengali speakers

4.2.1 Recruitment: UK-based and Bangladesh-based participants

In this section the recruitment process for the L1 Bengali participants is discussed with respect to the two experiments, as well as the placement test procedure adopted in this study. The participant groups for both Experiment 1 and Experiment 2 and relevant linguistic background is then set out. Participants were given information about the research in both English and Bengali, and an information sheet was provided and a consent form was signed before the start of the experiment. Ethics approval was obtained from the University of Sheffield before data collection began.

The spoken production and GJT data for both Experiment 1 and Experiment 2 were gathered from adult L1 Bengali-speaking participants (age range from 18 years to 48 years old). The participants can be differentiated according to the place of residence at the time of testing; L1 Bengali speakers based in the UK (henceforth referred to as UK-based) and L1 Bengali speakers based in Bangladesh (henceforth referred to a Bangladesh-based). The reason for this geographical division of participating subjects is largely due to the application of the predictions of the PTH across proficiency levels. The PTH provides an explanation as to why L2 speakers of English omit inflectional morphology even when a high level of proficiency is otherwise in evidence. If L1 Bengali speakers at high levels of proficiency show no or little difficulty in the suppliance of inflectional morphology (in accordance with the predictions set out here in relation to the PTH), then it is at lower levels of proficiency, in the developmental stages, that omission of inflection should be in evidence. In order to test whether this is the case, a range of proficiency levels is required.[2]

However, with respect to proficiency level, the UK-based Bengali speakers primarily placement tested at Beginner and Elementary proficiency levels. The UK-based participants were recruited via a community-based programme (based in the Tameside area of Greater Manchester) organised by a charity-funded organisation. This organisation runs a number of on-site health and education-based programmes, aimed at the local Bengali-speaking community. Participants, who had been recruited for a ladies-only in-house 'English for speakers of other languages' (ESOL) course, were invited to take part in the current study. The relevance of this to the proficiency level of potential participants recruited in the UK is that the uptake of such community-based ESOL classes is usually by learners at lower levels of proficiency (primarily between Beginner and Elementary proficiency levels, with only some participants testing at Intermediate proficiency level or above). Similar to a number of other Bangladeshi communities in the UK, such as Tower Hamlets (Rasinger,

[2]The PTH does not make specific predictions at lower levels of proficiency, other than if the required prosodic representations are unavailable in the L1, then production of certain functional morphemes will be depressed, at least in the early stages of acquisition. The PTH is more concerned with determining the cause of omission of L2 inflectional morphology despite an overall proficiency in language use at higher levels of proficiency and the end-state. The absence of the required L1 prosodic representation or difficulties in building the required prosodic representation can partly account for such omission and variable production (e.g. Goad et al., 2003; Goad and White, 2006).

2007) and Leeds (Hamid, 2011), the participants from the Bangladeshi community in the Tameside area of Greater Manchester traditionally have connections to the Sylhet district in the north east of Bangladesh.[3] In more recent times, L1 Bengali speakers with connections to other districts of Bangladesh have also settled into this area of Greater Manchester, and were also participating in the community-run programmes. In short, the UK-based Bangladeshi participants recruited for this study were an all-female group of L1 Bengali speakers, at lower levels of proficiency.[4] However, although a greater number of participants were also speakers of L1 Sylheti, not all UK-based recruits were speakers of Sylheti. Furthermore, although all recruits also spoke at least one other dialect of Bengali, there was no homogeneity across other dialects spoken between participants other than that found across Sylheti speakers.

It was not possible to recruit participants from within the same community who were both L1 Bengali speakers with a higher level of L2 English proficiency level. This is because within the Bangladeshi family unit in this area of Greater Manchester, it is generally the situation that children are raised speaking English and Sylheti in the family home, but not Bengali. This is in fact also reported by Rasinger (2007, p.28) with respect to the Bangladeshi community in Tower Hamlets, London. However, Rasinger (2007) reports that from the 1980s, classes in Bengali, and not Sylheti, have been provided within the borough in order to promote cultural identity. This does not seem to be the case in the community from which the UK-based participants were recruited for this study. To recruit participants at higher levels of proficiency in L2 English and who were also L1 speakers of Bengali (with or without Sylheti) it was necessary, therefore, to look to recruit participants who were based elsewhere, and for this reason contact was made with Bangladesh-based participants at university in Bangladesh. The Bangladesh-based participants recruited for this study were L1 Bengali speakers and were university students at private institutions in Dhaka. However, there was no single dialect spoken in sufficient

[3]Both Rasinger (2007) and Hamid (2011) provide an ethnographic insight into the Bangladeshi communities under study within a focus on language acquisition and sociolinguistic analysis respectively.

[4]L1 Bengali speakers here refer to speakers of Dhaka Colloquial Bengali.

quantity which could be introduced into the analysis as a possible factor influencing the suppliance of L2 English inflectional morphology. As the differences between Bengali and Sylheti have been briefly touched upon in Chapter 3, and to take account of this in the statistical analysis, for some aspects of the study, the participants were also grouped according to whether they spoke Sylheti or not, as a binary distinction.[5]

4.2.2 Participant recruitment for Experiment 1 and Experiment 2

The participants were recruited in two stages. The participants in Experiment 1 were initially recruited in the community centre in Tameside, Greater Manchester, to take part in an in-house ESOL course based in the community centre, and the invite to take part in this study was as an extension to the course. This was a busy hub of the community, and it was often difficult to secure quiet areas for the testing procedure. The participants for Experiment 2 were recruited outside the community centre and were taking part in a (non-invasive) medical study held on the premises of a nearby medical centre in the same area of Tameside, Greater Manchester. Although this was not without outside noise interference, this location provided a much calmer environment for the recording involved in Experiment 2. It should be noted, however, that neither of these locations can be equated with a sound-proof recording booth, and the study is firmly set within the constraints and opportunities found within community-based studies of this nature.

4.2.3 Placement test: Oxford Quick Placement Test

The participants were placement tested according to the Oxford Quick Placement Test (OQPT). The OQPT in its 'paper and pen' version (in contrast to the computer-based version) is a multiple choice test of English language proficiency, which can be applied in

[5]Although the Bangladesh-based participants were exclusively university students, a number of participants in the UK-based group were also educated at college and university, but to allow for variation, educational background is a factor which is also taken into account in the statistical analysis.

different situations such as placement testing and screening, and which is designed to be appropriate for candidates of all ages and proficiency levels. It is timed and administered in two parts. Part 1 consists of questions 1-40 and is taken by all participants. Part 2 (questions 41-60) is only given to candidates who score over 35 points on Part 1 of the test.

The test allows for six proficiency levels ranging from beginner to very advanced. As proficiency testing is often seen as a rather arbitrary measure of language, the score bands are provided here in relation to those given in other tests of English in order to provide a framework into which the OQPT fits. The proficiency levels correspond to the Association of Language Testers in Europe (ALTE) descriptors, and the Common European Framework of References (CEF/CEFR) which bands learners from A1 (beginner) to C2 (very advanced) (Council of Europe, 2001, p.24). There are equivalent levels from Entry 1 through to Level 2, according to the UK national standards for English Speakers of Other Languages (ESOL) Qualifications and Credit Framework (QCF). The equivalent bands for Cambridge English examinations are also given in the final column, and for reference, the corresponding levels for the OQPT are illustrated in Table 4.2.[6]

4.2.4 Experiment 1: UK-based participants

A total of forty-four UK-based participants who attended the pre-course enrolment session agreed to take part in the experiment, although the final number of participants was much smaller. A mandatory community centre questionnaire was administered before the programme could commence, and at this point information about the purpose of the current study was distributed in both English and Bengali. Participants were provided with the opportunity to ask questions in relation to the study. For those who consented to take part, an information sheet and consent form was distributed. Following the initial centre questionnaire, ten participants with low L1 and L2 literacy skills were excluded

[6] Cambridge English exams; KET = Key, PET = Preliminary, FCE = First Certificate, CAE = Advanced and CPE = Proficiency.

OQPT level descriptor	OQPT part 1	OQPT part 2	ALTE	CEF/CEFR ESOL	SfL ESOL	Cambridge
Beginner	0-15	0-17	0	A1	Entry 1	n/a
Elementary	16-23	18-29	1	A2	Entry 2	KET
Lower-intermediate	24-30	30-39	2	B1	Entry 3	PET
Upper-intermediate	31-40	40-47	3	B2	Level 1	FCE
Advanced	-	48-54	4	C1	Level 2	CAE
Very advanced	-	55-60	5	C2	n/a	CPE

Table 4.2: OQPT: Equivalent scores across language testing frameworks.

from the study. Although the experimental tasks were designed to avoid a text-heavy bias in order to avoid excluding participants, it still remains that a placement test and GJT requires a certain level of reading and writing skills.[7] Of a total of thirty-four potential participants who took the OQPT, nineteen tested at Beginner proficiency level, thirteen at Elementary level and two at (Lower-) Intermediate level. The overall results of the proficiency test are shown in Table 4.3, and it can be seen that the typical proficiency levels within such community-based ESOL are Beginner and Elementary.

Beginner	Elementary	Intermediate	Advanced
19	13	2	0

Table 4.3: Summary of written placement test proficiency levels.

[7]Sylheti is a dialect which has all but lost its written form (Chalmers, 1996), and whilst English is reportedly spoken at home by all the UK-based participants in this study (alongside Sylheti), it is not read or written. In this respect, there is often a distinct difference between literacy levels and spoken proficiency in English, and one of the issues in long-term language provision in this type of community ESOL-based setting.

However, it is not uncommon for community-based ESOL classes to be variably attended by participants, sometimes in the same way as a 'drop-in' class. As a result, of the thirty-four who took the OQPT and informal oral placement test, only eighteen participants completed the entire set of experimental tasks. Sixteen participants were removed from the analysis at various stages of the experiment. Three participants were excluded following low OQPT and oral scores, and four participants stopped attending the course. A number of participants had difficulties with task complexity, either with respect to the GJT (spoiled paper) or spoken production task (little or no audible response to the stimuli) and their data was excluded from the analysis. Three participants scored below the threshold of the GJT and were excluded on the grounds that even at a metalinguistic level, representation of the inflectional morphology was not in evidence.

4.2.5 Experiment 1: Bangladesh-based participants

The Bangladesh-based L1 Bengali speakers were recruited from private universities in Dhaka, Bangladesh. University students are required to take English classes, regardless of the major subject. Sixteen students were recruited for this study and all were enrolled on majors other than English. Communication and testing (spoken and reading and written OQPT tests) were conducted over the medium of Skype.[8] Six of the Bangladesh-based recruits were also removed from the analysis. This was due to learners dropping out or being excluded after completing the OQPT and student questionnaire, personal circumstances or the availability and quality of the internet connection.

4.2.6 Experiment 1: Linguistic profiles of participants

The twenty-eight remaining UK-based and Bangladesh-based participants who completed all parts of the data collection tasks were combined into four conflated proficiency levels: Beginner (n=7), Elementary (n=8), Intermediate (n=8) and Advanced (n=5). The lin-

[8] *About Skype* http://www.skype.com/en/about/

guistic profile and background to the participating learners is reported here. Table 4.4 presents the Beginner and Elementary proficiency level groups, and Table 4.5 shows the Intermediate and Advanced proficiency groups, logged with participant ID and OQPT score. Linguistic and background information includes gender and L1(s) spoken. Education background was recorded according to whether learners had received primary, secondary or tertiary education. Medium of study was noted, and it was reported by students who had been educated through the medium of English that although English was used, the teachers were predominantly L1 Bengali speakers, and Bengali was also used in the classroom. Age is recorded according to (a) age when tested (b) age on arrival (AoA) to the UK or EU, length of residence in the UK (LoR UK) and length of residence in the EU (LoR EU) respectively.

Participant ID & OQPT score	Gender	L1(n) DCB=Bengali S=Sylheti	Education P=primary S=secondary T=tertiary	Medium of education	Age at testing	AoA UK/EU	LoR UK	LoR EU
Beginner (n=7)								
BE003 (08)	F	DCB, S	P, S	Bengali	28	18	12	n/a
BE001 (12)	F	DCB, S	P, S, T	Bengali	37	25	14	n/a
BE013 (13)	F	DCB, S	P, S	Bengali	26	23	5	n/a
BE020 (15)	F	DCB, S	P, S, T	Bengali	38	24	16	n/a
BE009 (15)	F	DCB	P, S	Bengali	46	45	3	Spain (12)
BE006 (15)	F	DCB, S	P	Bengali	31	21	12	n/a
BE004 (15)	F	DCB, S	P, S, T	Bengali	32	19	15	n/a
Elementary (n=8)								
BE018 (16)	F	DCB, S	P, S	Bengali	32	22	12	n/a
BE011 (16)	F	DCB	P, S, T	Bengali	30	30	2	Italy (11)
BE016 (16)	F	DCB, S	P, S, T	Bengali	31	25	7	n/a
BE008 (16)	F	DCB, S	P, S, T	Bengali	31	21	12	n/a
BE015 (16)	F	DCB	P, S, T	Bengali	48	47	3	Spain (12)
BE014 (18)	F	DCB	P, S	Bengali	39	37	4	Spain (11)
BE007 (19)	F	DCB, S	P, S	Bengali	20	19	3	n/a
BE017 (22)	F	DCB, S	P, S, T	Bengali	32	26	6	n/a

Table 4.4: Experiment 1: Linguistic backgrounds - Beginner and Elementary groups.

Participant ID & OQPT score	Gender	L1(n) DCB=Bengali S=Sylheti	Education P=primary S=secondary T=tertiary	Medium of education	Age at testing	AoA UK/EU	LoR UK	LoR EU
Intermediate (n=8)								
BE019 (24)	F	DCB	P, S	Bengali	37	20	18	n/a
BE021 (27)	F	DCB, S	P, S, T	Bengali	28	22	7	n/a
BE012 (28)	F	DCB, S	P, S, T	Bengali	34	25	10	n/a
BE032 (29)	M	DCB	P, S, T	Bengali	19	n/a	n/a	n/a
BE031 (29)	M	DCB	P, S, T	English	21	n/a	n/a	n/a
BE023 (29)	M	DCB	P, S, T	English	18	n/a	n/a	n/a
BE034 (32)	F	DCB	P, S, T	Bengali	18	n/a	n/a	n/a
BE026 (33)	M	DCB	P, S, T	Bengali	19	n/a	n/a	n/a
Advanced (n=5)								
BE024 (50)	M	DCB	P, S, T	English	23	n/a	n/a	n/a
BE025 (51)	F	DCB	P, S, T	English	19	n/a	n/a	n/a
BE027 (55)	M	DCB	P, S, T	English	21	n/a	n/a	n/a
BE030 (55)	F	DCB	P, S, T	English	21	n/a	n/a	n/a
BE029 (56)	F	DCB	P, S, T	English	20	n/a	n/a	n/a

Table 4.5: Experiment 1: Linguistic backgrounds - Intermediate and Advanced groups.

4.2.7 Experiment 1: Native speaker control group

Finally, a native speaker control group (NS Control) was also recruited in order to validate the experimental tasks and provide an indication of native-like performance for both spoken and reading tests. The recruited participants (n=10) were all from the Greater Manchester area in the UK and their linguistic background is noted in Table 4.6. The NS Control group performed at ceiling across the board.

Participant ID	Gender	Education P=primary S=secondary T=tertiary	Age at testing
NSE01	F	P, S, T	31
NSE02	F	P, S, T	32
NSE03	F	P, S, T	25
NSE04	F	P, S, T	20
NSE05	F	P, S, T	45
NSE06	F	P, S, T	49
NSE07	F	P, S	25
NSE08	M	P, S, T	25
NSE09	M	P, S, T	47
NSE010	F	P, S, T	20

Table 4.6: Experiment 1: NS Control group.

4.2.8 Experiment 2: UK-based participants

Thirteen UK-based L1 Bengali speaking participants were recruited to take part in Experiment 2. Of these, six were excluded, two due to low literacy in the L2, three were excluded due to incomplete data and one whose L1 was Urdu.

4.2.9 Experiment 2: Bangladesh-based participants

A further three Bangladesh-based participants were recruited. The three Bangladesh-based participants were grouped together as a conflated Intermediate level.

4.2.10 Experiment 2: Linguistic profiles of participants

The linguistic backgrounds are set out in Table 4.7, recording participant ID and OQPT score, gender and L1(s); Bengali (DCB) and also Sylheti (S). Education background was noted as to whether participants received primary, secondary or tertiary education. As with the participants for Experiment 1, the medium of education was recorded, as well as age when tested, age on arrival to the UK or EU, length of residence in the UK and/or length of residence in the EU respectively. It should be noted that during the statistical analysis, there was a confound when all these factors were entered into the model build, and it was found that education background, that is whether a participant had received a primary, secondary or tertiary education, was the best predictor compared to the medium of education, age when tested, age on arrival to the UK or EU, or length of residence in the UK and/or EU.

Participant ID & OQPT score	Gender	L1(n) DCB=Bengali S=Sylheti	Education P=primary S=secondary T=tertiary	Medium of education	Age at testing	AoA UK/EU	LoR UK	LoR EU
Beginner								
NSB1 (09)	F	DCB, S	P, S, T	Bengali	21	20	1	n/a
NSB2 (14)	F	DCB	P, S, T	Bengali	42	37	4	Italy (11)
NSB3 (15)	F	DCB	P, S, T	Bengali	38	35	3	Spain (11)
NSB4 (15)	F	DCB	P, S, T	Bengali	38	37	1	Italy (13)
Elementary								
NSB5 (18)	F	DCB	P, S, T	Bengali	38	36	3	Italy (10)
NSB6 (19)	F	DCB	P, S, T	Bengali	42	39	3	Italy (13)
NSB7 (20)	F	DCB, S	P, S, T	Bengali	24	23	2	n/a
Intermediate								
NSB8 (25)	M	DCB	P, S, T	English	18	n/a	n/a	n/a
NSB9 (30)	F	DCB	P, S, T	English	18	n/a	n/a	n/a
NSB10 (50)	F	DCB	P, S, T	English	19	n/a	n/a	n/a

Table 4.7: Experiment 2: Linguistic backgrounds - L1 Bengali participants.

4.2.11 Experiment 2: Native speaker control group

A NS Control group (n=8) was also recruited, as shown in Table 4.8 and this group also completed the whole test. The NS Control was not intended to provide a comparison to the L1 Bengali speaking group regarding the vowel length in the various configurations, as this measurement was intended to be comparative within L1 Bengali speakers. However, with respect to the validity of the test materials and the tense-lax distinction, the NS Control group was necessarily implicated as a control group. Column (2) notes gender, column (3) education and (4) age at time of testing.

Participant ID	Gender	Education p=primary s=secondary t=tertiary	Age at testing
NSE01	F	P, S, T	31
NSE02	F	P, S, T	32
NSE03	F	P, S, T	25
NSE04	F	P, S, T	20
NSE05	F	P, S, T	45
NSE06	F	P, S, T	49
NSE07	F	P, S	25
NSE08	M	P, S, T	25

Table 4.8: Experiment 2: NS Control group.

Having discussed the procedure for participant recruitment, in the following sections attention now turns to the the research methodology. This is considered first for Experiment 1, and then for Experiment 2, discussing the rationale for the experimental task and test stimuli. The stimuli design and the data collection procedure are discussed particularly with respect to making the experimental tasks accessible to a range of proficiency levels.

Finally, there is an explanation of the system for data coding in preparation for statistical analysis in a Generalized Estimated Equations approach.

4.3 Experiment 1: Suppliance of inflectional morphology in a spoken production and grammaticality judgement test

Experiment 1 consists of two experimental tasks focussing on different modes; spoken and reading. The two experimental tasks were administered to all proficiency levels in the following order:

- Experiment 1A: Elicited spoken data from semi-spontaneous question and answer picture card task.
- Experiemnt 1B: Reading test - grammaticality judgement task (GJT).

The spoken task was intended to elicit examples of suppliance and omission of L2 English inflectional morphology and was designed as an untimed semi-spontaneous elicitation task. This was analysed (i) as an overview of suppliance data and (ii) within categories of verb type to test for evidence of transfer of L1 constraints and requirements of the minimal word with respect to patterns in L2 repair and inflection. The reading grammaticality judgement task (GJT) was intended to indicate whether the learners showed a comparative syntactic knowledge of inflectional morphology, and was presented as a binary true/false judgement on sentence accuracy. If learners perform better on the GJT than on the spoken elicitation task, then the source of the problem cannot be attributed to a deficit in the required syntax, and may, at least in part, be due to transfer of L1 phonological constraints. A summary of the experimental tasks for Experiment 1 is set out in Table 4.9.

Verbs such as 'clean' are classed as long vowel (LV) and others such as 'stopped' are classed as short vowel (SV) verb stems, and are differentiated in regular simple past tense

Experiment 1A	Spoken experimental task
Test purpose	Suppliance/omission of inflectional morphology (a) overview of suppliance rates (b) transfer of minimal word requirements
Experimental task	semi-spontaneous elicitation picture description cards
Test stimuli (a)	regular simple past tense verbs (Reg. PT) = 68 irregular simple past tense (Irreg. PT) = 18 third person singular agreement (3SG)= 34 plural noun agreement (Pl Noun)=16 monomorphemic words (Mono) =13
Test stimuli (b)	long (14) and short (31) vowel regular verbs voiced (14) and unvoiced (17) SV regular verbs voiced (14) and unvoiced (14) LV regular verbs LV regular vowel-final stem (5) ablaut (8) and pseudo-inflected (10) irregular verbs third person singular agreement long (10) and short (16) vowel verbs Reg.-ed PT = (4) 3SG-es = (8)
Experiment 1B	Reading experimental task
Test purpose	Syntactic knowledge
Experimental task	GJT reading task true - false sentence format
Test stimuli	regular simple past past tense n= 20 irregular simple past tense n= 20 third person singular agreement n= 20

Table 4.9: Experiment 1: Summary of experimental tasks.

tokens (Reg. PT) and third person singular agreement tokens (3SG). A further class of Reg.-ed verbs (e.g. started) is also included for Reg. PT and 3SG verbs. Irregular simple past verbs (Irreg. PT) are classed as pseudo-inflected (e.g. kept) or ablaut (e.g. fell).

Plural noun agreement (Pl Noun) and monomorphemes (Mono) are also included in this analysis.

4.3.1 Experiment 1A: Experiment design

The experimental design for the elicitation of spoken data is set out first, beginning with an outline of the number and type of tokens, followed by the stimuli, elicitation procedure, coding and method of analysis. The spoken data from Experiment 1A were analysed in two ways; first as an overview of suppliance of inflection with comparison to GJT scores and secondly with respect to the L1 transfer of minimal word requirements and moraic structure. The test stimuli was therefore selected with this in mind.

4.3.1.1 Test stimuli

As far as possible the regular simple past verbs were selected in terms of stem shape and voicing. LV verb stems, were, when feasibly possible, matched with SV verb stems and paired for verb frequency (see Section 5.2.4.2). For example, 'faced', a LV unvoiced stem-final verb with a frequency value of 164 was loosely matched with 'missed', a SV unvoiced stem-final verb with a frequency value of 108. The stems were, again, as far as possible, CVC shapes, and to anticipate the possibility that regular verbs were produced in a non-target like PWd internal prosodic representation, the stem-final and inflectional morpheme were restricted to unvoiced /k-t/, /p-t/, /s-t/ and voiced /m-d/, /n-d/ and /l-d/ clusters. As the prediction was that epenthesis would be invoked in a repair of subminimal (i.e. not well-formed) SV forms (in accordance with L1 Bengali minimal word requirements), past tense verbs which ended in an alveolar stop and therefore attract the /ə-d/ allomorph were largely avoided in the test stimuli, in order to avoid priming effects, and only four examples of Reg.-ed PT verbs were included in the test set.

A much smaller subset was made up of irregular simple past tense verbs. This is because the interest in this study only partially lies in the comparison of the suppliance of inflection on regular and irregular verbs. The focus of this study is much more on the different forms of the PWd adjoined prosodic representation and with respect to transfer of L1 prosodic representation of affixation in relation to that of the moraic structure and minimal word requirements. The irregular verbs were roughly halved between ablaut and pseudo-inflected verbs. In this respect, the suppliance of ablaut verbs is predicted to exceed that of pseudo verbs if the transfer of L1 moraic structure rejects vowel shortening in the L2 rhyme.

The third person singular agreement verbs were selected along the same lines as the simple past tense verbs, and categorised according to vowel stem and voicing status. Plural noun agreement was included as a semi-control set to test whether the inflectional morpheme *-s* was in any way likely to influence suppliance rates. As a semi-control, the plural noun category was only included in the overall analysis, and was not categorised further according to stem length or voicing qualities. Singular nouns of the plural forms were included to allow comparison. Only if a singular noun was correctly identified would a plural noun be counted as supplied. Similarly, third person agreement was only included in the analysis if a first or second person was similarly produced.

Finally, monomorphemes were included to allow comparison to irregular past tense verbs in word-final consonant clusters, and were not included in statistical analysis (not least because they were so well produced across proficiency levels that there was insufficient variance to run in the statistical model). The test stimuli are set out in Appendix B.

4.3.1.2 Frequency of stimuli

Any comparison of the suppliance of inflectional morphology which includes both irregular and regular verbs must control for the influence of verb frequency. The frequency of verbs in this study were noted according to Leech et al. (2001) in keeping with Goad and White (2006), and these values were used to create a log frequency. This was created to account for the extreme high or low frequency values of some tokens. Frequency was input as a factor into the statistical analysis.

4.3.1.3 Test token quantities

As mentioned regarding the test stimuli, the tokens were not balanced across categories. There were a larger number of tokens which inflect in a PWd adjoined representation compared to those which prosodify inflection in a PWd internal representation. The reason for including a greater number of tokens requiring a PWd adjoined representation is because the Bengali PWd internal representation is arguably ready to transfer to the interlanguage, whereas the Bengali PWd adjoined representation must either be licensed to a new position in the interlanguage or is readily available for use in a new location in the interlanguage (depending on the weak or strong interpretation of the PTH). Further, there are more functional morphemes which are represented in a PWd adjoined structure, allowing cross-comparison. In this respect, it is expected that in relation to developmental stages, the inflectional morphology which requires the PWd adjoined representation, will potentially be delayed in both verbal and nominal contexts. In contrast, tokens which require a PWd internal representation should be comparatively straightforward for L1 Bengali speakers. The method of statistical analysis with logistic regression is not sensitive to frequency variation in the number of test tokens as it models rate (i.e. it works with the percentage and not the overall count).

4.3.1.4 Overview of data collection

First, to test the suppliance of inflectional morphology with relation to prosodic representation (see test purpose (a) in Table 4.9), a total of 149 verb and noun test tokens were elicited in a semi-spontaneous question and answer picture card task. These were distributed over the five categories of regular simple past tense (Reg. PT), irregular simple past tense (Irreg. PT) third person singular agreement (3SG), plural noun agreement (Pl Noun) and monomorphemic nouns (Mono). It should be noted that the monomorphemic noun category was included as a control item to compare production of consonant clusters in relation to Irreg. PT verbs. The subcategories are shown in Table 4.11. Similarly, singular nouns were included in comparison to the plural noun agreement forms. The test tokens are as set out in Table 4.10 in relation to the required L2 prosodic representation.

	PWd adjoined	PWd internal
Reg. PT	68	n/a
Irreg. PT	n/a	18
3SG	34	n/a
Pl Noun	16	n/a
Monomorphemic noun	n/a	13
Singular noun	(not analysed)	16
Distractors	(not analysed)	10

Table 4.10: Experiment 1A: Token distribution by prosodic representation.

Secondly, in order to look at the potential for transfer of prosodic representation below the level of the PWd, at the level of the mora and the instantiation of L1 minimal word requirements (see test purpose (b) in Table 4.9), the tokens for the Reg. PT, Irreg. PT and 3SG tokens were reanalysed according to the stem vowel length and voicing status of the stem-final consonant.

4.3.1.5 Recapitulation of predictions

It is predicted that SV verb stems will be noticed as being subminimal according to L1 requirements. This is predicted to prompt a repair by insertion of an epenthetic vowel. Epenthesis is a way of introducing another mora, and it also mimics the formation of simple past tense in Bengali by adding a second mora. As the vowel provides opportunity for a consonant to be attached, without recourse to a consonant cluster (disallowed in Bengali in word-final position), it is predicted that it is possible that the inflectional morpheme will therefore be more likely to be supplied in spoken production (at least sometimes, and at least more often than in the case of LV verb stems). This is because a LV verb stem is not likely to attract the same attention, as it is a well-formed word according to the L1 Bengali minimal word requirements. The moraic structure is well-formed, and it is predicted that production will be considered sufficient in its bare verb form, without inflection. As inflection is proposed to be attached to SV verb stems as an extra syllable (the SV verb form being non-target like with an epenthetic vowel), this replicates the way that inflection is attached to English verbs which end in an alveolar stop /t/ or /d/. For this reason, only a few Reg.-ed tokens are included in the test stimuli in order to avoid any priming effects. The subcategories are shown in Table 4.11

	Reg. PT n=68	Irreg. PT n=18	3SG n=34
SV	31	n/a	16
LV	33	n/a	10
Reg.-ed	4	n/a	n/a
Reg.-es	n/a	n/a	8
Ablaut	n/a	8	n/a
Pseudo	n/a	10	n/a

Table 4.11: Subcategories of test verbs for Reg. PT, Irreg. PT and 3SG.

Although Irreg. PT verbs are not the main focus of this study, the behaviour of ablaut and pseudo-inflected verbs may further illustrate the influence of L1 moraic structure on L2 productions. If transfer of L1 structure at the level of the mora is influential in the production of L2 inflectional morphology, then the Irreg. PT verbs may also be affected if the verb is pseudo-inflected rather than ablaut. This is because the pseudo-inflected forms invoke vowel shortening, causing conflict with L1 Bengali bimoraic minimal word constraints. The ablaut forms, on the other hand, undergo vowel change but not shortening, and would, potentially, be less prone to the effects of L1 transfer. Similarly, the 3SG verbs are also expected to behave in a comparable fashion to the Reg. PT verbs in both SV and LV forms. Finally, in order to potentially rule out that suppliance of inflection is not dependent upon the phonotactics at the level of the syllable, the tokens were classified according to whether the stem-final consonant in the regular verb stems was voiced or unvoiced (Reg. PT both SV and LV).

4.3.1.6 Data collection: Organisation of test stimuli and procedure

There was a total of 165 test items and there was a nominal set of ten distractors, which deliberately elicited a different tense. As the elicitation cards were rich in vocabulary and opportunity to provide several contexts for further language input, it was not considered necessary to increase the task materials any further. The test stimuli were merged and divided into two main sets. The elicitation task was delivered over two sessions, and each session consisted of approximately half the total test material. The test materials were further subdivided into fifteen smaller sets of twelve or eleven tokens.[9] The reason for making smaller sets was to set a brisk pace for the task with plenty of short breaks. This was to avoid excessive deliberation and to help prevent boredom or tiredness setting in. By working through a smaller more manageable set of tokens at a time, a natural break was provided as the interlocutor put one set of cards away and opened up another set. This deliberately allowed time for the participant to look up from the test material and take a sip of water (which was encouraged to help keep the voice recording as clear as possible). Participants were reminded to ask for a break if they wished, but it was not requested in any of the sessions (either online via Skype or in person). A session typically lasted for approximately half an hour to forty-five minutes, although this varied according to the response times and the enthusiasm in answering follow-up questions. To maintain consistency the conversations were kept as short as possible during the test time and a

[9] The test tokens were divided as equally as possible between the two sessions and within each session, the tokens were again divided into a number of smaller sets. However, the elicitation procedure did not elicit one token per picture card, and the number of elicitation picture cards was significantly smaller than the number of tokens elicited. In other words, ‘token’ does not equate ‘picture card’ in numerical terms.

rubric was followed.

4.3.1.7 Elicitation procedure and test stimuli

A semi-spontaneous question and answer picture card task was adopted for a number of reasons. First, a pair work task was found to be untenable during the pilot test stage of the experiment design, whereas a semi-spontaneous question and answer task allowed the target structures to be elicited as equally as possibly across proficiency levels. The focus of the target language could easily be disguised due to the opportunity for pre- and post-target language elicitation. This could be simplified or developed according to proficiency level and following a rubric, was equal across participants. Furthermore, it was often possible to design a picture card and elicitation rubric to allow multiple verb or noun forms to be elicited from one picture source. However, primarily, the semi-spontaneous question and answer picture card task was intended to provide the most realistic indication of the representation of inflectional morphology within the confines of controlled task.

The elicitation task was based around a family (Figure 4.1) who sometimes appeared together or individually within a picture card. It was sometimes left to the participant to decide which subject was involved in a particular event or scene. The interlocutor and participant discussed the family relationships, and throughout the test material, the family were referred to with their titles of ‘Mum’, ‘Dad’, ‘Granny’ and so on. The involvement of the family allowed the elicitation of 3SG as well as the use of plural pronouns and agreement interchangeably, both within a picture card and across tenses. In this way, the elicitation of the 3SG was never a prominent feature of the task.

A timeline reminder card (Figure 4.2) was also introduced together with a clock face card with daily routine prompts, which could be referenced to help locate the timeframe of the event if necessary. A number of cards were clearly marked either with an adverbial of time (e.g. ‘last weekend’) or a set date in the past (e.g. 1975-1990). If no time frame was indicated, the interlocutor would provide a contextual time reference.

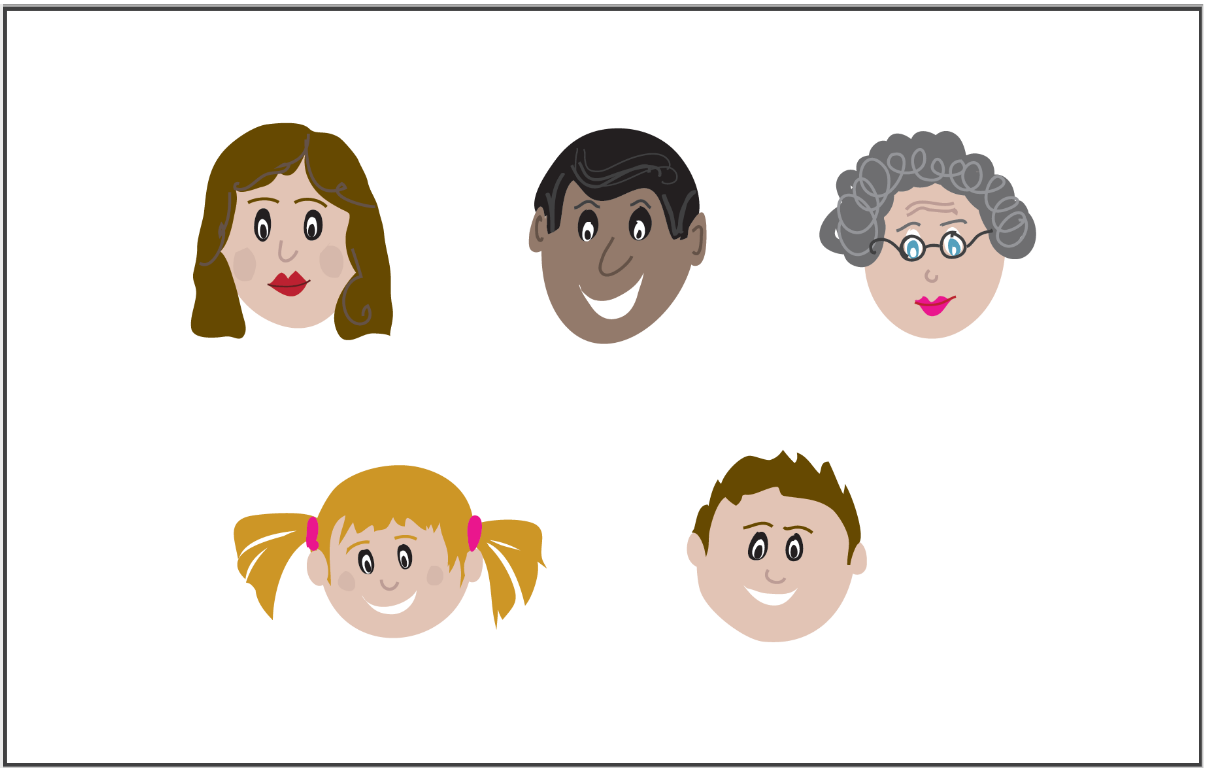


Figure 4.1: Family subjects

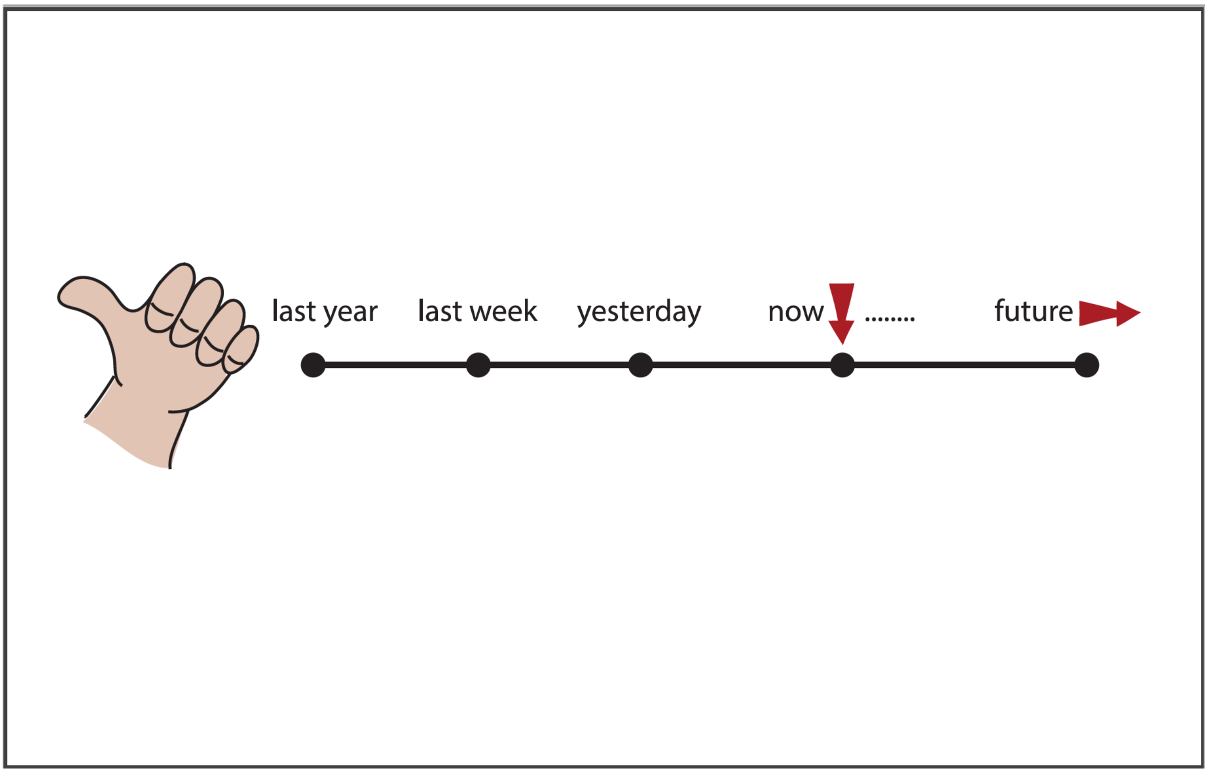


Figure 4.2: Timeframe: tenses

The picture cards were designed to be double-sided, so that the target verb stem or noun was also printed on the reverse side as shown in Figure 4.3 and Figure 4.4.

Figure 4.3: Past and present ‘wash’ and ‘find’: card A

Figure 4.4: Past and present ‘wash’ and ‘find’: card B

During the practice phase (there were three practice cards), the participants were shown that this was available to refer to if they could not remember the verb or noun. It was on the reverse side to avoid undue focus on the word and to help the participant to engage with the initial interaction with the interlocutor. Direct questioning was avoided except as a last resort, and a rubric was designed to ensure the same language and procedure was used across participants. The interlocutor asked vocabulary based questions about the picture followed by a general question, whereby the vocabulary item would necessarily be included in the answer. With encouragement to produce complete sentences, the target language was intended to be an incidental part of the utterance.[10]

An elicitation procedure is illustrated for the verb 'live' in Figure 4.5 and Figure 4.6, and the elicitation rubric is set out in (104). The elicited target forms were Reg. PT *lived* and 3SG *lives*. The italicised notes indicate instructions and when to proceed with sensitivity according to proficiency level. The procedure was intended to elicit full sentence responses. If a one word answer was provided, the interlocutor put fingers together and then pulled hands apart to indicate 'stretch this into a full sentence, please'. As far as possible, the target verb was intended to be followed by a vowel in order to allow clear indication as to whether the inflection was supplied on the target form and to avoid interference from the onset of a following consonant (e.g. He washed *a* green sock in elicitation card Figure 4.3). In practice, this was not always possible to engineer, especially as the procedure was intended to be as spontaneous within a semi-spontaneous approach as possible. However, particularly at lower levels of proficiency but also at higher levels, it was noted that responses were often delivered with short pauses between words, and often with paralinguistic fillers, such as 'er' /ɛː/, resulting in relatively few cases which could not be analysed due to the (potential) interference of articulation of the following sounds.

(104) Elicitation rubric: lived/ lives

1. Ask participant to name the buildings. Supply unknown vocabulary.

[10] It is this aspect of design and execution of the test material which is intended to create a less prescriptive and more (semi-)spontaneous elicitation of L2 inflectional morphology. It is, of course, more difficult to control for the production of particular token forms. In the initial analysis and coding phase, a new subcategory was formed to account for analysable but unsolicited (i.e.non-elicited) responses.

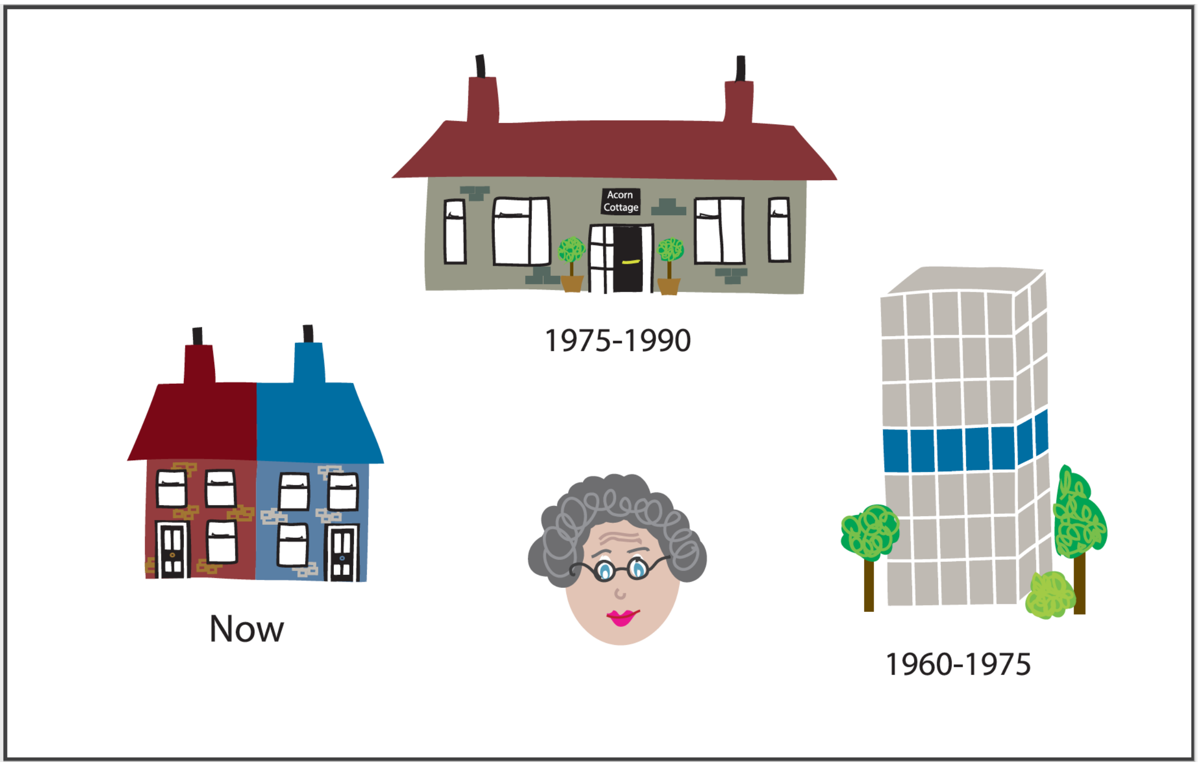


Figure 4.5: Past and present 'live': card A

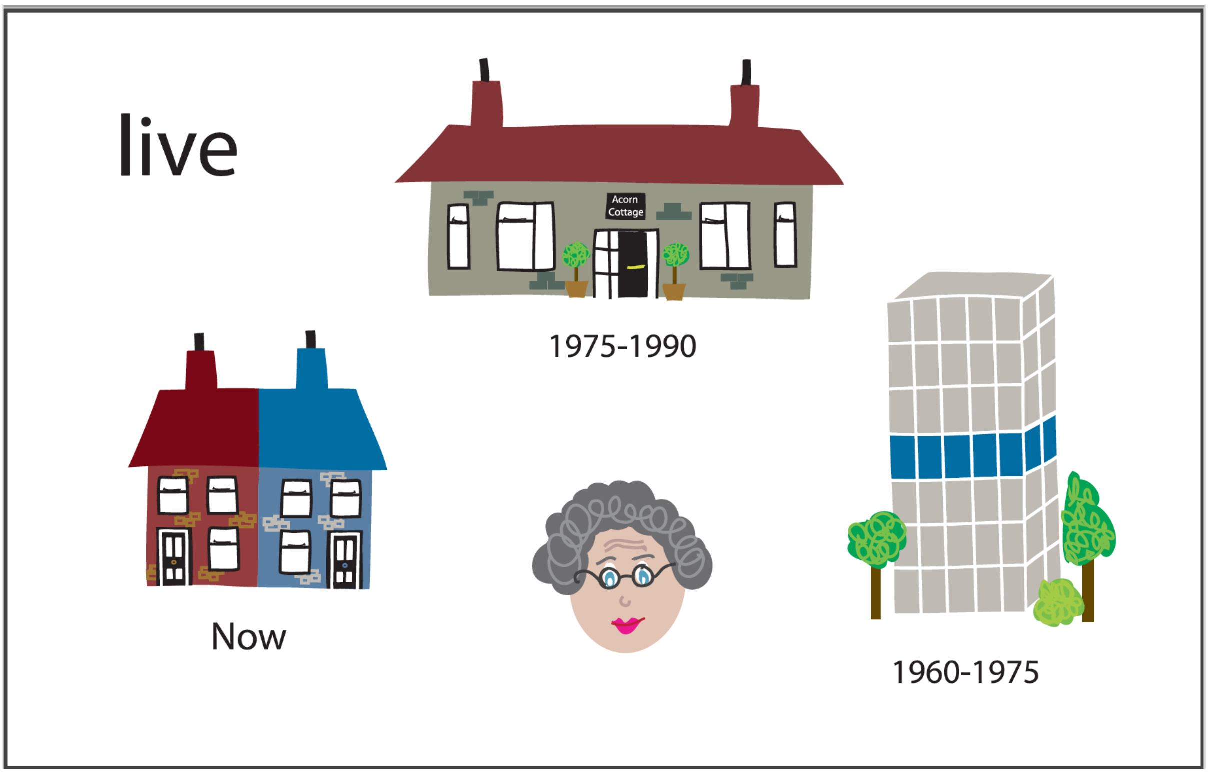


Figure 4.6: Past and present 'live': card B

2. Ask who is in the picture. Confirm it is Granny.

3. Elicit Reg. PT

   (a) Prompt: 'Tell me about the bungalow ......' *Encourage learners to state how many years she lived there*

4. Elicit 3SG

   (a) Prompt: 'And what about the terraced house ......' *Encourage learners to choose which of the two houses she lives in*

5. *Remove the card and ask a participant-centred question appropriate for the proficiency level*

   (a) Which house do you like (most)?

   (b) Have you ever lived in a high rise building?

   (c) What are the advantages of living in a bungalow?

   (d) Would you like to live in an unusual home?

The card was always removed whilst discussing the material more freely, in order to encourage focus away from the test material and to further camouflage the purpose of the task. A further example of the picture prompt and rubric is illustrated with Figure 4.7 and Figure 4.8. In this example the elicited target is 3SG *drives* and Irreg. PT *drove* (105).

(105) Elicitation rubric: drives/drove

1. Ask participant to name the transport. Supply unknown vocabulary.

2. Ask who drives in the family.

3. Elicit 3SG

   (a) Prompt: 'Tell me about *person X* during the week ....' *Encourage learners to speculate what is in the tanker*

4. Elicit Irreg. PT

   (a) Prompt 'And what about last weekend?' *Encourage learners to speculate where to and why*

5. *Remove the card and ask a participant centred question appropriate for the proficiency level*

   (a) Can you drive?

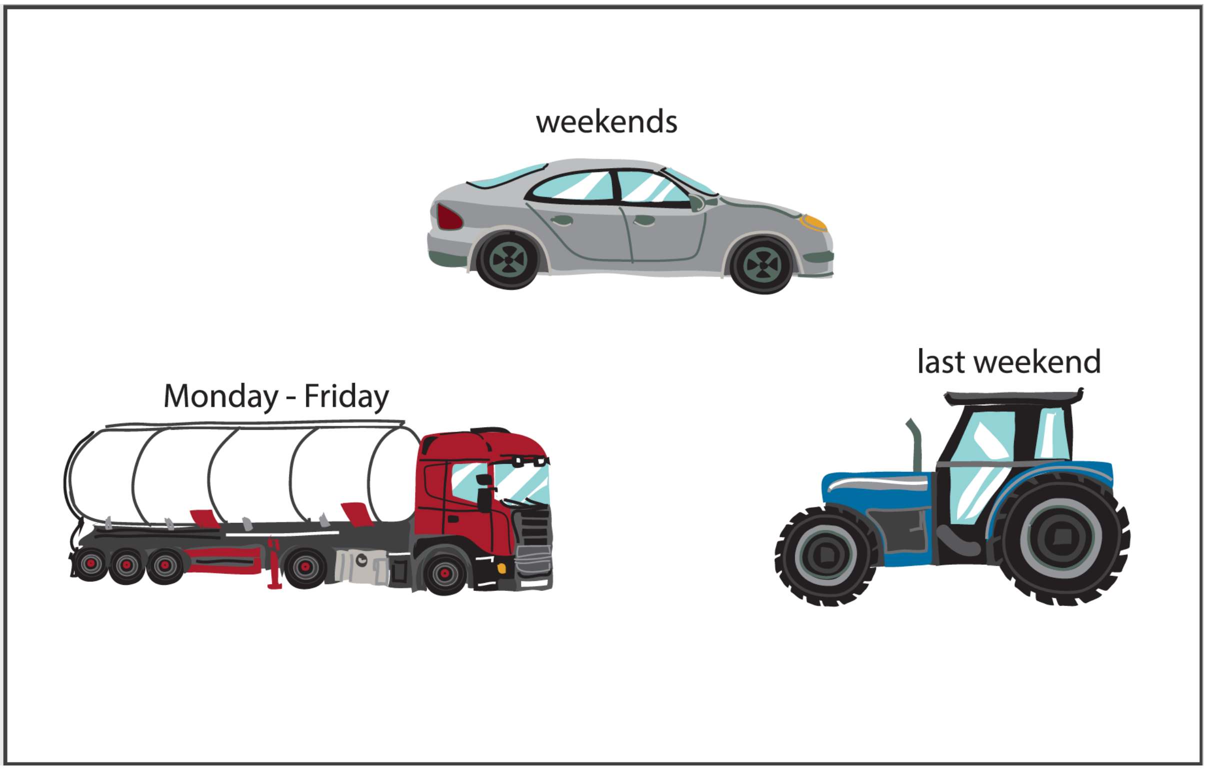


Figure 4.7: Past and present ‘drive’: card A

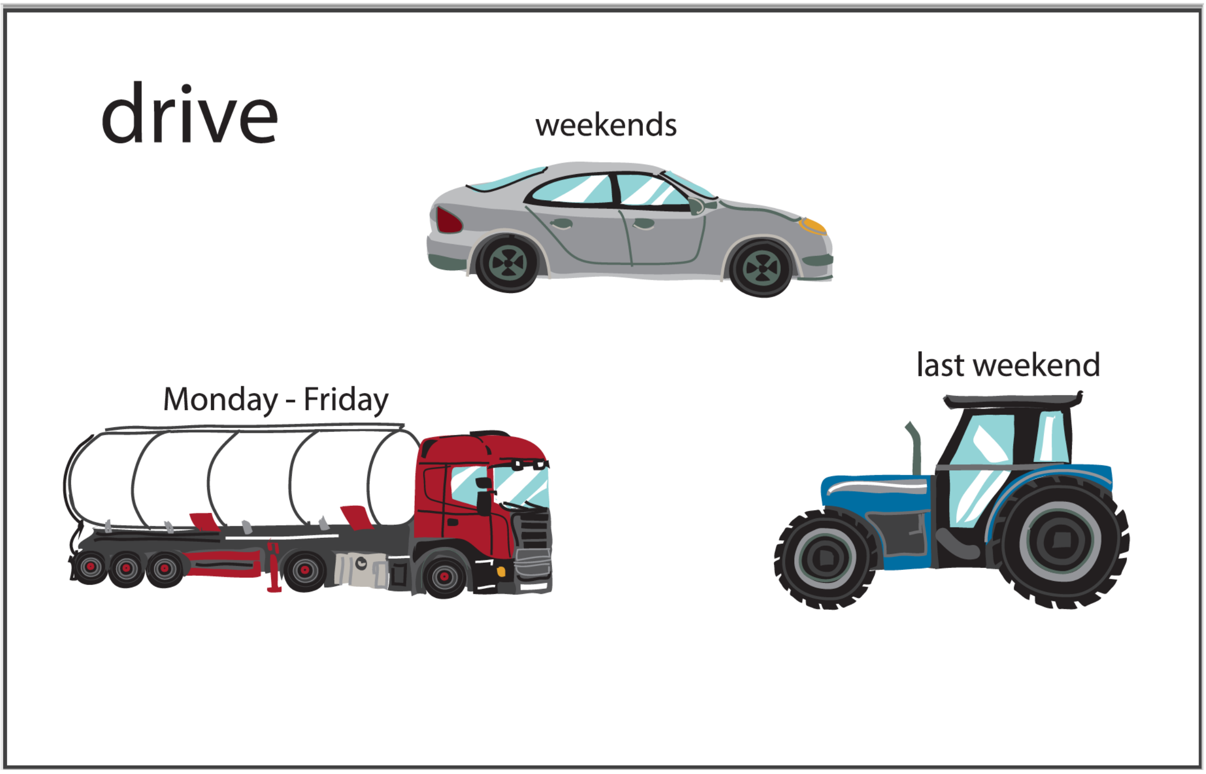


Figure 4.8: Past and present ‘drive’: card B

(b) Have you ever driven a tractor?

(c) What are the advantages of electric cars?

(d) Have you ever driven an unusual vehicle?

Plural nouns (Pl Noun) were also elicited, the stimuli for the noun cards were single-sided and mixed individually and 'randomly' within the other test cards, as were the distractors and cards for monomorphemic nouns. In order for a plural noun to be analysed, a singular form also had to be produced without an inflectional morphmeme *-s*. In this example the target *dog-s* would only be analysed if *dog* was produced in the singular, in order to ascertain that not all four-legged animals that bark are called *dog-s*. Examples and rubric are shown for a singular noun control in Figure 4.9 and Pl Noun target in Figure 4.10.

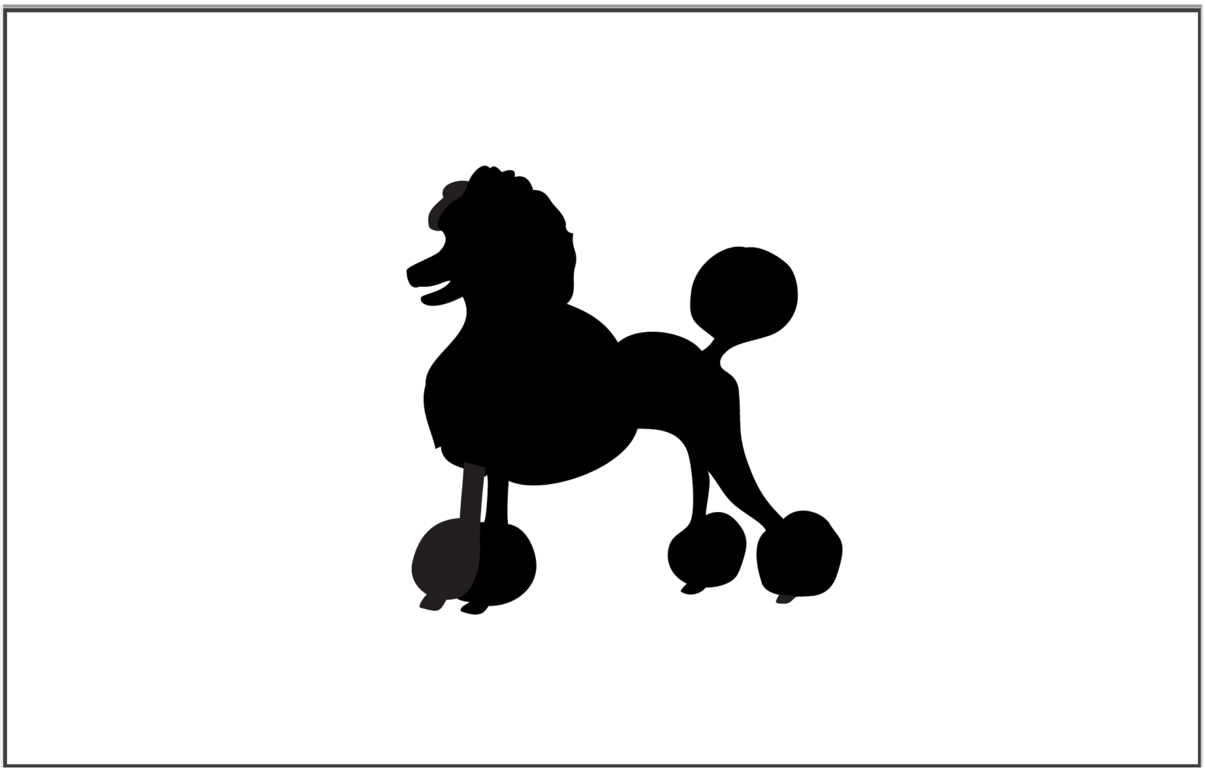


Figure 4.9: Singular noun: 'dog'

1. Elicit singular noun

   (a) Prompt 'Tell me about this picture .....'

   Remove the card and ask a participant-centred question appropriate for the proficiency level

   (a) Do you like its hair(cut)?

1. Elicit Pl Noun

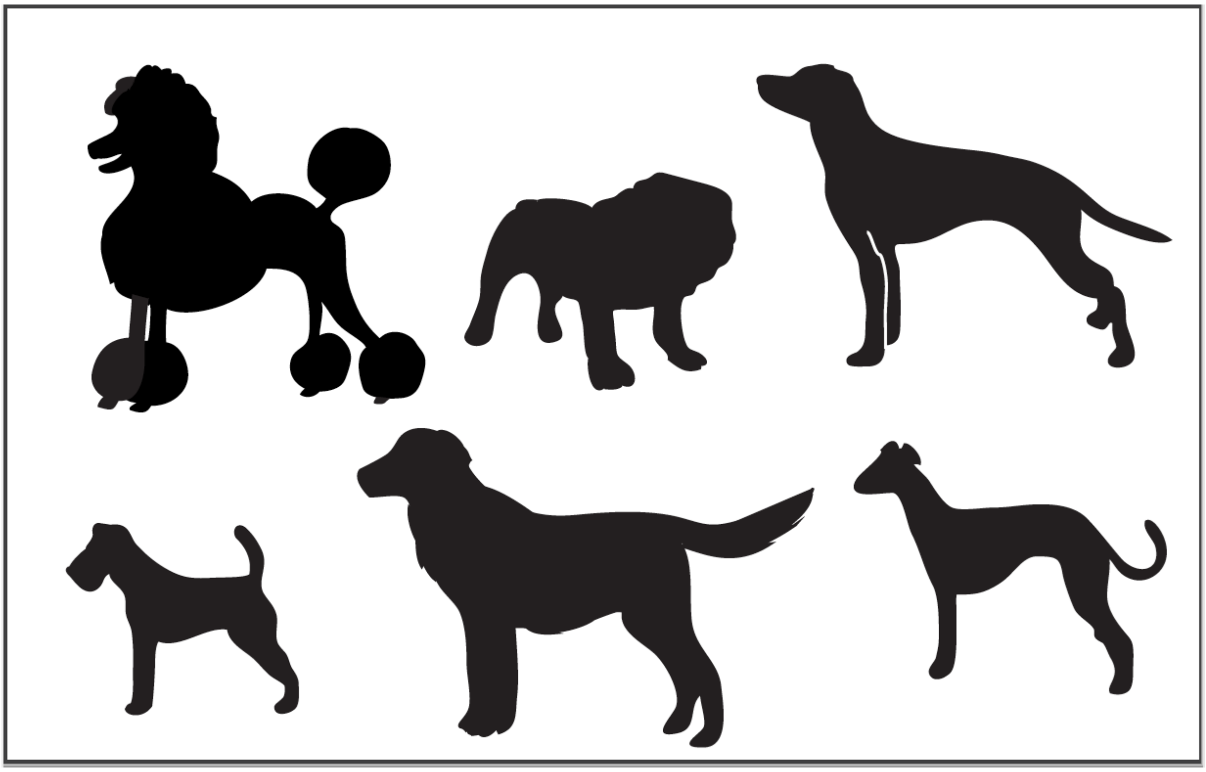


Figure 4.10: Plural noun: 'dogs'

(a) Prompt 'Tell me about this picture .....'

Remove the card and ask a participant-centred question appropriate for the proficiency level

(a) How many are there?

(b) Have you got a dog? / Have you got any pets?

(c) Which of these would you choose and why?

Similarly, the elicitation for monomorphemic nouns was also disguised (Figure 4.11). Here the target form is 'list', but the elicitation process asks learners to guess what the shopping list was for.

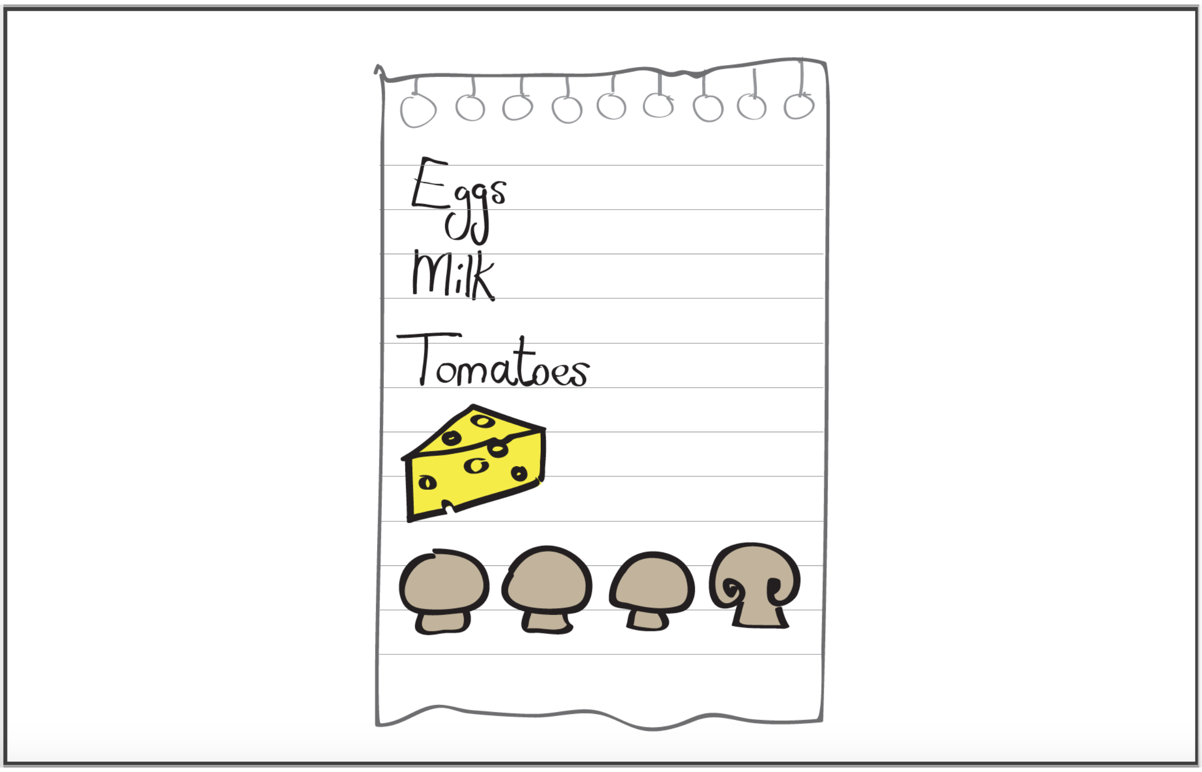


Figure 4.11: Monomorphemic word: list

4.3.1.8 Coding: Regular verbs, third singular agreement and plural noun agreement

The data was recorded on a portable Roland Edirol R-09 digital recorder at a standard 44.1 KHz. The audio files were exported to a computer and compressed as WAV files, and the sound files were analysed using version 5.4.16 of Praat (Boersma and David Weenink, 2015). The target verb or noun was cut and saved as an individual sound file, with a small portion of the previous and following utterance to ensure the recording was not clipped. The test utterance was played alongside observation of the spectrogram, and the tokens were transcribed and coded according to both an aural and visual inspection of the sound file. Two non-specialist native speakers were also trained to make a broad transcription of 50% each of the test data. Any discrepancies between these transcriptions and those of the interlocutor were re-analysed. A final decision was taken by the interlocutor.

Elicited tokens were either produced with the target inflection, produced in the bare (uninflected) form, or produced with a non-target inflection, and classified as 'other responses'. In some cases, the productions classed as 'other responses' included the target verb, but in an ungrammatical construction (e.g. 'is picks' for 'picked') or grammatically accurate (e.g. 'has been picking' for 'picked'), but contextually inappropriate. The 'other responses' category was coded and categorised separately, and removed from the statistical analysis. There were a total of 370 'other responses' counted for the Reg. PT verb category across proficiency levels, and 250 circumventions (i.e. verbless utterances), primarily from Beginner and Elementary level learners. To put this in context, there were 1,904 instances where a Reg. PT verb was the intended elicited item. However, if a Reg. PT verb was produced when an Irreg. PT verb was the intended elicited item, then the Reg. PT verb would be incorporated into the suppliance data for Reg. PT verbs. In this respect, there is no direct correlation between actual suppliance data and elicited verb types. A count summary of 'other responses' is provided in Table 4.12.

	Reg. PT	Irreg. PT	3SG
Other responses	370	131	214
Circumvention	250	65	125

Table 4.12: Count of 'other responses' for Reg. PT, Irreg. PT and 3SG.

The coding procedure is illustrated in Table 4.13 with an example of elicited Reg. PT target 'pick' and Pl Noun 'dogs'.[11]

[11]There is no significance attached to the actual numeral assigned to each code in this analysis, and the coding was generated in the order such errors occurred in the data set.

Target	Suppliance code = 1 target inflection	Omission code = 3 target inflection omitted	Other response code = 5 present simple in past simple context
picked	picked	pick	picks
dogs	dogs	dog	

Table 4.13: Token analysis: Target elicited responses.

Furthermore, as would be expected in a semi-spontaneous elicitation task, unsolicited tokens were also produced, again either with target inflection, in a bare form or in another non-target 'other responses' construction. All production data were analysed, whether elicited or unsolicited, and categorised according to whether the verb was contextually in the simple past, in the third person singular agreement, plural noun or 'other response'. Similarly number agreement on nouns (Pl Noun) was considered supplied if the *-s* morpheme was supplied regardless of the accuracy of the noun (but only if a singular form of the noun was also produced accurately without the affix *-s*). Of course, the suppliance of non-target inflection involves a change of target category, whereby a target regular simple past verb (e.g. 'picked') was replaced with, for example, an irregular simple verb (e.g. 'took') with both inflectional and contextual accuracy. Similarly, a target SV Reg. PT verb might be replaced with a LV Reg. PT verb. This is illustrated in Table 4.14. In these cases, the verb was analysed according to its accuracy, categorised accordingly and included in the analysis.

Target	Suppliance code = 2 non-target inflection	Omission code = 11 non-target inflection omitted	Other response code = 21 verb-ing no auxiliary
picked	plucked took	pluck	picking
dogs	puppies	puppy	

Table 4.14: Token analysis: Unsolicited responses.

4.3.1.9 Coding: Irregular simple past and word-final consonant clusters in monomorphemic words

The irregular simple past verbs and monomorphemic words were analysed and coded in the same manner as the regular simple past verbs, third person agreement verbs and plural noun categories. Monomorphemic word-final consonant clusters (e.g. /*st*/ in *list*) were considered supplied if both word-final segments were produced, and considered omitted if either one of the segments were missing. Although it was considered appropriate to accept suppliance of the irregular past tense if the final consonant was produced, on the basis that the final consonant of the pseudo-inflected verbs effectively carries the inflection (i.e. C_2 but not C_1), this was actually not attested in this data set, and irregular past tense verbs (both pseudo and ablaut) were not subject to omission of C_1 in the sequence C_1C_2.

4.3.1.10 Duplicate productions

Duplicates, a target or non-target verb or noun produced in two different contexts, which are both accurate and appropriate, were included within the analysis. Only solicited and unsolicited verbs and nouns were entered into the statistical analysis; inflection supplied or inflection not supplied.

4.3.1.11 Data analysis

The data were analysed using the Generalized Estimating Equations (GEE) approach in four logistic regression mixed models. The first model was built to provide an overview of the production data in the suppliance of inflectional morphology on Reg. PT verbs, 3SG and Pl Noun. The second and third models focussed on the production of inflectional morphology in the context of the simple past. The second model was constructed to test for differences in the suppliance of simple past inflection based on whether the vowel in the verb stem was monomoraic (SV) or bimoraic (LV). Similarly, the model analysed the suppliance of inflection on Irreg. PT verbs with respect to whether the irregular past tense was formed by vowel change (as in the ablaut) or by vowel shortening as in the pseudo-inflected forms). The third model was run to analyse whether the voicing status of the regular verb stem was instrumental in determining whether inflection was supplied or not on Reg. PT verbs. Finally, the fourth model focussed on the suppliance of inflection in the context of SV and LV 3SG verbs. Predictors and variables regarding learner background and whether the participant was a speaker of the Sylheti dialect or not were included in the models.

4.3.2 Experiment 1B: Grammaticality judgement test

The grammaticality judgement test (GJT), was intended to test whether learners show knowledge of syntactic representation of inflectional morphology commensurate (or to a greater or lesser extent) to that in spoken production.[12]

4.3.2.1 GJT: A true-false reading test

The GJT was perhaps the most vulnerable part of the experimental task with respect to accommodating a range of proficiency levels and in allowing for individual differences.

[12]It is argued to be more accurate to refer to an acceptability rather than grammaticality judgement, reflecting acceptability of a constituent or string as a percept in the mind and not a conscious evaluation of an abstract construct. See for example, Schütze (2013).

This is in relation not only to levels of literacy (particularly with respect to the speed of reading and writing), but also with respect to familiarisation of task type. This may be apparent in relation to placement tests, such as the OQPT, where a fairly common cloze passage task, for example, is unremarkable for a student taking English classes and working towards qualifications with English as a second language examination boards, but not so run-of-the-mill for learners no longer involved in a language or other learning environment.

For the purposes of this study, the primary requirement for including a GJT was that it would allow a measurement of learner knowledge of L2 linguistic representation, whilst being as accessible as possible, especially in accommodating lower level learners. The GJT was intended, then, to test a learner's ability to accurately identify both grammatical and ungrammatical forms of the simple past and third person agreement. Participants were asked to read a series of decontextualised sentences, in which the subject of the sentence was always referenced with a pronoun, to emphasise that 'he', 'she', 'they' or 'it' were not specified or contextualised, other than being placed along a timeline. Learners were asked to make a judgement as to whether a sentence was grammatically accurate or inaccurate by answering 'true' or 'false', and in doing so, recording the answer with a tick or a cross. This could easily be re-worded as grammatically 'correct' or 'incorrect'. During the pilot testing of the GJT, the instruction to ask learners to decide if a sentence was 'correct' or 'incorrect' was replaced with whether it was 'true' or 'false', as this appeared to be more readily understood by lower level learners. In this respect, the 'true-false' response was equated with 'good-bad', or 'thumbs up' versus 'thumbs down' in the day-to-day non-verbal feedback often witnessed in EFL/ESOL language classrooms.

The binary 'true-false', 'right-wrong' response is also commonly associated with truth-value judgement tasks (TVJT), whereby the participant makes a judgement based on the truth of the utterance in relation to a contextual situation. This is frequently seen in child acquisition studies, with puppets used to enact a scene or with successive pictorial representations. In one such study, children were placed in the role of benevolent teacher to a puppet (Mr. Bear). The children observed a story and then made judgements on the puppet's comments about the story, deciding whether Mr. Bear was being truthful or untruthful; making an innocent 'silly' mistake or getting it right (Orfitelli, 2012). By assuming that the child can determine the truth value of an utterance in relation to the contextual situation, the TVJT provides a window of how the sentence is interpreted at a certain point of linguistic development, which might be examined in relation to, for example, grammar or semantic interpretation. In contrast, GJTs are often seen in adult L2 studies, particularly with respect to syntax, and are presented with non-contextually associated material. The emphasis is on the intuitiveness of the grammaticality of the test item and how this relates to competence, taken to be the linguistic knowledge underpinning language performance (e.g. Mandell, 1999).[13] There are different ways of constructing a judgement test. Numerical tasks, for example, are often designed on a graded scale such as a seven-point Likert scale, whereby participants decide how strongly they agree or disagree with the grammaticality of an item.[14] A 'yes-no' task is a non-numerical judgement which allows comparison in the compilation of positive responses across conditions. One of the advantages of this kind of task is that it is relatively expeditious (Schütze, 2013).

The decision to present the GJT as a 'true-false' version of a 'yes-no' judgement task was determined by the intended purpose of the GJT and the proficiency level and linguistic background of the participants in this study. First, the GJT was intended to examine whether the learners in this study had knowledge of the target language, which might not otherwise be in evidence in the spoken production data. As tense and agreement are highly frequent in the input, it was not intended to test underlying knowledge of structures rarely witnessed in the input, where acceptability may vary across a range. Secondly, a 'true-false' task was quick to deliver - a bonus for lower level learners. Thirdly, with comparatively lower demands on literacy and processing, the binary response allowed learners to make a two-way decision, rather than adding a further requirement of a

[13]It should be noted that there is debate as to whether the GJT actually measures competence (e.g. Tremblay, 2005; Tabatabaei and Dehghani, 2012; Gutiérrez, 2013).

[14]GJTs may also be judged on a continuous scale, or beyond the confines of a scale by creating a series of relative judgements or magnitude estimates (Gurman et al., 1996).

decision between the difference of say 1 and 2 on the scale or 3 and 4. Finally, the 'true-false' task was easier to explain and demonstrate and had a less complicated task rubric than might otherwise be required. The participants were informed that the time taken to complete the test would be noted on the top of the paper. A quasi-timed 'true-false' GJT was intended to encourage the participants to work through the test as quickly as possible, and therefore answer according to 'feeling', but to not disengage or disadvantage learners, especially those at lower levels of proficiency. The average completion time for the Beginner and Elementary participants was twenty-nine minutes. For the Advanced and Intermediate participants, this was an average of twelve minutes. The GJT test stimuli and carrier sentences are set out in categories in Appendix A.

4.3.2.2 Test tokens and categories

The breakdown of the GJT between grammatical and ungrammatical items and between the regular, irregular simple past and third person singular agreement test items is presented in Table 4.15.

Test token type	Number of test tokens	Total
GJT regular simple past tokens		20
GJT regular simple past grammatical	10	
GJT regular simple past ungrammatical	10	
GJT irregular simple past tokens		20
GJT irregular simple past grammatical	10	
GJT irregular simple past ungrammatical	10	
GJT third person singular agreement tokens		20
GJT third person singular agreement grammatical	10	
GJT third person singular agreement ungrammatical	10	
GJT distractor tokens		34
GJT distractor grammatical	18	
GJT distractor ungrammatical	16	
Total number of test items		94

Table 4.15: Experiment 1B: GJT summary of test items.

The test items for the GJTs (Reg. PT, Irreg. PT and 3SG) were randomly selected from the test tokens in the semi-spontaneous elicitation task. Sentences were created (both grammatical and ungrammatical) and presented as a randomised test booklet. Six practice tokens were provided on the front page of the booklet.

An example of a grammatical and ungrammatical Reg. PT question is shown in (106). Learners were required to make a tick if the answer was considered accurate and a cross if it was considered grammatically inaccurate.

(106) a. Grammatical GJT for Reg. PT

The children played football and basketball yesterday. __________

b. Ungrammatical GJT for Reg. PT

We pick some mushrooms last weekend. __________

4.3.2.3 Distractors and participant exclusion

In order to establish whether the participants were engaged with the grammaticality judgement task, the distractor test items were removed from the analysis and a mean score (combining grammatical and ungrammatical distractor test items) was calculated for each individual participant. A threshold was established per proficiency level, and participants who scored below this level on the distractors from the GJT were removed from the analysis. The justification for the exclusion of some of the participants on this basis is that without sufficient demonstration of competency in the GJT, spoken production of target inflection is unlikely to be reliable. The threshold was set per proficiency level as illustrated in Table 4.16. Although the threshold scores may appear to be somewhat arbitrary, it is unexpected that the Beginner participants would score somewhere above and below chance, and the threshold was set between 30% - 49% to include sufficient participants at a lower proficiency level. The Elementary threshold was set to be above the level of chance, from 50% - 64%. The Intermediate threshold was set to be accessible to both Lower and Upper-Intermediate participants, from 65%, whilst the Advanced group was set at 75% and over, which it was deemed would be accessible to both Lower and Very Advanced participants.

Beginner	Elementary	Intermediate	Advanced
30 - 49	50 - 64	65 - 75	75+

Table 4.16: GJT: Percentage threshold scores.

4.3.2.4 Data analysis

The data was initially analysed using GEE to compare the accuracy in the suppliance of inflection in the GJT compared to the overview of the suppliance of inflection in spoken production. A series of nonparametric tests (one-sample binomial tests, Friedman tests and Kruskal-Wallis tests) were run to analyse whether GJT scores were a result of chance, whether the tests were equally difficult, and whether proficiency level was a factor in performance.

4.4 Experiment 2: Prosodic boundaries and vowel lengthening

The primary aim of Experiment 2 was to examine whether, through evidence of vowel lengthening, prosodic boundaries could be determined. That is, whether L1 transfer of Bengali minimal word requirements can be seen to influence the suppliance of L2 inflectional morphology, and whether inflection is supplied in a target-like representation or not. In Experiment 2, there was one task with two analyses; a main test, Test (i) and a control test, Test (ii). An elicited imitation task provided the data for both Test (i) and (ii). For Test (i), the experimental task was primarily aimed at eliciting data regarding whether vowel length was produced equally across tetrads of both bimoraic and monomoraic L2 word forms, in the context of English monomoraic verb, monomoraic verb + consonantal (C) affix, bimoraic disyllabic noun, and monomoraic verb + vowel and consonantal (VC) affix. The control test, Test (ii) was aimed at eliciting minimal pairs with tense and lax vowels. This was to allow comparison of any durational differences in the L2 production data between (a) the possible influence of the L1 in the event of vowel lengthening in certain monomoraic contexts or (b) the instantiation of perceptual difference in quality between L1 tense and lax vowels. In other words, to ascertain whether learners could determine vowel difference in quality rather than duration. An overview of Experiment 2 is set out in Table 4.17.

Experiment 2	Spoken experimental task
Test purpose	Test (i) Transfer of L1 moraic structure: vowel lengthening and prosodic boundaries Test (ii) (control test) tense-lax distinction
Experimental task	Elicited imitation task audio input
Test (i) stimuli	Minimal tetrads: 12 sets of 4 n=48 e.g. tick - ticks - ticket - ticking
Test (ii) stimuli	Minimal pairs: 8 sets of 2 n=16 e.g. ship - sheep

Table 4.17: Experiment 2: Test summary.

4.4.1 Experiment design

4.4.1.1 Test stimuli and categories

The elicited imitation task Test (i) included a total of forty-eight tokens to test vowel duration of six different /ɪ/ and six different /æ/ vowels, set within four different prosodic representations as follows:

1. monomoraic stem verb (stem)
2. stem + C (*-s* affix) (stem+C)
3. bimoraic disyllabic word (disyllabic)[15]

[15]The desirable bimoraic disyllabic word token would be an underived word (e.g.'pickle'). However, it was difficult to collate sufficient examples across all categories which fell within the desired CVC (stop vowel stop) syllable. As such, some derived *-er* forms were included (e.g. 'kicker' - as a person or thing that kicks). This was a compromise with the rationale that this would most likely be stored as a lexical item rather than in its component derived parts.

4. stem + VC (-*ing* affix) (stem+V(C))

Comparative vowel duration measurements were made across the tetrad of prosodic representations for each monomoraic verb (e.g. tick - ticks - ticket - ticking). All stems are of the shape CVC and the coda consonant is always a stop to aid the measurement of vowel duration. Nasals were initially included in the minimal pairs sets (*bin* - *bean*), but it was more difficult to locate the offset of the vowel, and the test tokens were restricted to word final stops and sibilants, although only one sibilant was included in the onset position.

	monomoraic verb	monomoraic verb + C affix	bimoraic disyllable	monomoraic verb + VC affix
i)	tick	ticks	ticket	ticking
	sit	sits	sitter	sitting
	pick	picks	pickle	picking
	kick	kicks	kicker	kicking
ii)	dig	digs	digger	digging
	bid	bids	bidder	bidding
iii)	bat	bats	batter	batting
	pack	packs	packet	packing
	pat	pats	pattern	patting
	tap	taps	tapas	tapping
iv)	bag	bags	baggage	bagging
	dab	dabs	dabble	dabbing

Table 4.18: Test items (i): comparative vowel duration.

The tokens for Test (i) were differentiated according to stem-final voicing, so that any difference in vowel length due to the voicing status of the stem-final consonant could potentially be ruled out of the analysis. The groups are marked in roman numerals in Table 4.18 with i) and ii) unvoiced and voiced /ɪ/ verb stems and iii) and iv) unvoiced and voiced /æ/ verb stems.

A further thirteen tokens were incorporated into the test set for the subsidiary control analysis in Test (ii). This was to create a set of eight minimal pairs (this set of minimal pairs included three items from the main body of the Test (i) tokens; sit, pick and bid) in order to provide insight as to whether any vowel difference can be attributed to a tense-lax distinction rather than vowel duration or transfer of minimal requirement strategies from the L1 (shown in Table 4.19).

monomoraic monosyllable (lax) /ɪ/	bimoraic monosyllable (tense) /ɪː/
ship (N)	sheep (N)
sit (V)	seat (N)
pick (V)	peek (V)
bid (V)	bead (N)
bit (N)	beat (V)
dip (V)	deep (ADJ)
kip (V)	keep (V)
pip (N)	peep (V)

Table 4.19: Test items (ii): tense - lax distinction.

4.4.1.2 Spoken tasks and stimuli

The production speech data for Experiment 2 Test (i) and (ii) were collected via an elicited imitation task for individual words. It was initially planned as an elicited 'read aloud' task consisting of isolated words. The primary reason for this task choice, despite the fact that this type of elicitation task invites criticism regarding the influence of the orthographic representation of the word, was to accommodate the lower proficiency levels, making the task as uncomplicated as possible. Although literacy is often cited as a reason for exclusion, it was decided that single words would be on the whole, unproblematic. However, when pilot tested, some subjects spelt out the target word, often accompanied with an appeal for non-verbal reassurance to confirm pronunciation. In order to address this, the material was adapted and delivered as an elicited imitation task.

The elicitation procedure was quite straightforward, and the task was pre-recorded and played back electronically on a laptop. The target word for imitation was first delivered and recorded in a carrier sentence 'Say ——- for me', followed by a short burst of white noise (the sound of an electric fan), the end of which signalled the opportunity for the participant to repeat the target word in isolation. The pre-recorded test material supplied the target word embedded in a carrier sentence in order to help retain neutral delivery. Again, there are criticisms to be levied against an imitation elicitation task of this type, particularly regarding whether production is a mere repetition versus evidence of linguistic representation. To address this, white noise was included in the stimuli design, providing an auditory buffer between the recorded target input and the prompt for the participant to repeat the token. This interruption was intended to stall an acoustic or auditory memory-based repetition of the target form. A delay of three seconds between exposure to the target and the required oral production is arguably too long for adult L2 learners to rely upon auditory perception and phonetic processing of non-L1 phonological categories, and, conversely, a longer delay provides the conditions for learners to show a reliance upon the phonemic categories of the L1 (see, for example, Strange and Shafer (2008); Colantoni et al. (2015). With respect to the above considerations, it was determined that in order to allow maximal participation across proficiency levels, and to provide the best opportunity to collect production of as many instances of the same vowel type whilst avoiding rote repetition, the elicited imitation task was the most appropriate approach.

The test procedure was as follows: The test items were pre-recorded onto an Apple MacBook Pro laptop using the internal microphone. Each token was itemised, so that the start of a new item was signalled with the words beginning 'Number X...' The carrier phrase and target was then recorded. A short three second burst of white noise was inserted after each recorded test item, followed by a (five second) gap for the participant to respond. The recorded task was then imported into a PowerPoint presentation, with a plain light blue background projected on the screen. This was then numerically linked to each consecutive token, allowing for the task to be moved manually between test items by pressing the enter key on the keyboard, and allowing for the test material to be easily stopped and re-started if necessary.

During the procedure, each individual participant listened to the recording through headphones, and the elicited response was recorded onto the laptop with an external microphone using the Audacity software.[16] It was also recorded on a portable Roland Edirol R-09 digital recorder, using the internal microphone with a sample rate set at a standard 44.1 KHz. The task procedure is illustrated with the first two practice items in (107)

(107) Recorded carrier sentence: 'Number one (pause). Say *petal* for me'
3 second burst of white noise
end of white noise - signifies a 5 second interval (participant response)
Participant presses the enter key to move on to the next item
Recorded voice: 'Number two (pause). Say *wing* for me'
3 second burst of white noise
end of white noise - signifies a 5 second interval (participant response)
Participant presses the enter key to move on to the next item

The recording for all test tokens and distractors was duplicated and organised into two randomised sets. The participants were asked to complete the imitation elicitation task twice (on two separate occasions with a week between sessions), in order to increase the number of examples for each vowel in each prosodic representation or tense-lax minimal pair. It was not logistically possible to meet further with the participants due to the time restrictions of the original study to which they were recruited and also with respect to the room availability at the medical centre where the meetings were held. A different version was played each time, so that the tokens appeared in a different order.

[16] Audacity® software is copyright © 1999-2019 Audacity Team. The name Audacity® is a registered trademark of Dominic Mazzoni. For this work I used version 2.1.1 of Audacity(R) recording and editing software.

4.4.1.3 The recording procedure

Although a quiet room was allocated for one-to-one recording, this was a patient consultation room, and not a soundproof booth. It must be stressed, therefore, that the data collected here is not immune from background noise, although every effort was made to minimise outside interference. The participant was seated as close as possible (and slightly offside) to both the external microphone connected to the Edirol R-09 and to the external microphone on the laptop; the microphone volumes were kept as high as could be without causing distortion. The potential rustle of otherwise daily background noise, such as clothing, paper and swivel chairs was again minimised as much as was possible. This is, of course less than ideal. According to Ladefoged (2003), one of the most frequently asked questions in fieldwork studies relates to how to go about finding participants. For the current study, having found willing L1 Bengali speaking participants based in the UK (and Bangladesh), the knottiness of the problem relates to the gathering of the recordings within the community setting. Similarly, with L1 Bengali speaking participants based in Bangladesh, whilst communications for the large part can be satisfactorily carried out using Skype, it is not without impact on the frequency of formants in recordings.[17] However, if the segmentation of the recorded vowels is consistent and if the objective of the analysis is kept in mind, then a rudimentary comparison of vowel duration across different prosodic representations of different stems may be able to at least provide the beginnings of identifying whether there is a pattern to indicate if stems and affixes are treated the same or differently.

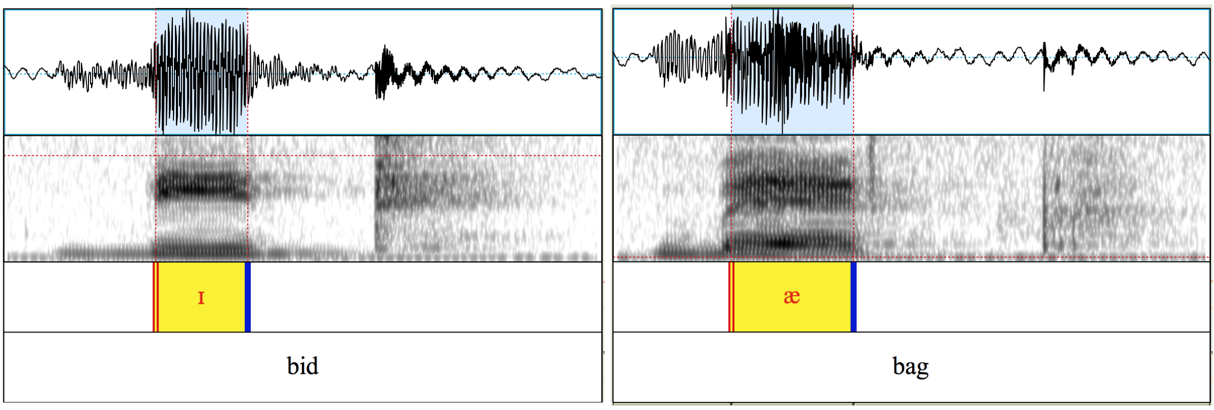
4.4.1.4 Analysis

The sound files were analysed using version 5.4.16 of Praat (Boersma and David Weenink, 2015). The vowels were isolated using the visual displays from spectrogram and waveforms

[17]That is not to say that recordings carried out in Bangladesh would necessarily be carried out in laboratory conditions. Many schools and public buildings are air-conditioned by fans or air cooling units, all of which add distortion to any recording as well as unavoidable surges in electrical supply.

in the Praat windows. For analysis of Test (i), the vowels were segmented by locating the onset and offset of dark and unbroken formant structure. Duration was measured in milliseconds. An overall judgement was made after taking three separate measurement of both types of analysis (manual and electronic), and 8% of the sound files were transcribed and coded by a trained phonetician, who was not informed of the purpose of the analysis. Any discrepancies in the measurements were compared and judgement was made with respect to the most consistent point of onset and offset of vowel measurement across the data set. Difficulties in determining vowel and formant measurements outside of the 8% were also compared and measured by the trained phonetician and together joint judgement was made upon boundaries.

In the example spectrograms shown in Figure 4.12, the vowel measurement begins after the burst release of /b/, and the vowel measure ends with the vowel offset (showing as an irrregular waveform and less energy on the spectrogram). This is a simple measure which is considered sufficient for the purposes of this analysis for Test (i) regarding how similar the vowel length is within the tetrad.



(a) Spectrogram of /ɪ/ in 'bid' (b) Spectrogram of /æ/ in 'bag'

Figure 4.12: Spectrogram analysis of vowel duration in Praat.

For the analysis in Test (ii), first and second formant (F1 and F2) analysis was first done manually and then using Linear predictive Coding (LPC). Any discrepancies were re-analysed using both manual and LPC information looking for whether the F1 and F2 formants showed differences in vowel quality (height and backness respectively). However, as some of the recordings showed unusually extreme values and reliability was questioned, it was concluded that the analysis of formants was better replaced with an AX perception task, which was conducted with three NS Control participants. In this analysis, a spliced recording of the participants' utterances from Test (ii) was created and the NS Control participants acted as coders. They were were asked to listen to the recording and note whether A was the same as X or different. The results for each participant from the three coders was then combined into a percentage score.

4.4.1.5 Data analysis

The data was not normalised to account for speaker variation as this was accommodated for within the statistical analysis in Generalised Estimated Equations with the input of the speaker ID. The data for Test (i) was analysed to test whether word type (stem, stem+C, disyllabic or stem+V(C)) influenced the length of vowel, or whether the voicing status of the stem-final consonant influences vowel length. The measurements input in the statistical analysis were vowel length in milliseconds. The data for Test (ii) was analysed according to whether there was any perceived difference in the vowel quality between L2 English tense and lax vowels.

4.4.1.6 Excluded data

Excluded data for (i) vowel duration and (ii) tense/lax distinction is set out in Table 4.20 and Table 4.21. Responses were excluded if the vowel was changed (e.g. /æ/ to /e/), or if the target inflection was omitted or erroneously affixed. If a coda was omitted the data was also excluded as this changed the environment of the vowel. Interestingly in the exclusions for Test (ii), there were nine instances when the short monomoraic vowel /ɪ/ was changed to a bimoraic diphthong, and these were also excluded from the statistical analysis.

Error type	Example target form	Example error	Number of errors of this type
Syllable reduction disyllable → monosyllable	tapas	tap-s	4
Initial vowel change lax → diphthong/long vowel	tapas	[teɪpas]	1
Vowel change	pack-s	peck-s	2
Monosyllable → disyllable/polysyllable	pack	pack -es	1
Omission of target inflection	bat -s	bat	1
Omission of coda C	bat -s	[bæ-s]	2

Table 4.20: Test (i): Error types and exclusion of data.

Error type	Example target form	Example error	Number of errors of this type
Vowel change → diphthong/long vowel	bidder /ɪ/	[baɪdə]	9
Monosyllable → disyllable/polysyllable	tick -s	ticket -s	6
Omission of target inflection	sit -s	sit	4
Addition of non-target inflection	tick	tick -s	1
Omission of coda C	bid -s	[bɪz]	1
Unclear pronunciation	ticket	?	1

Table 4.21: Test (ii): Error types and exclusion of data.

4.5 Chapter summary

This chapter begins with the statement of the research questions and predictions for the experimental studies. It describes the recruitment and placement testing procedure for the participants for Experiment 1 and Experiment 2 and an overview of the experiments conducted in this study. The experimental design methodology is described and there is discussion regarding the choice of task and the design of the test stimuli. The data collection method, coding and preparation of the data for statistical analysis is then reported. Examples of the test stimuli and rubric are given within body of the chapter, and a complete set of test items is provided. The GJT is set out in Appendix A, and the semi-spontaneous production test stimuli is set out in in Appendix B. The results of Experiment 1 are presented in the following chapter, and those of Experiment 2 in Chapter 6.

Chapter 5

Results for Experiment 1

5.1 Introduction

This chapter reports the results for Experiment 1. The results are analysed and discussed with respect to the Prosodic Transfer Hypothesis (PTH), in light of the effects of (a) L1 transfer of prosodic representation of affixation at the level of the prosodic word (PWd), (b) the availability and accessibility of L1 PWd adjoined and PWd internal representations in the interlanguage with respect to a 'weak' and 'strong' version of the PTH and (c) evidence of L1 transfer below the level of the word with reference to minimal word requirements.

The results section is organised as follows: an overview of the suppliance of inflection is presented from experiment 1A, followed by a comparison of accuracy between the spoken suppliance rates and the grammaticality judgement tests (GJT) from Experiment 1B. The data are then considered in relation to transfer of L1 minimality requirements and moraic structure. This is particularly in relation to how moraic structure and minimality requirements define the shape of the (L1) prosodic word, and how this might interact with regards to affixation of L2 inflectional morphology. In the case of Bengali, the suppliance of inflection on verbs with long vowel (LV) stems (well-formed according to L1 requirements) and short vowel (SV) stems (subminimal according to L1 minimality) is considered for simple past verbs in regular forms, as well as evidence of phonological processes (particularly epenthesis) to repair moraic structure which is deemed subminimal in the L1. The suppliance of inflection is subsequently further examined with respect to irregular simple past forms in ablaut and pseudo-inflected conditions. Finally, the lower rates of suppliance of inflection on third person singular is considered in terms of L1 minimality requirements. First, however, Section 5.2 provides a short background to the motivation for the statistical analysis procedures adopted in this study.

5.2 Background to the method of statistical analysis

As well as nonparametric tests which were run to look for differences in performance across the GJTs, both within and between participant groups, the generalized estimating equations (GEE) modelling approach was used to estimate the associations between different variables and the suppliance of inflectional morphology in spoken data.[1] This method included some linear mixed models, but mainly logistic regression mixed model. All analyses were run using IBM SPSS Statistics for Macintosh, Version 23.0.

One of the primary reasons for adopting the GEE approach over other parametric or non-parametric statistical tests is because GEE accommodates correlated (i.e non-independent) responses. The assumption of independence is one of the four main assumptions of, for example, the ANOVA and its non-parametric alternative the Kruskal-Wallis test. If independence of observations is not met, one participant's score may influence another participant's score, the consequence of which may be an increased chance of a Type I error (leading to a possibly unwarranted rejection of the null hypothesis). Eddington (2015) and Larson-Hall (2010), amongst others, discuss the importance of the observation of the assumption of independence in relation to tests which are not designed to measure individuals on more than one condition. Similarly, non-trivial differences, particularly regarding dialectal language background in the current study, length and type of

[1]The nonparametric tests primarily included the Kruskal-Wallis, Friedman and One-sample binomial tests in relation to the GJTs.

exposure to the L2 and individual differences within proficiency groups can be included in the model, which would otherwise be averaged out in an ANOVA type analysis. As well as allowing multiple responses per subject, this type of analysis is more robust when dealing with missing data, and can include data which is both continuous and ordinal as well as binomial data.

With relation to the logistic regression mixed model run in this data analysis, the probability distribution was binomial (as a binary distinction was made between whether inflection was supplied or not supplied), the link function was logit (for logistic regression), and the independent working correlation matrix structure was specified, the process of selection of which is discussed to in the following section. Speaker ID was included in each model as a random factor in order to accommodate individual variation.

5.2.1 Working correlation matrix

In this method of analysis, the predictors (i.e. the independent variables) are fixed and the outcome (i.e. the dependent variable) is considered random. As the outcome is dichotomous, a binomial probability distribution is selected (i.e. inflection was either supplied or not) with a logit link function to model the mean. A working correlation structure is specified to account for how responses relate to each other within clusters, in other words, a pre-selected correlation structure for the repeated measurements.

There are different types of correlation structure of interest in this study, which make assumptions on how data are correlated, and the selection of which is based upon the simplest structure that best fits the data. It is worth pointing out, however, that GEE is considered to be fairly robust in that if the wrong correlation structure is selected, the resulting regression coefficient estimates will still be consistent and considered to be asymptotically unbiased. However, a sub-model was run under three different working correlation matrices in order to find the best goodness of fit and the most efficient model for the current analysis (e.g. Kleinbaum and Klein, 1994, p.349-354). To avoid biasing the results, this was run prior to the main analysis with the predictors of proficiency level and word type. Word type consisted of regular and irregular simple past verbs, third person singular agreement verbs, plural noun agreement (number) and monomorphemic nouns. However, the high level of performance (across all proficiency levels) on the monomorphemic nouns created a warning of singularity in the Hessian matrix, and this category was removed from the statistical analysis. In order to make a comparison between suppliance of word-final consonant clusters in monomorphemic forms versus those in irregular simple past verbs, a simple contrast of percentage scores is drawn in Section 5.4.4.1. Similarly, the lack of evidence of variation in the plural noun agreement category for the Advanced proficiency group also created a warning of singularity in the Hessian matrix, and this sub-category was also removed from the statistical analysis, leaving plural noun agreement for Beginner through to Intermediate proficiency levels only. As a result, the plural noun category is only included in the overview analysis of inflectional morphology suppliance rates, and was not examined to any further depth. To illustrate this more clearly, the count for word categories included in this analysis for correlation type of repeated measures is shown in Table 5.1.

Word type category	Excluded	Included	Total
LV Reg. PT	0	1024	1024
SV Reg. PT	0	950	950
Irreg. PT	0	547	547
SV 3SG	0	655	655
LV 3SG	0	342	342
Pl Noun	80	368	448
Mono	364	0	364
Total	444	3886	4330

Table 5.1: Input data for overall suppliance of inflectional morphology.

Three correlation structures were tested: independent, exchangeable and unstructured. The purpose of this is to find the best fit for the data, that is, the simplest correlation structure available measured as a corrected quasi likelihood under independence model criterion (QICC). Briefly, the independent correlation matrix assumes that responses are uncorrelated within clusters, and this correlation matrix returned a QICC of 2127.117. The exchangeable correlation structure makes the assumption that responses within a cluster are equally correlated, and this returned a QICC of 2131.290. The unstructured correlation structure has fewer constraints on the correlation parameters and gives a separate correlation parameter for each pair of observations within a cluster (e.g. Kleinbaum and Klein, 1994, p.370). The unstructured model run here generated a warning, and iterations were increased from a maximum of 100 to 200. However, the model still did not accept above 100 iterations and the results reported here should therefore be considered with caution. The goodness of fit did not improve with the unstructured correlation matrix, QICC = 2239.001, and the best goodness of fit (the lowest QICC value) was the model with the independent correlation structure (QICC = 2127.117), and this is the working correlation matrix selected for the model builds in the analysis of results in this chapter, and also for those in Experiment 2. The goodness of fit for the correlation structures is summarised in Table 5.2.

Correlation matrix	QICC
1) Independent	2127.117
2) Exchangeable	2131.290
3) Unstructured	2239.001

Table 5.2: Model selection for the working correlation structure.

5.2.2 Reporting the goodness of fit

The goodness of fit is based on a statistic of the generalization of likelihood. The QICC is reported here and throughout the results presented in this study. The QICC allows the selection of the best model, given two sets of model terms and a (specified) correlation structure. The implications of a lower QICC is a better fit in the model (the goodness of fit). The Δ QICC provides a quick overview of the difference between the base model and the predictor under observation.

5.2.3 Probability: Sequential Sidak

To allow for multiple contrasts, the overall significance level reported here is the adjusted Sequential Sidak procedure, with probability value $p \leq 0.05$.

5.2.4 Data preparation

The data was coded as discussed in Chapter 4. Before statistical analysis, the data was also prepared with relation to (a) the best measure of proficiency and (b) a log frequency was made. This was to allow for the extreme values of some very high and very low frequency values of test tokens. This is discussed in the following sections.

5.2.4.1 A measure of proficiency and the Oxford Quick Placement Test

A sub-model was run to determine whether proficiency as a factor has a greater effect according to the criteria of measurement. As discussed in Chapter 4, the participants in this study were assigned a proficiency level (from Beginner through to Advanced), which was allocated according to the OQPT 'paper and pen' test score, in accordance with Alte and Council of Europe Levels. Due to the small number of participants, the lower Intermediate proficiency level participants (scoring from 24 - 30 on the OQPT scale) and the upper Intermediate level participants (scoring from 31 - 40 on the OQPT scale) were collapsed into one group, with the lowest score being 24 and the highest 33. Similarly, the Advanced proficiency group was collapsed to include the Advanced (48 - 54 on the OQPT scale) and very Advanced (54 - 60 on the OQPT scale) participants into one Advanced group, with scores ranging from 51 to 56. It is possible, therefore, that the raw OQPT score might provide a better predictor of proficiency than the collapsed proficiency bands. Furthermore, the participants also completed a grammaticality judgement test (GJT), which consisted of regular and irregular simple past tokens (GJT for Reg.cannot PT and GJT for Irreg. PT), as well as third person singular agreement tokens (GJT for 3SG), and this may also better predict proficiency in the context of suppliance of inflection.

In order to both illustrate the best predictor for proficiency as well as the process of model build as adopted in the analysis reported in this study, a step by step illustration of how the best predictor for proficiency was obtained is shown here. The base model was first established with the suppliance of simple past inflection on regular and irregular verbs in the simple past, and proficiency level was entered as a factor into the model, as shown in Table 5.3. The goodness of fit was improved from 2124.382 to 1279.105, with a Δ QICC of 845.277 (from the deduction of the factor of proficiency from the base model).

	Predictor	QICC	Δ QICC
1) Base		2124.382	-
2a) Proficiency	proficiency level	1279.105	845.277

Table 5.3: Model (1) selection for the inclusion of proficiency level.

Table 5.4 shows whether a better model would be obtained if the participants' actual raw OQPT scores were included rather than the collapsed proficiency levels. However, the raw OQPT scores created a higher goodness of fit than the proficiency level and a lower Δ QICC of 717.881.

	Predictor	QICC	Δ QICC
1) Base		2124.382	-
2a) Proficiency	proficiency level	1279.105	845.277
2b) Proficiency	raw OQPT score	1406.501	717.881

Table 5.4: Model (2) selection for the inclusion of proficiency level.

A third model was run with the combined GJT scores for regular simple past, irregular simple past and third person singular agreement combined, as shown in Table 5.5. The GJT is intended to provide a measure of L2 learner syntactic knowledge of simple past tense in regular and irregular verb types and also in third person singular agreement (3SG). Although the combined GJT scores resulted in a better goodness of fit (1291.023) than the raw OQPT scores (1406.501), the assigned (conflated) proficiency level still provides the better goodness of fit and highest Δ QICC.

	Predictor	QICC	Δ QICC
1) Base		2124.382	-
2a) Proficiency	proficiency level	1279.105	845.277
2b) Proficiency	raw OQPT score	1406.501	717.881
2c) Proficiency	combined GJT for Reg. PT, GJT for Irreg. PT, GJT for 3SG	1291.023	833.359

Table 5.5: Model (3) selection for the inclusion of proficiency level.

Looking more closely at the individual GJTs for tense and agreement, the parameter estimates revealed that the GJT for Reg. PT gave a negative beta value (β = -.106,

p=.078), the GJT for Irreg. PT gave a positive and statistically significant result (β = .414, p=.0005), and the GJT for 3SG gave a non-statistically significant result (β = .097, p=.128). A final model was therefore run with the GJT Irreg. PT, as shown in Table 5.6 to see whether this provided a better measure of proficiency. However, the GJT for Irreg. PT did not provide the best goodness of fit or the highest Δ QICC, and proficiency as indicated by the the conflated proficiency levels (2a) was retained as the best indicator of proficiency in the model presented here.

	Predictor	QICC	Δ QICC
1) Base		2124.382	-
2a) Proficiency	proficiency level	1279.105	845.277
2b) Proficiency	raw OQPT score	1406.501	717.881
2c) Proficiency	combined GJT for Reg. PT, GJT for Irreg. PT, GJT for 3SG	1291.023	833.359
2d) Proficiency	GJT for Irreg. PT	1306.108	818.274

Table 5.6: Model (4) selection for the inclusion of proficiency level.

Considering the differences in the goodness of fit that the different measures of proficiency level returned, it was questioned whether the evidence of proficiency from the OQPT proficiency level (QICC = 1279.105) in comparison to the GJT for Irreg. PT scores (QICC = 1306.108) were testing the same thing. If both proficiency level and the GJT for Irreg. PT scores were statistically insignificant, then variation would be shared, and the tests would be effectively testing the same thing (i.e providing a value taken from the same measure of proficiency). However, if they are both significant, then they are independently significant and testing different things, resulting in a different measure of proficiency. It was found that both proficiency level and the GJT scores for irregular simple past were significant (p=.0005 and p=.001 respectively), and therefore indicative that these tests each provide a different measure of proficiency. It would appear, therefore, that the OQPT provides a measure of proficiency, which is seemingly not compromised by conflating upper and lower levels within a proficiency band, whilst the GJT for Irreg. PT provides a measure of something other than a general level of proficiency (following other studies, the intended measure of the GJT is syntactic knowledge).

Why the GJT for Irreg. PT should provide a better measure than the GJT for Reg. PT or GJT for 3SG (as the intended measure is syntactic knowledge of representation of inflectional morphology) is unclear. Following White (2009), it is assumed that there is no syntactic difference between whether a verb is regular or irregular and past or non-past [$\pm$ past]. The parameter estimates showing the interaction between the GJT for Irreg. PT and suppliance of simple past inflection (in both regular and irregular forms) for the Beginner proficiency level show a negative β value, indicating that the higher the GJT score, the lower the likelihood that a Beginner-level learner will supply the target inflection (β = -.207, p=.030). From the Elementary proficiency level upwards, however, there is positive interaction; the higher the score on the GJT for Irreg. PT, the greater the prediction of accurate suppliance of target inflection (Elementary β = .277, p=.014; Intermediate β = .518, p =.0005; and Advanced β = .534, p=.019).

5.2.4.2 Log frequency for the frequency variable

Word frequency was controlled for in this analysis by way of a log frequency which was entered into the model build. Following Goad and White (2006), reference was made to the companion website for Leech et al. (2001), which is based on the British National Corpus and which records frequency-ranked lists (by lemma) per million words, in spoken and written English. The rank frequency of target verbs and nouns, as well as unsolicited tokens, showed that the frequency distribution was highly skewed (which is not uncommon with a frequency variable). To adjust for a more even spread, and to reduce the influence of a few very high or low frequency target verbs or nouns (e.g. (to) look has a very high frequency value of 1151), the standard approach of taking a log was used to create a variable where the very high values did not exert undue influence over the lower value frequency tokens. Logs (to base 10) were taken. A few target verb or nouns did not occur in the database (e.g. leak = $\emptyset$). It was assumed that tokens which did not appear in the corpus had a frequency of between 0 and 1, and the middle value of 0.5 was therefore used for those tokens which returned zero frequency in the corpus.

5.2.4.3 Reporting standard error

The statistics which are reported in these results include the standard error values or upper and lower confidence intervals. However, in some cases, there is very little difference between the upper and lower confidence intervals, despite a statistically significant result. This is put down to the different measures of standard error, as illustrated in Figure 5.1, which is loosely adapted and modified from Mead (1990, p.388).

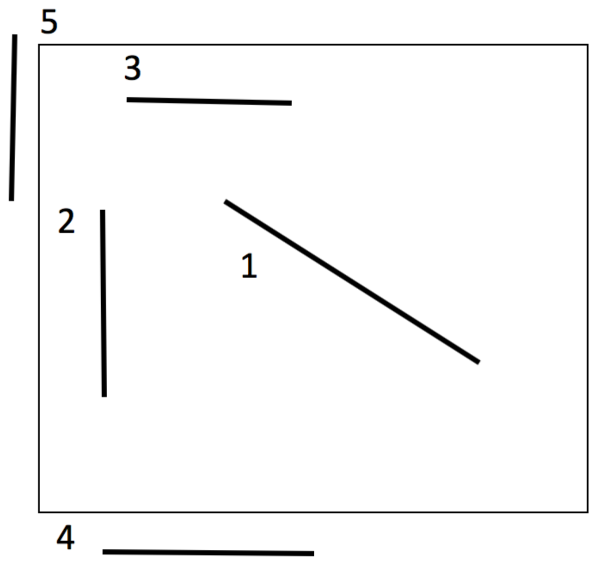


Figure 5.1: The different measures of standard error.

According to Mead (1990), different measures of standard error (i.e. how reliable the mean is) are obtained depending upon what is being compared. SPSS calculates the mean and standard error from the data of estimates, which is closest to the diagonal line (1) in the graph, whereas the standard error measurement most appropriate for this study is similar to that shown in line (2). Put simply, the difference can be illustrated if the Y axis is assumed to represent 'word type' and the X axis the subject or 'person factor'. In

(1), the measure is equivalent to comparing a Beginner production of a word 'x' with an Elementary production of a word 'y'. Whereas the measure of standard error in line (2) signifies a comparison between a Beginner production of 'x' and a Beginner production of 'y'. To complete the comparison, line (3) would be consistent with a measure of Beginner 'y' with Elementary 'y'. Line (4) and (5) are out of the table and would therefore compute an overall comparison, line (4) a comparison of Beginner and Elementary and line (5) a comparison between two words, 'x' and 'y'. With logistic regression, as a rule of thumb, mean-(2xSE) should be greater than 0 (i.e. the lower confidence should be greater than 0), and mean+(2xSE) should be less than 1 (i.e. the upper confidence interval should be less than 1).[2] A note of caution then is recommended in the interpretation of the standard error values reported here.

With the background to the statistical analysis, particularly the application of the approach to the initial set up of the logistic regression mixed model statistical analysis (for both Experiment 1 and Experiment 2), attention now turns to the presentation of the results for Experiment 1.

5.3 Experiment 1: Transfer of L1 prosodic representation

The results for Experiment 1 are set out in the following sections, beginning with an overview of the suppliance data in Experiment 1A. The results of the GJT (Experiment 1B) are then discussed, followed by a comparison between the GJT and overview of the suppliance of inflectional morphology. Next, further statistical analysis of the regular past tense with respect to stem vowel length is reported, and then the results for the suppliance of the irregular simple past and third person singular agreement are presented.

[2]SE=standard error.

5.3.1 Overall suppliance of inflectional morphology

This section begins with a recapitulation of the predictions from Chapter 4. This is followed with the analysis of the overall suppliance of inflection in the spoken data and the results of the GJTs. This is then followed with a comparison of the overall suppliance of inflectional morphology in the spoken data with the results of the GJTs.

5.3.2 A recapitulation of the predictions

The PTH makes predictions for advanced (and end-state) stages of proficiency. As it is assumed that developmental stages help reveal more about the representation of inflectional morphology in spoken production at the end state, this study attempts to provide predictions relevant to L1 Bengali speakers at lower levels of proficiency as well as for advanced levels. The predictions primarily concern English simple past tense, both regular (Reg. PT) and irregular (Irreg. PT) and third person singular agreement (3SG). For the initial overview of suppliance of inflection, a plural noun category (Pl Noun) was also included as a small 'control' subset. The Pl Noun category was included to allow a small control set for a comparative overview with 3SG, as the inflectional morpheme *-s* is common to both forms. Some previous studies have shown a higher rate of inflection on Pl Noun than 3SG (Goad and White, 2004; Lardiere, 2007). The plural nouns tested in this subset were overt and in clearly quantified contexts (e.g six dog *-s*). The lack of variance, however, prevents full analysis of this category (see Section 5.2.1). A category of monomorphemic nouns was also included to contrast production of word-final consonant clusters (CC) with Irreg. PT in a PWd internal representation (as discussed in Chapter 2). However, the lack of variance within proficiency levels created an error warning, and this was removed from the analysis (also see Section 5.2.1). An overview of the mean scores for the suppliance of CC in monomorphemic forms is reported in Section 5.4.4.1.

To recapitulate, for L1 Bengali speakers, the PWd adjoined representation is proposed to be available in the L1, but potentially, although not necessarily depending on the interpretation of the PTH (Goad et al., 2003; Goad and White, 2004, 2006; Goad and White, 2009), requires licensing to a new position in the interlanguage (i.e. from Bengali perfect forms to English regular past tense, third singular and plural forms). The PWd internal representation is also proposed to be readily available in the L1 to transfer, and, with respect to licensing, is already well-placed for production of L2 irregular past tense inflectional morphology, as it is similarly representative of simple past tense in Bengali. The predictions for L1 Bengali speakers at L2 English Advanced proficiency level are set out in Section 5.3.2.1, followed by the predictions for lower level learners in Section 5.3.2.2

5.3.2.1 Predictions 1a: Advanced proficiency level

By Advanced proficiency level, it is assumed that any (minimal) differences between Bengali PWd internal and PWd adjoined representations (i.e. minimal adaptation with respect to the licensing of a PWd adjoined structure to a new position in the interlanguage), if required, will be complete (i.e. regardless of the strong or weak versions of the PTH). It is proposed, therefore, that inflection will be supplied in spoken production in equal measure across the test categories and will be equivalent to the NS Control group. The PTH allows that native-like performance is possible if the required L2 prosodic representation is available in the L1 to transfer, or if it can be built under conditions (relative to weak and strong versions). Similarly, with respect to the grammaticality judgement test (GJT), it is also proposed that at Advanced proficiency levels, the functional syntactic categories for L2 English tense and agreement will be present in the interlanguage grammar. It is predicted that Advanced learners will perform equally well on all sections of the grammaticality judgement test (GJT for Reg. PT, GJT for Irreg. PT and GJT for 3SG), and with equivalence to the spoken production data. It is also expected that Advanced learners will perform equally as well as the NS Control group in each section of the the GJT.

The predictions for the overall suppliance of inflectional morphology in both spoken production and the GJT by L1 Bengali speakers at Advanced proficiency level are summarised in (108).

(108) a. Spoken data: Pl Noun = Reg. PT verbs = Irreg. PT verbs = 3SG

b. Accuracy in GJT data = spoken production data

c. Suppliance of inflection in spoken production and GJT: Advanced proficiency level L1 Bengali speakers = NS Control group

5.3.2.2 Predictions 1b: Lower levels of proficiency

In comparison to the predicted ease with which Advanced proficiency speakers will supply inflection across the test categories and with equivalence across both spoken and GJT, it is proposed that the suppliance of inflection will be dependent upon the required prosodic representation and will, at some level of proficiency, be asymmetrical in the suppliance of spoken inflection in relation to the GJT.

It is proposed that L2 inflection which requires the PWd internal representation (e.g. Irreg. PT), will be facilitated with L1 transfer. The L2 inflection which requires the PWd adjoined representation (e.g. Reg. PT, 3SG and Pl Noun) will (initially at least) be hindered (equally across categories). This is because if the Bengali PWd adjoined structure requires licensing to a new position in the interlanguage, then it is assumed that there will be some delay in the suppliance of L2 inflectional morphology requiring the PWd adjoined representation (i.e. the strong version of PTH). Alternatively, if a weak version of PTH prevails, then it is assumed there will be little delay between the suppliance of inflectional morphology requiring a PWd adjoined representation, as learners will be able to adapt an L1 structure to a new location in the interlanguage. Snape and Kupisch (e.g. 2010, p.536) discuss the weak and strong versions of PTH, and Section 2.3.3 includes a review of a strong and weak interpretation of the PTH, and the significance of this with respect to L1 Mandarin speakers of L2 English.

At some lower level(s) of proficiency, the GJT scores are predicted to be higher across all the test categories (GJT for Reg. PT, GJT for Irreg. PT and GJT for 3SG) than the spoken production of inflectional morphology. This is because although functional syntactic categories may be present in the interlanguage, spoken production is proposed to be hindered by deficiencies related to the transfer of L1 prosodic representation. In other words, under the PTH, it is proposed that syntactic representation of the required categories and features will not be problematic in the suppliance of inflection in spoken production. However, the GJT scores for learners at lower levels of proficiency will be lower than those of the NS Control group. The predictions for L1 Bengali speakers at lower levels of proficiency are summarised in (109).

(109) a. Strong version of PTH for spoken data: Irreg. PT verbs > Reg. PT, Pl Noun and 3SG

b. Weak version of PTH for spoken data: Irreg. PT verbs = Reg. PT, Pl Noun and 3SG

c. GJT data: Accuracy in GJT > spoken production data

d. Suppliance of inflection in spoken production and GJT: L1 Bengali speakers at lower levels of proficiency < NS Control.

5.3.3 Results 1: Overview of suppliance of inflectional morphology

As discussed in Chapter 4, the spoken data were collected in an elicited semi-spontaneous production task. The responses were coded, and only those coded as either 'accurately inflected' or 'inflection omitted' (i.e. bare verb) were entered into this analysis. A numerical summary of the factors entered into the model is set out in Table 5.7. The data from a total of 28 participants were entered into the model, with a count of 2,481 data points. Of this, a total of 525 responses were entered into the model from the Beginner proficiency group, 597 from the Elementary proficiency group and so on. With respect to verb type, of the 2,481 data points, 333 of the responses entered into the model were related to Irreg. PT verbs, either inflected accurately or presented as a bare verb. A further 1,231 responses were related to Reg. PT verbs, and so on. Unsolicited responses (i.e. responses which involved an alternate verb or noun form which was not the intended elicited form), which were either accurately inflected or produced without inflection, were also incorporated into the data input into the model. Of the overall data entered into the model, there were 1,440 instances of accurately inflected tokens (58%) and 1,041 instances of uninflected bare tokens (42%).

Factor	Description	Number (n)	Input data
Proficiency level	Beginner	(n=7)	525
	Elementary	(n=8)	597
	Intermediate	(n=8)	830
	Advanced	(n=5)	529
	Total		2481
Word type	Irreg. PT		333
	Reg. PT		1231
	3SG		605
	Pl Noun		312
	Total		2481

Table 5.7: Summary of categorical variables: Proficiency level and word type category.

5.3.3.1 Estimated means of suppliance of inflection in relation to the predictions

A base model was run with the predictors of proficiency level and word type category, with a two-way interaction between proficiency and word type category (proficiency*word type category). However, number agreement on the Pl Noun category created a warning of singularity in the Hessian matrix (due to the high level of performance across the Advanced proficiency group), and this category was removed from the analysis at the Advanced proficiency level. The NS Control group was also excluded from this (and all further analysis) because the participants performed at ceiling in all categories, again showing lack of variation across the group and creating a warning of singularity in the Hessian matrix. Once these categories were removed from the analysis, the model ran without further warning (Wald χ^2 27.356, df=3, p=.0005). Table 5.8 shows the model build, and Table 5.9 reports the tests of model effects, showing that everything in the model is significant.

	Predictor	QICC	Δ QICC
Overview	proficiency, word type, proficiency*word type	2120.221	-

Table 5.8: Base model: Overview of the suppliance of inflection.

Factor	Sig.(p)
proficiency level	.0005
word type	.0005
proficiency*word type	.017

Table 5.9: Tests of model effects for the overview of suppliance of inflection.

The estimated means for the overview of the suppliance of inflection are shown in Figure 5.2 and Table 5.10. L1 Bengali speakers at Advanced proficiency level consistently produce inflection across all test categories, suppliance of inflection is uniformly high (always above 90%), and there is no statistical significance between word type categories (Reg. PT and Irreg. PT p=.212, Reg. PT and 3SG p=.533, Irreg. PT and 3SG p=.245). These results, to a large extent, support the predictions made in (108a) regarding uniformity across word type category, but the Advanced speakers do not perform at the same level as the NS Control. The NS Control scored 100% across categories, but were removed from the analysis due to lack of variance which triggered an error warning in the Hessian matrix. It is not the intention to suggest here that an equivalence between suppliance data for L1 Bengali speakers at Advanced level and a NS Control is either a desirable or meaningful analogy. It is, however, a benchmark which has been used in previous studies (e.g. Goad and White, 2006; Campos-Dintrans, 2011; Cabrelli Amaro et al., 2018) as a comparatively accessible way to measure the degree to which acquisition can be said to have taken place. See Lakshmanan and Selinker (2001) for discussion regarding percentage suppliance rates which might suggest acquisition of inflectional morphology has been accomplished.

For the lower levels of proficiency, however, in contrast to the predictions in (109), there are no statistically significant differences between the suppliance of inflection on the past tense verb types of Irreg. PT and Reg. PT, at any level of proficiency (Beginner p=.697, Elementary p=.130, Intermediate p=.262). It was predicted that suppliance of inflection on Irreg. PT verbs would outstrip that on Reg. PT verbs (109a), due to the ease of transfer of the L1 Bengali PWd internal representation in contrast to the possible adaptation required in licensing the L1 Bengali PWd adjoined representation to a new position in the interlanguage.

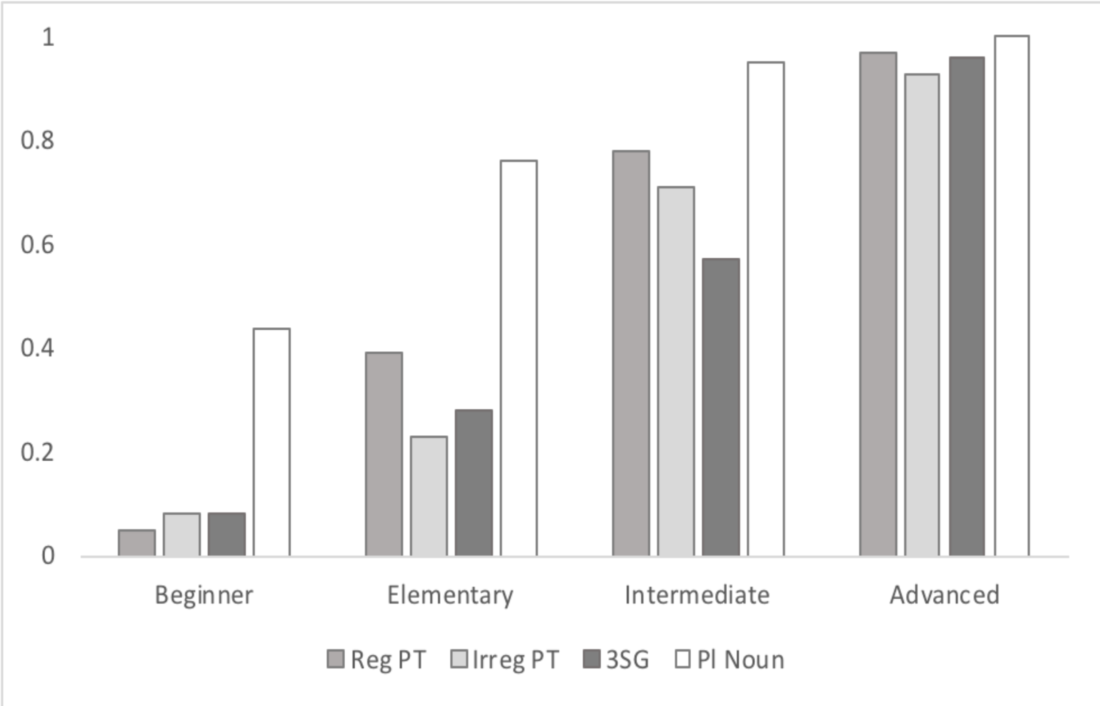


Figure 5.2: A comparison of the overall suppliance of inflectional morphology

	Reg PT	SE	LI	UI	**Irreg PT**	SE	LI	UI	**3SG**	SE	LI	UI	**Pl N**	SE	LI	UI
Beginner	**.05**	.021	.02	.11	**.08**	.027	.04	.15	**.08**	.034	.04	.18	**.44**	.103	.25	.64
Elementary	**.39**	.069	.26	.53	**.23**	.098	.10	.47	**.28**	.068	.17	.43	**.76**	.078	.58	.88
Intermediate	**.78**	.047	.68	.86	**.71**	.077	.54	.83	**.57**	.122	.33	.78	**.95**	.022	.88	.98
Advanced	**.97**	.012	.94	.99	**.93**	.035	.82	.97	**.96**	.015	.92	.98	**1.0**	-	-	-

SE = standard error, LI = lower confidence interval, UI = upper confidence interval

Table 5.10: Estimated mean scores for overall suppliance of inflection according to word type category.

As there is no statistical significance between the suppliance of inflection according to whether the verb is Reg. PT or Irreg. PT, the data presented here could indicate that the L1 PWd adjoined representation does not require licensing to a new position in the interlanguage, and is more readily available than the strong version of PTH might suggest (e.g. Goad and White, 2004) as stated in (109b). However, as the Beginner group perform equally low across all verb categories tested here, it is impossible to relate performance to availability of prosodic representation. Similarly, although the Elementary group do show higher rates of suppliance than the Beginner group, again there is no statistical significance in performance across the verb categories tested here. However, the only statistically significant differences in the suppliance rates across word types within proficiency levels can be seen between inflected regular Pl Noun and all other word types (Irreg. PT, Reg. PT and 3SG) at Beginner through to Intermediate proficiency levels. This is summarised in Table 5.11 ($*$ shows statistical significance).

Proficiency	Reg. PT - Pl Noun	Irreg. PT - Pl Noun	3SG - Pl Noun
Beginner	p=.001 $*$	p=.0005 $*$	p=.001 $*$
Elementary	p=.001 $*$	p=.001 $*$	p=.0005 $*$
Intermediate	p=.003 $*$	p=.009 $*$	p=.001 $*$

Table 5.11: Summary of statistically significant differences in overall suppliance rates.

Whether plurality is more consistently marked on a Pl Noun category than other functional morphemes seems to be variable across L1s. For comparison, Campos-Dintrans (2011) reports no statistical significance in the spoken production of plural morphology between L1 Spanish speakers and a NS Control group, but this was not similarly replicated with the L1 Mandarin and L1 Japanese speakers in that study. Specifically, Campos-Dintrans (2011, p.172) points out that in Spanish, but not the other L1s, there appears to be a convergence between the availability of both L1 syntactic structure and prosodic representation required for for L2 production. Whilst the syntactic features for [Number] are present in Spanish, this is not the case for Mandarin and Japanese. Similarly, whilst Spanish plurality is marked with the morpheme *-s* on the noun, and prosodically represented adjoined to the PWd, this is not the case for Mandarin and Japanese, where the required structure must be built. It is possible, then, that at lower levels of proficiency suppliance of inflection on certain functional morphemes is dependent upon an L1-L2 convergence of both prosodic and syntactic (and morphosyntactic) features.

It is perplexing why there should be relatively high rates of suppliance of inflection on Pl Noun by lower proficiency levels, as there is no reason for the PWd adjoined representation to be more accessible for Pl Noun than it is for Reg. PT or 3SG. However, as Bengali plurality is proposed to be inflected both PWd internally and PWd adjoined, it is a possibility that optionality of prosodic structure in the L1 is also at play in L2 productions, and plurality on nouns may be variably marked in both or either a non target-like PWd internal or target-like PWd adjoined representation.

There is a clue, however, from patterns in developmental stages between proficiency levels for L1 Bengali speakers. Suppliance rates of inflected Reg. PT verbs (and 3SG and Pl Nouns) show a statistically significant increase between proficiency levels, but this is not replicated in the case of Irreg. PT verbs between the Beginner and Elementary proficiency levels, indicating a much slower development at lower levels in the suppliance of inflected Irreg. PT verbs. In this respect, whether this is due to frequency effects or availability of the PWd internal prosodic representation in the interlanguage, there is a predicted delay in development of suppliance of inflected Irreg. PT verbs between Beginner and Elementary levels. The percentage differences and statistical significance in suppliance rates between proficiency levels per word type is reported in Table 5.12 ($*$ marks statistical significance).

	Beginner to Elementary	Elementary to Intermediate	Intermediate to Advanced
Pl Noun	73 p=.023 $*$	25 p=.023 $*$	5 - n/a
Reg. PT	680 p=.0005 $*$	100 p=.0005 $*$	24 p=.0005 $*$
Irreg. PT	188 p=.128	209 p=.0005 $*$	31 p=.020 $*$
3SG	250 p=.018 $*$	104 p=.042 $*$	68 p=.004 $*$

Table 5.12: Percentage increase in overall suppliance rates across developmental stages.

There are, however, a number of considerations when making a comparison between the suppliance of inflection on regular and irregular verbs, not least the potential conflict related to comparative token frequency of regular or irregular verb type (Goad and White, 2006; Cabrelli Amaro et al., 2018), and the potential influence of rote learning of irregular forms in comparison to rule formation of regular forms (Cabrelli Amaro et al., 2018). In previous studies, frequency has been addressed by, for example, matching regular and irregular verb tokens according to the frequency rating in a corpus (Goad and White, 2006, p.254). In the current study, a log frequency using the same corpus as that in Goad and White (2006) is created to manage variation between extremes of frequency of tokens (see Section 5.2.1). The effects of frequency on suppliance of PT inflectional morphology is discussed in Section 5.4.2.4.

5.3.3.2 Interim summary

To summarise, the estimated means for the overall suppliance of inflection as generated in a base model (i.e. without the effect of other independent variables) by Advanced L1 Bengali speakers of L2 English supports the predictions based on the PTH for the Advanced proficiency level learners.

1. There are no statistically significant differences in the suppliance of inflection on

the different inflectional morphemes (Reg. PT, Irreg. PT, Pl Noun, 3SG) tested here.

2. Learners perform at a high level and produce inflection an average of 90% of obligatory contexts for inflection.[3]

Superficially, at lower levels of proficiency there is no apparent advantage in the production of Irreg. PT in the convenience of the L1 PWd internal representation being readily available to transfer to the interlanguage. The suppliance of inflectional morphology which requires the PWd adjoined representation (i.e. Reg. PT, 3SG and Pl Noun) is produced variably. This can be summarised as follows:

1. Inflection is supplied statistically significantly more on the Pl Noun word category than any other category. In Bengali, plurality is represented in both a PWd adjoined and PWd internal representation, effectively maximising structural options for the production of L2 English plurality.

2. Irreg. PT is not supplied more than any other category (and although it is not statistically significant, it is produced less consistently than any other inflection type tested here). Effect of frequency has not been included in the model so far.

3. Related to the above, there is a statistically significant developmental increase in suppliance rates across all word type categories, showing an increase in suppliance rates with an increase in proficiency, except between Beginner and Elementary with respect to Irreg. PT verbs.

In the next section, spoken suppliance rates are considered against the results of the GJTs. What becomes apparent is that by Intermediate proficiency level, there is a direct correlation between the suppliance of inflection in relation to accuracy in identifying

[3]According to the PTH, there is no reason to suppose that Advanced level speakers of L2 English could not achieve the same suppliance rates as the NS Control. In this study, the NS Control perform at ceiling, however, this is not always the case. Campos-Dintrans (2011) reports eleven NS Control participants scored 94-99% and only four participants scored 100% in the overall rates of suppliance in simple past tense (oral and written combined).

grammatically correct or incorrect forms in a reading task. Accuracy in grammaticality judgements not only precedes spoken accuracy in the suppliance of inflection, but a higher degree of accuracy in the GJT is also reflected in higher suppliance rates of inflection in spoken production.

5.3.4 Results 2: Grammaticality judgement tests and the spoken suppliance of L2 inflectional morphology

The GJT results (Experiment 1B) are considered alongside the spoken suppliance data in order to ascertain whether grammatical representation of the relevant structures can be said to be in evidence in the interlanguage grammar. That is to establish whether omission of inflection is due to phonological issues or difficulties with syntactic representation (Goad and White, 2006). As detailed in Chapter 4, the GJTs presented here relate to tense and agreement (Reg. PT, Irreg. PT and 3SG). This section proceeds with a comparison of spoken suppliance rates compared to GJT scores, demonstrating that the GJT scores are consistently higher than spoken suppliance of inflected forms. However, one-sample binomial tests reveal that only the Intermediate and Advanced proficiency groups perform above chance, and that at Intermediate level there is a dissociation between the performance on GJTs compared to the spoken suppliance of inflection.

To compare the results from the GJT and spoken production data, the mean scores from the GJT (grammatical and ungrammatical items combined) are plotted against the estimated marginal means for the overall spoken production data (oral). The NS Control group is again excluded from this analysis, as they perform at ceiling in both GJT and spoken production, creating a warning in the Hessian. The Pl Noun category is also removed from further analysis due to the lack of variance across proficiency levels. As can be seen in Figure 5.3 and Table 5.13 (spoken production data scores are bracketed), the general pattern across proficiency levels is that the GJT scores are higher than the spoken production data, suggesting that the relevant grammatical representation of tense (and agreement) is present in the interlanguage. The results for the one-sample binomial tests for Advanced and Intermediate proficiency groups are given in Table 5.14 and Table 5.15.

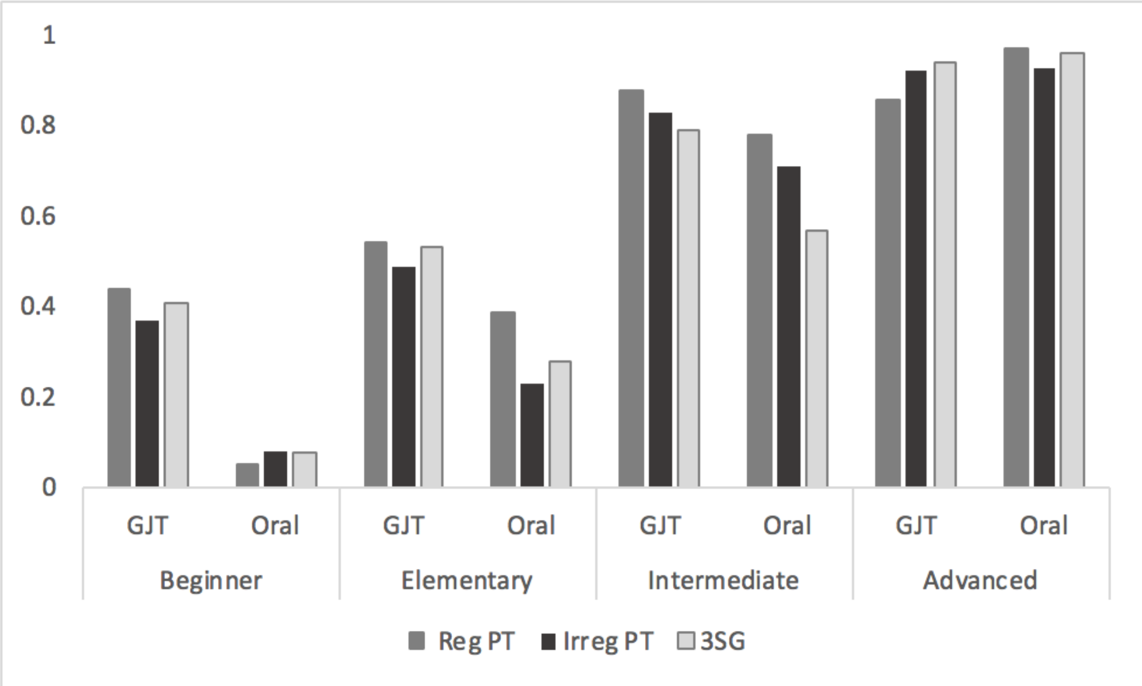


Figure 5.3: GJT mean scores and estimated means for spoken suppliance.

	Reg. PT	**Irreg. PT**	**3SG**
	GJT (Oral)	GJT (Oral)	GJT (Oral)
Beginner	.44 (.05)	.37 (.08)	.41 (.08)
Elementary	.54 (.39)	.49 (.23)	.53 (.28)
Intermediate	.88 (.78)	.83 (.71)	.79 (.57)
Advanced	.86 (.97)	.92 (.93)	.94 (.96)

Table 5.13: GJT mean scores and estimated means for spoken suppliance of inflection.

The Advanced proficiency group do not perform at ceiling in the GJT, which may be taken to suggest that the grammatical representation of tense or agreement cannot be considered native-speaker like. The NS Control in this study performed at ceiling across all GJT and spoken data. However, (Goad and White, 2006) report that although accurate, the L1

Mandarin speakers in their study do not perform at the same level as the control group, but it is still taken as evidence that learners represent [± past] in the interlanguage. The one-sample binomial tests reported in Table 5.14 show that the seemingly low performance on the GJT for Reg. PT by the Advanced group can be explained by the performance of one participant (BE024), scoring only 60% on the GJT for Reg. PT, and negatively affecting the overall mean score (indicative of the potential pitfalls of a small sample size). Of the individual performance on the GJTs at Advanced proficiency level, only one participant does not produce a statistically significant result (BE024 on the GJT for Reg. PT), and three participants perform at ceiling with a 'perfect score' on the GJT for Irreg. PT and GJT for Reg. PT (i.e. performing the same as NS Control). Allowing that there is a 50-50 chance of getting the answer right or wrong, particularly in a binary choice test of 'true - false', a series of one-sample binomial tests were run for the combined GJT (n=60) and individual GJT questions sets (GJT for Reg. PT, GJT for Irreg. PT and GJT for 3SG). Allowing for individual differences, the GJT results can be seen to partly fulfil the prediction that Advanced learners perform at the same level as the NS Control (108c). By Advanced proficiency level, the suppliance of inflection in spoken data does not lag behind the accuracy in identifying correct and incorrect instances of tense and agreement morphology (in a GJT reading task), again partially fulfilling the predictions set out in (108) (* denotes statistical significance).

Participant ID	Total GJT	GJT for Reg. PT	GJT for Irreg. PT	GJT for 3SG
BE024				
p value	p=.0005*	**p=.502**	p=.014*	p=.0005*
Correct (%)	78	60	80	95
Incorrect (%)	22	40	20	5
BE025				
p value	p=.0005*	p=.014*	perfect	p=.001*
Correct (%)	90	80	score	90
Incorrect (%)	10	20		10
BE027				
p value	p=.0005*	p=.0005*	p=.004*	p=.0005*
Correct (%)	98	95	85	95
Incorrect (%)	2	5	15	5
BE029				
p value	p=.0005*	perfect	p=.0005*	p=.0005*
Correct (%)	97	score	95	95
Incorrect (%)	3		5	5
BE030				
p value	p=.0005*	p=.0005*	perfect	p=.0005*
Correct (%)	97	95	score	95
Incorrect (%)	3	5		5

Table 5.14: One-sample binomial tests: GJT accuracy scores for Advanced group.

For the Intermediate proficiency group, there appears to be some dissociation between the knowledge of grammatical representation of tense and agreement and the suppliance of inflectional tense and agreement morphology in the spoken data. This is set out in Table 5.15 and Figure 5.3. As a group, the Intermediate participants tested here, similar to those at Advanced proficiency level, perform above chance. There are twenty-six out of thirty-two statistically significant test results, and Participant BE012 performs at ceiling for both Reg. PT GJT and 3SG GJT. There are only four test results which are not statistically significant, three of which are on the GJT for 3SG. Spoken suppliance of inflectional data is correspondingly lower on 3SG than the other verb types tested here.

Participant ID	Total GJT	GJT for Reg. PT	GJT for Irreg. PT	GJT for 3SG
BE012				
p value	p=.0005*	perfect*	p=.0005*	perfect*
Correct (%)	98	score	95	score
Incorrect (%)	2		5	
BE019				
p value	p=.0005*	p=.001*	p=.044*	p=.044*
Correct (%)	80	90	75	75
Incorrect (%)	20	10	25	25
BE021				
p value	p=.0005*	p=.001*	p=.004*	p=.502
Correct (%)	78	90	85	60
Incorrect (%)	22	10	15	40
BE023				
p value	p=.0005*	p=.118	p=.004*	p=.264
Correct (%)	73	70	85	65
Incorrect (%)	27	30	15	35
BE026				
p value	p=.0005*	p=.001*	p=.044*	p=.014*
Correct (%)	82	90	75	80
Incorrect (%)	18	10	25	20
BE031				
p value	p=.0005*	p=.001*	p=.004*	p=.0005*
Correct (%)	90	90	85	95
Incorrect (%)	10	10	15	5
BE32				
p value	p=.0005*	p=.014*	p=.014*	p=.264
Correct (%)	75	80	80	65
Incorrect (%)	25	20	20	35
BE034				
p value	p=.0005*	p=.001*	p=.004*	p=.001*
Correct (%)	88	90	85	90
Incorrect (%)	12	10	15	10

Table 5.15: One-sample binomial tests: GJT accuracy scores for Intermediate group.

The production of inflectional morphology was also consistently lower in the spoken data than the accuracy shown in the GJTs at Beginner and Elementary levels. Although performing below chance, a pattern can be seen to develop between Beginner and Elementary proficiency levels. At Beginner level, there are sixteen out of twenty-eight instances when a participant selects an accurate response 40% of the time or less. By Elementary proficiency level there are only five instances when the accurate response was selected 40% or less, indicating a possible developmental stage in the shift in accuracy of recognition of L2 tense and agreement at a relatively low proficiency level. However, as participants at Beginner and Elementary both perform below chance, the results are not set out here.

Further tests were run to ascertain that the difference in performance on the GJTs could not be attributable to test construct, especially with respect to levels of difficulty. Assuming that the GJT tests could be responsible for the lower scores on the GJT for 3SG compared to the GJT for Reg. or Irreg. PT (e.g. perhaps explaining the results for participants at Intermediate proficiency level), a Friedman test was run to establish whether there was any evidence of difference in difficulty between the three categories of GJT; Reg. PT, Irreg. PT and 3SG test questions. This was run across all participants regardless of proficiency level. The results suggested that there was no difference in difficulty between the GJT for Reg. PT (Md = 85%), GJT for Irreg. PT (Md = 82.5%) or GJT for 3SG (Md = 77.5%), $\chi^2(2) = 3.140$, p=.208.

A further series of Friedman tests were run to establish whether there was any evidence of difference in difficulty between the three categories of GJT for Reg. PT, GJT for Irreg. PT or GJT for 3SG test questions within each proficiency level. This proved to be negative at all levels of proficiency, as participants score roughly the same across the categories. This is reported in Table 5.16 per proficiency level.

Proficiency	GJT for Reg. PT	GJT for Irreg. PT	GJT for 3SG	Test statistic
Beginner	45	40	35	$\chi^2(2)$ = .538 p=.764
Elementary	55	50	52.5	$\chi^2(2)$ = 1.103 p=.576
Intermediate	90	85	77.5	$\chi^2(2)$ = 4.500, p=.105
Advanced	95	95	95	$\chi^2(2)$ = .353, p=.838

Table 5.16: Friedman tests: Percentage median scores for differences in difficulty of GJT per proficiency level.

Finally a Kruskal-Wallis test confirmed that there were significant differences in the number of correct answers in the GJT between the four different proficiency levels for test categories of GJT for Reg. PT $\chi^2(3)$ = 19.246, p=.0005 , GJT for Irreg. PT $\chi^2(3)$ = 21.720, p=.0005 and GJT for 3SG $\chi^2(3)$ = 19.107, p=.0005, and also the combined GJT result for all three test categories $\chi^2(3)$ = 21.907, p=.0005.

Pairwise comparisons using Dunn's procedure with a Bonferroni correction for multiple comparisons revealed that the GJT for 3SG scores show that groups performed differently (Beginner to Intermediate p=.010, Beginner to Advanced p=.001, and Elementary to Advanced p=.020), but there is no evidence that the Elementary and Intermediate groups performed differently. This could be illustrative of a developmental stage which straddles Elementary and Intermediate proficiency levels, particularly relevant to the grammatical representation of 3SG (as syntactically, this is not directly available for transfer from the L1 to the interlanguage). In all other cases, the Intermediate and Advanced groups performed differently from the Beginner and Elementary groups (Beginner to Intermediate p=.003, Beginner to Advanced p=.009, Elementary to Intermediate p=.021 and Elementary to Advanced p=.045). This is the same, for the GJT Irreg. PT scores, (Beginner to Intermediate p=.003, Beginner to Advanced p=.001, Elementary to Intermediate p=.047 and Elementary to Advanced p=.012).

5.3.5 Interim summary

A summary of the results of the GJT scores in relation to the overview of spoken suppliance scores are set out as follows:

1. It was predicted that by Advanced proficiency level, learners would perform on a GJT commensurate with the NS Control and produce inflected Irreg. PT, Reg. PT and 3SG (and Pl Noun) with equal consistency. Not all the Advanced learners performed equally with the NS Control on the GJT. However, it is clear that in other studies, for example Campos-Dintrans (2011), the NS Control group did not all perform at ceiling either. In this respect, there is an expectation that in order to perform commensurately with the NS Control group in the current study, a perfect score of 100% must be attained. At the same time, studies such as that by Lakshmanan and Selinker (2001) do not suppose that only a perfect score equates acquisition of L2 inflectional morphology. In sum, the Advanced proficiency group performed at a very high level of accuracy, which, although not commensurate with the NS Control group, exceeds that shown by the participants in the study by Goad and White (2006), which was taken to demonstrate acquisition of the target structure.[4] With respect to spoken production of inflectional morphology, again, the NS Control perform at ceiling. Although not perfect scores, the overall results for the Advanced proficiency group are again remarkably high, and could be considered whilst not commensurate with the NS Control group, and therefore not as predicted, not far from it; inflection was consistently supplied across all word types and there were no statistical differences between inflected forms. However, there is no evidence from these results that inflection is supplied in a target-like prosodic representation.

2. At lower levels of proficiency it was predicted that GJT scores would be higher

[4] In a sentence completion task with a choice between inflected and uninflected verbs, the L1 Mandarin participants scored 83% compared to L1 English control 98% on present versus past forms, and 77% versus 98% respectively on present versus perfective forms.

than suppliance rates. It was found that GJT scores were consistently higher across all lower proficiency levels, but that this was only above chance for Intermediate proficiency level.

3. At Intermediate proficiency level and above, a higher score on a GJT is directly correlated to a higher suppliance of inflectional morphology, suggesting that, particularly regarding inflectional forms which are PWd adjoined (i.e. 3SG and Reg. PT verbs), the difference in suppliance rates is conditioned by degrees of proficiency. In other words, assuming a weak version of the PTH, and allowing that the PWd adjoined representation and PWd internal representation are both readily available to transfer to the interlanguage grammar, differences in accuracy in spoken suppliance can seemingly be related to developmental differences in accuracy in determining grammaticality in the order of Reg. PT, Irreg. PT and 3SG.

5.4 Suppliance of inflectional morphology on regular and irregular simple past verbs

There is no indication in the data regarding the target-likeness of the prosodic structure used in L2 utterances. The following section focusses on whether L1 Bengali minimal word requirements (and moraic structure) influence suppliance of L2 inflection on PT verbs, particularly Reg. PT verbs requiring a PWd adjoined representation. This is considered in terms of the verb stem, and whether it would be considered well-formed or subminimal in terms of L1 calculations of syllable weight and moraic structure. The regular simple past verb tokens are therefore further analysed according to whether the L2 English verb stem has a long (tense) vowel (LV) (e.g. /iː/ 'clean)', including diphthongs, (e.g /əʊ/ 'smoke'), or short (lax) vowel (SV) (e.g. /ɒ/ 'drop'). A SV Reg. PT verb stem would be considered subminimal according to L1 minimality, whereas a LV Reg. PT verb stem would be considered well-formed. As regards the Irreg. PT, this is also considered with respect to whether learners show any preference in the suppliance of Irreg. PT verbs which undergo vowel-shortening (i.e. pseudo-inflected forms) and those which do not (i.e. ablaut forms).

5.4.1 Recapitulation of the predictions for the suppliance of regular and irregular simple past tense inflection

5.4.1.1 Predictions 2a: Advanced levels of proficiency

For ease of reading, the predictions discussed in Chapter 4 are replicated here.

1. L1 moraic structure and minimal requirements of the L1 (transferred to the interlanguage) will not interfere with the production of L2 inflectional morphology. Learners will have adjusted to L2 moraic structure and minimal word requirements, and inflection will be supplied equally, regardless of vowel length of verb stem in regular verbs.

2. Irreg. PT verbs will not be produced according to whether the verb stem is ablaut or pseudo-inflected. Vowel shortening (e.g. *keep* - *kept*) will be permitted as learners adjust to allow the weight of the syllable to be distributed across the nucleus and coda in L2 productions.

5.4.1.2 Predictions 2b: Lower levels of proficiency

At lower levels of L2 English proficiency, it is predicted that L1 speakers of Bengali will omit inflection on LV Reg. PT verb stems more consistently than on SV Reg. PT verb stems.

1. LV Reg. PT verb stems will be considered well-formed according to L1 minimal word requirements, and it is more likely that the past tense marker *-ed* will be omitted. The output in the bare form will not violate L1 minimality, and as a well-formed verb, attention will not be placed on repair of the structure and inflection will be more readily omitted.

2. SV Reg. PT verb stems will be considered subminimal. A subminimal form is more likely to be repaired (in order to avoid violation of L1 minimal word requirements).

   i It is predicted that SV Reg. PT verbs will be repaired with the insertion of an epenthetic vowel which will add a mora, fulfilling the L1 minimal word requirements.

   ii Epenthesis both draws attention to the subminimal form and provides a vowel on to which a consonantal past tense marker *-ed* can be attached (Bengali disallows word-final consonant clusters). Suppliance of inflection is more likely to be supplied in the case of SV verb stems which have also undergone epenthesis than LV verb stems.

3. Irreg. PT verbs will be supplied according to type of inflection.

   i Irreg. PT pseudo-inflected verbs will be supplied without vowel-shortening and without inflection as a well-formed minimal word will satisfy L1 minimality requirements and require no further repair. This may develop to the suppliance of inflected regularised irregular forms.[5]

   ii Some learners may supply inflected ablaut Irreg. PT forms more consistently than pseudo-inflected Irreg. PT forms if the verb stem matches L1 minimality.

5.4.1.3 Rationale for epenthesis

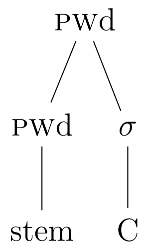
The rationale for epenthesis in SV Reg. PT verb forms by lower proficiency levels is because (a) epenthesis is a universal strategy to add a vowel (and mora), (b) it is a phonological process which is in evidence in Bengali to disrupt consonant clusters in loan words, and (c) epenthetic vowel insertion in L2 Reg. PT verb forms would also more closely replicate the structure of L1 bimoraic disyllabic past tense forms (e.g. *buj^h -l -am*

[5] This does not exclude the possibility that verbs are regularised as part of the acquisition process between rule-based regular and irregular verb forms, but it could equally also be due to the application of L1 well-formedness constraints.

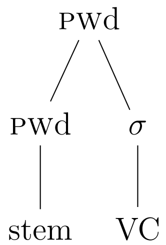
'I understood').[6]

The example in (110) illustrates the target prosodic representation for English LV or SV stem Reg. PT verbs. Example (111) depicts the prosodic representation for an affix which involves a VC shape (e.g. [-əd]), as in Reg.-ed verbs (e.g. 'land-ed'). If a SV Reg. PT verb stem is repaired with an epenthetic vowel, then it can be represented in the structure shown in (111). This is target-like in that affixation is PWd adjoined, but not target-like in that an English verb which does not end in a stem-final /t/ or /d/ does not take an epenthetic vowel. For LV verb stems, which do not violate L1 Bengali minimal word constraints, it is predicted that the affixation will be omitted more readily and the verb will be produced as a bare stem.

(110)



(111)



A small subset of Reg.-ed PT verbs, which take the [-əd] past ending (e.g. want - wanted, wait - waited) were therefore also included in the dataset. These are the verbs which end with an alveolar stop /t d/ and undergo schwa insertion alongside the addition of the inflectional alveolar stop /-əd/ (e.g. wait - waited, wound -wounded). Although the verb stem may be SV (e.g. land) or a LV stem and 'well-formed' according to L1 Bengali constraints (e.g. wait), the output is well-formed according to L1 bimoraic minimal word

[6]Epenthesis is one of the phonological processes applied in naturalisation of, for example, English loan words into Bengali (e.g. *fɪlɪm* 'film'). See Dash (2015) for an account of Bengali naturalisation processes for English loan words and Section 3.2.3.2 regarding the relevance of this to the current study.

requirements. In this respect, the Reg.-ed category was subdivided between accurate Reg.-ed verbs with inflection, conflating LV and SV stems (e.g. land - landed, wait - waited), or inaccurate Reg.-ed verbs (e.g. drop - *drop-əd). In order to avoid priming effects, only a few such tokens were included in the data set as it was predicted that epenthesis would be the repair strategy for SV Reg. PT verb forms.

If moraic structure and L1 minimal word requirements influence production of L2 inflectional morphology, learners (at lower levels of proficiency) will arguably repair SV verb stems with an epenthetic vowel and apply inflection: SV Reg. PT verbs are produced in the prosodic representation shown in Figure 111 (e.g. ∗drop → drop + əd), but LV Reg. PT verbs are more likely to be produced as a bare stem. The following characteristics are predicted in the production data of Reg. PT verbs at lower levels of proficiency:

1. Evidence of epenthesis in the data set.

2. Epenthesis is restricted to SV Reg. PT verbs (i.e. those verb stem which are considered subminimal in the L1) and not applied to LV Reg. verbs (i.e. well-formed according to L1 minimality).

3. Both SV Reg. PT verbs and Reg.-ed PT verbs are produced with the the ‘ -əd’ form of the past tense marker.

4. Affixation will be represented in a PWd adjoined stem+VC affix configuration (i.e. the lower PWd verb stem will be repaired before affixation is applied). This is a target-like prosodic representation but instigates non target-like pronunciation for regular verb stems which do not end in an alveolar stop.

5. SV Reg. PT verbs will be more consistently supplied with inflection compared to the lower level of suppliance of inflection on LV Reg. PT verbs.

6. The Reg.-ed verb category will consist of accurately formed and target-like Reg.-ed verbs (e.g. land + əd) and non-target like Reg.-ed verbs (e.g. ∗drop + əd).

5.4.2 Results 3: Suppliance of inflection on regular and irregular simple past tense

A summary of initial factors entered into the model is set in Table 5.17.

Factor	Description	Input data
Proficiency level	Beginner	289
	Elementary	359
	Intermediate	509
	Advanced	370
	Total	1527
PT verb type	Irreg. PT	333
	LV Reg. PT	582
	SV Reg. PT	573
	Reg.-ed	39
	Total	1527

Table 5.17: Summary of categorical variables: Proficiency level and past tense verb type category.

It can immediately be seen that the Reg.-ed category is extremely small in comparison to the other verb types input here, indicating that there is no or little influx of target-like or non target-like Reg.-ed verbs (i.e. either accurate unsolicited Reg.-ed or inaccurate SV Reg. PT verbs) and therefore it is apparent that there is very little evidence of epenthetic vowel insertion in the production data analysed here. This is in direct contrast to the predictions set out in Section 5.4.1.2. Without epenthesis, there is no reason for learners at lower proficiency levels to inflect SV Reg. PT verbs more than LV Reg. PT verbs, as the additional mora and vowel is not supplied. A revision of the predictions for Reg. PT verbs at lower proficiency levels therefore follows:

(112) If epenthesis is not in evidence, then both LV Reg. PT verbs and SV Reg. PT verbs will be supplied in equivalence without inflection.

This part of the analysis was built from the base model upwards, with each build incorporating predictors and interactions (verb type, proficiency, dialect, college education and log frequency). The binary independent variable was the suppliance of accurate inflection or bare verb (1 - 0). The model generates estimated marginal means (for categorical variables) or parameter estimates (for continuous variables), indicating the suppliance of inflection or bare verb (the dependent variable) with respect to the effect of the predictors and interactions, both of which are reported here. This model also takes into account subject effect, in that the data consist of multiple responses per subject, and within-subject effect of the verb token and unsolicited responses (i.e. non-elicited verbs which may skew the data towards certain verb types and away from others).

The NS Control group performed at ceiling across all categories, and were not included in the analysis as the lack of variance created an error in the Hessian. In the first run of the model, the Hessian warning was singular, and the Reg.-ed verbs were found to be without variance at the Beginner level (i.e. no inflection was supplied on Reg.-ed verbs) and also at the Advanced proficiency level (i.e. inflection was supplied on all Reg.-ed verbs). The Reg.-ed verb category was removed from the analysis for the Beginner and Advanced proficiency levels, although it was retained in the model for Elementary and Intermediate proficiency levels. With Reg.-ed verbs partially removed, the model ran without warning, and the base model is reported in Table 5.18 ($*$ indicates an interaction).

5.4.2.1 The base model

	Predictor	QICC	Δ QICC
1) Base	proficiency, PT verb type, proficiency*PT verb type	1270.867	-

Table 5.18: Model build: Base.

The tests of model effects showed that the terms in the model were significant (proficiency level p=.0005, PT verb type p=.011, as was the interaction between proficiency and PT verb type p=.0005). The variable of speaker of Sylheti dialect was added to the model, the numerical summary of which is set out in Table 5.19.

Factor	Description	Input data
Sylheti dialect	speak Sylheti	671
	do not speak Sylheti	856
	Total	1527

Table 5.19: Summary of categorical variables: Sylheti dialect.

5.4.2.2 Sylheti dialect

The Sylheti dialect was added to the model to test whether being a speaker of the Sylheti dialect influences the of suppliance of inflection on the PT verb types. A number of participants tested in this study were also speakers of Sylheti (and traditionally so in the area from which a number of the UK-based participants were recruited), and there is some difference between Bengali and Sylheti in the prosodification of tense. However, due to demographic change, a number of participants recruited to take part in this study also originated from areas other than Sylhet, as did the Bangladesh-based participants. The input of Sylheti dialect in the model is reported in Table 5.20.

	Predictor	QICC	Δ QICC
1) Base	proficiency, PT verb type, proficiency*PT verb type	1270.867	-
2) Dialect	proficiency, PT verb type, proficiency*PT verb type, Sylheti dialect	1270.325	0.542

Table 5.20: Building the model: Sylheti dialect.

The difference in the goodness of fit is very small (Δ QICC = 0.542), indicating that the inclusion of Sylheti dialect as a factor does not improve the model. Similarly, the tests of model effects showed that the Sylheti dialect is not statistically significant (p=.535). The estimated marginal means for the suppliance of inflection on PT verb types by speakers of the Sylheti dialect was .56 in comparison to .50 for non-speakers of the Sylheti dialect (mean difference = .07, p=.534).

A submodel was subsequently run to question whether there was any effect of being a speaker of the Sylheti dialect on the suppliance of inflection with respect to interaction with the proficiency level or the PT verb type. However, this created a warning of singularity in the Hessian matrix, and the decision was made to reduce the complexity and re-run the model testing only the interaction between the PT verb type and Sylheti dialect. This model also did not run, and it is suspected that this is because speakers of the Sylheti dialect may dominate some proficiency levels (particularly Beginner and Elementary) and similarly may not be represented in other levels (particularly Advanced, and to a lesser degree Intermediate). In order for the model to run, a significant amount of data would have to be removed, and it was therefore deemed advisable to forgo any further investigation. An observation, therefore, is that the effects of being a speaker of the Sylheti dialect is either not interpretable from the data supplied here, or the variable of being a speaker of Sylheti has no effect on the model. The Sylheti dialect variable was subsequently removed from further models, and attention now turns to examine whether college education status interacts with suppliance of inflection on simple past verb types. A summary of the variable is shown in Table 5.21

Factor	Description	Input data
College education status	college	1259
	pre-college	268
	Total	1527

Table 5.21: Summary of categorical variables: College education status.

5.4.2.3 College education status

College education status was added to the model to test whether attending primary and secondary school or primary school through to tertiary education has any effect on the suppliance of simple past inflection on PT verb type. The variable of college education status was seen to be the best predictor in relation to other factors which caused confounds, including medium of education (English or Bengali), age at time of testing, place of residency and length of residence in the UK.

	Predictor	QICC	Δ QICC
1) Base	proficiency, PT verb type, proficiency*PT verb type	1270.867	-
2) Dialect	proficiency, PT verb type, proficiency*PT verb type, Sylheti dialect	1270.325	0.542
3) College education	proficiency, PT verb type, proficiency*PT verb type, college education, PT verb type*college education	1259.878	10.989

Table 5.22: Building the model: College education status.

The goodness of fit of the model is slightly improved (Δ QICC = 10.989). The tests of model effects indicates that college education status is not significant as a factor (p=.599), but the interaction between college education status and the suppliance of inflection on PT verb types is statistically significant (p=.040), and college education status is retained in further models. The effect of frequency was added to the model next to see whether verb frequency impacted the suppliance of inflection on simple past verb types.

5.4.2.4 Log frequency

The comparative frequency of the different verb type tokens was included in the model. As discussed in Section 5.2.4.2, log frequency was calculated as a standard procedure to avoid undue influence of the extremes of very high or very low verb frequency, and as this is measured on a scale, log frequency is added to the model as a covariate. The goodness of fit improves with the inclusion of log frequency in the model (Δ QICC = 22.543), as shown in Table 5.23.

	Predictor	QICC	Δ QICC
1) Base	proficiency, PT verb type, proficiency*PT verb type	1270.867	-
2) Dialect	proficiency, PT verb type, proficiency*PT verb type, Sylheti dialect	1270.325	0.542
3) College education	proficiency, PT verb type, proficiency*PT verb type, college education, PT verb type*college education	1259.878	10.989
4) Log frequency	proficiency, PT verb type, log frequency, college education, PT verb type*log frequency	1248.324	22.543

Table 5.23: Building the model: Log frequency.

The tests of models effects showed that everything in the model is significant, as shown in Table 5.24.

Factor	Wald χ^2	df	Sig.(p)
verb type	22.883	3	.0005
verb type*log frequency	23.585	4	.0005
proficiency level	125.433	3	.0005
college education status	6.158	1	.013

Table 5.24: Tests of model effects: Suppliance of inflection on past tense verb type.

As log frequency is a continuous variable and entered into the model as a covariate, the parameter estimates of past tense verb type*log frequency rather than estimated marginal means are reported here. The estimated coefficient beta (β) reports the change in the dependent variable (suppliance or omission of inflection) which can be attributed to a change of one unit in the independent variable or predictor (the log value, here set to multiples of 10). The parameter estimates indicate that the interaction between log frequency and Irreg. PT verbs has a statistically significant (p=.0005) increase in suppliance rate related to frequency (estimated coefficient β 1.289). In this respect, the higher the frequency of the irregular verb, the more likely it is that the inflection will be supplied. There is also a positive but not statistically significant relationship between log frequency and the suppliance of inflection for SV Reg. PT verb (estimated coefficient β .197, p=.167) and Reg.-ed (estimated coefficient β .196, p=.757) verbs. The estimated coefficients for SV Reg. PT of β .197 and β .196 for Reg.-ed verbs are much lower than that for Irreg. PT verbs, indicating a much weaker relationship between log frequency and the suppliance of inflection on SV Reg. and Reg.-ed verbs than that for log frequency and Irreg. PT verbs. However, as there are significantly fewer tokens of Reg-ed verb type, caution should be exercised in interpreting these results, as a greater number of tokens could well produce a more statistically significant result. In contrast, LV Reg. PT verbs have a negative coefficient (estimated coefficient β -.028, p=.815) showing an inverse relationship between log frequency and the suppliance of inflection on LV Reg. PT verbs, however this is not statistically significant. In other words, as frequency increases, the likelihood of simple past inflection being supplied on LV Reg. verbs decreases. The effect of frequency in the log as taken from the corpus (represented on the X axis) against the frequency of the suppliance of inflection on the token in the data set (Y axis) is illustrated in Figure 5.4.

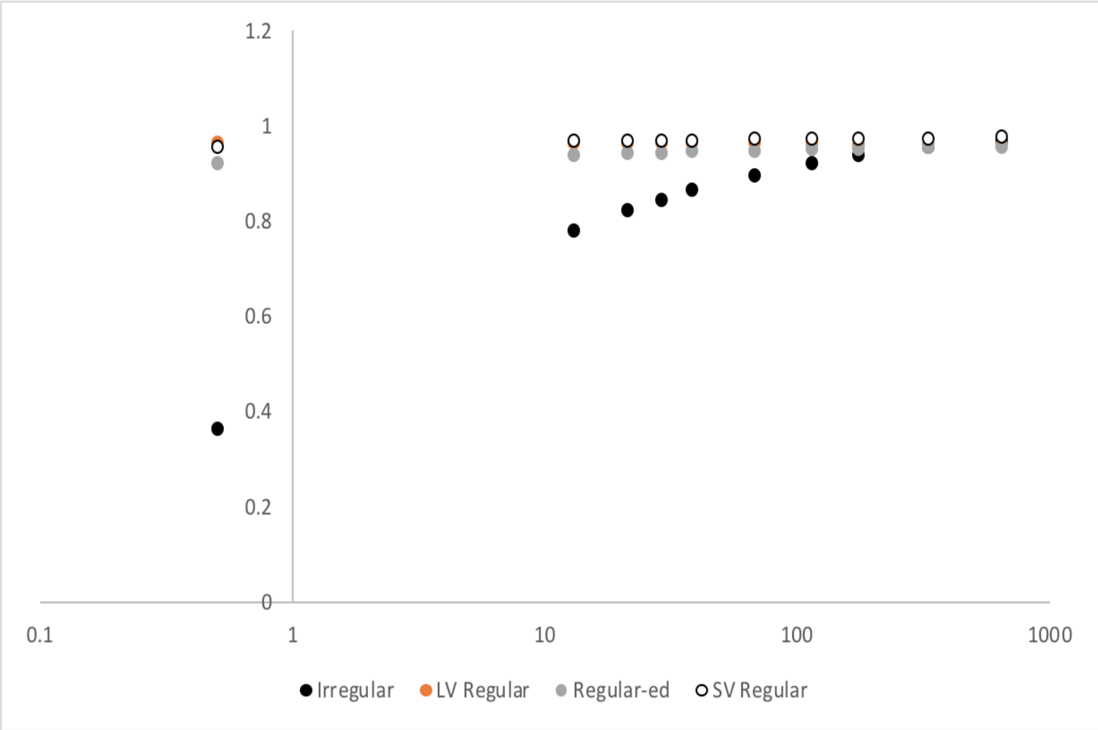


Figure 5.4: Suppliance of past tense inflection in relation to log frequency.

Set on a scale from 0 - 1, the markers to the left of the vertical line represent those tokens which did not register on the companion website for Leech et al. (2001). These tokens were given a log frequency of 0.5 as detailed in Section 5.2.4.2. Notably, the leftmost black dot in relation to the vertical line represents the very low token frequency of some irregular verbs, and, as can be seen, the lower the frequency of the irregular verb the lower the suppliance of inflection (Y axis). This is in sharp contrast to the regular verbs (SV Reg., LV Reg. and Reg.-ed verbs), where even very low frequency verbs are produced with inflection commensurate with those regular verbs with a much higher frequency. This is represented in the virtually linear lines created by the Reg. PT verbs from low to high frequency verbs, in contrast to the curved line created with the Irreg. PT verbs as frequency increases. Indeed, the Irreg. PT verbs (represented by solid black dots) show a distinct curve, indicating a direct effect of log frequency on the suppliance of simple past inflection on irregular verbs. The mean estimates are plotted in a bar graph (Figure 5.5) and set out in numerical form in Table 5.25.

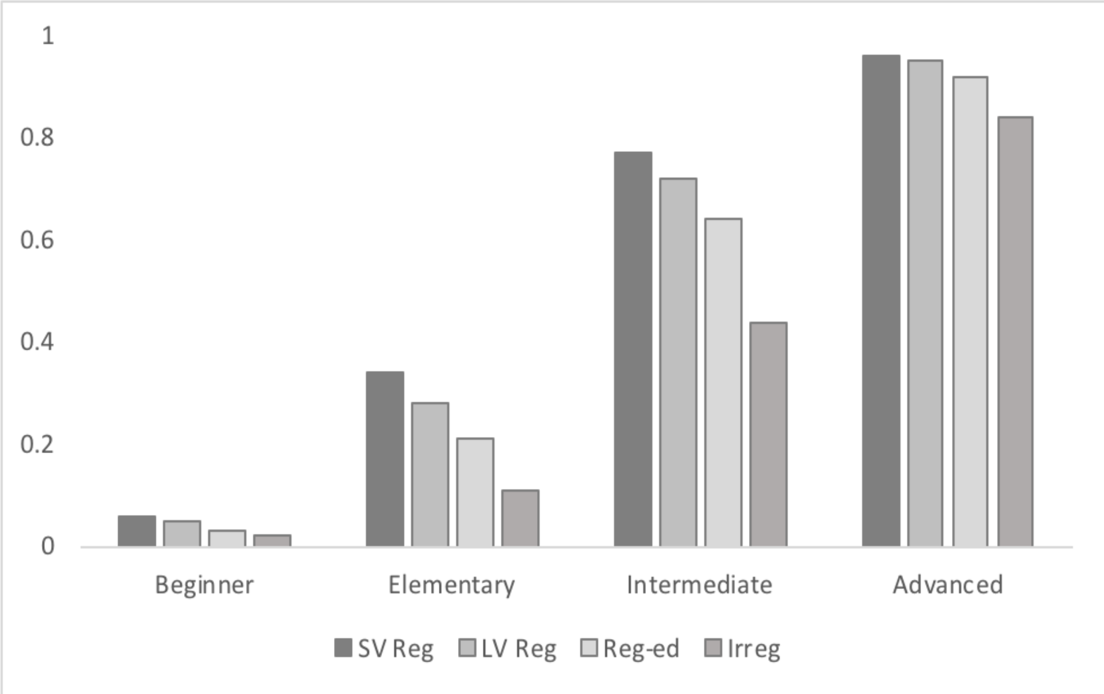


Figure 5.5: Effect of log frequency on simple past verb type by proficiency level.

	LV Regular	SV Regular	Regular-ed	Irregular
Beginner	.5	.6	.3	.2
Elementary	.28	.34	.21	.11
Intermediate	.72	.77	.64	.44
Advanced	.95	.96	.92	.84

Table 5.25: Estimated means for the suppliance of inflection per simple past verb type by proficiency level.

When the effect of log frequency is included in the model, the estimated means for the suppliance of inflection on Irreg. PT verbs (Figure 5.5), a fairly uniform pattern emerges across proficiency levels. There is no statistical significance between the production of inflected SV Reg. verbs and LV Reg. PT verbs in any of the proficiency levels. There are, however, statistically significant differences in the production of Irreg. PT verbs compared to both LV Reg. PT verbs and SV Reg. PT verbs across all proficiency levels.

At Elementary and Intermediate proficiency levels, there are statistically significant differences between the production of Reg.-ed and Irreg. PT verbs, but there is no evidence of epenthesis. For the Elementary group only, there is a statistical difference between Reg.-ed and SV Reg. PT verbs. The statistically significant differences are summarised for each proficiency level in Table 5.26.

	Beginner	Elementary	Intermediate	Advanced
SV Reg. PT - LV Reg. PT	.166	.055	.097	.191
Irreg. PT - LV Reg. PT	*.018	*.0005	*.0005	*.047
Irreg. PT - SV Reg. PT	*.019	*.0005	*.0005	*.041
Reg.-ed - Irreg. PT	.095	*.031	*.011	.084
Reg.-ed - SV Reg. PT	.067	*.011	.052	.141
Reg.-ed - LV Reg. PT	.273	.261	.291	.337

Table 5.26: Effect of log frequency: Summary of statistically significant differences by proficiency level

5.4.2.5 Interim summary

The main points from this results section are set out as follows:

1. Epenthesis is not attested in this data set. As moraic structure is not repaired with the addition of an epenthetic vowel providing an obvious anchor to which inflection can be attached, there is no reason to expect SV verbs to be inflected statistically significantly more consistently than LV verbs in the simple past. Moreover, at Elementary proficiency level, there is a statistically significant difference in the production of SV Reg. PT verbs compared to Reg.-ed verbs, and the estimated means for Reg.-ed verbs are lower across the board for all proficiency levels compared to Reg. PT verbs.

2. The overall pattern is that suppliance of inflection on Irreg. PT verbs is less consistent across proficiency levels, particularly at Elementary and Intermediate proficiency levels. The PWd internal prosodic representation is readily available to transfer to the interlanguage grammar, so superficially it seems unlikely to conclude that failure to consistently supply inflection on irregular verbs can be due to difficulties related to prosodic transfer. However, if a weak version of the PTH is assumed, and the PWd adjoined representation is also readily available in the interlanguage grammar, then the effect of frequency can be seen to play a distinct role in the difference in suppliance rates between regular and irregular past tense morphology, which is visible across proficiency levels. This interpretation assumes that the availability of the PWd adjoined representation is not restricted to re-licensing conditions, and that as it is available in Bengali in the prosodic representation of the present and past perfect tenses, it will be readily available to transfer to the interlanguage and represent L2 inflectional morphology other then perfect tenses. Should this be the case, it would appear that there is no reason for one prosodic representation to be more readily available than another in the interlanguage. As the inclusion of log frequency in the model showed a huge effect of frequency on the suppliance of tense on irregular but not regular verbs, one possible explanation for the statistically significantly lower production of inflected Irreg. PT than Reg. PT (for all Reg. PT types of SV, LV and Reg.-ed) could be due to (a) the equal availability of both PWd internal and PWd adjoined prosodic representations in line with the 'weak' version of the PTH, and (b) the negative effects of frequency on irregular forms compared to no effect of frequency on regular forms.

3. It was predicted that epenthesis would repair moraic structure and provide the opportunity (both in terms of noticing and in the provision of a vowel) to inflect SV Reg. PT verbs more consistently than LV Reg. PT verbs. There was no evidence of epenthesis in this data set, and there is no statistically significant increase in the suppliance of inflection on SV Reg. PT verbs than LV Reg. PT verbs at any level of proficiency. However, there is a pattern at both Elementary and Intermediate

proficiency levels (which is no longer visible at Advanced proficiency level) which indicates that SV Reg. PT verbs are inflected more than LV Reg. PT verbs, and this is considered further in the following section, where it can be seen that inflection is statistically more likely to be placed on SV Reg. unvoiced stem-final verbs than other verb forms.

5.4.3 Results 4: Suppliance of inflection on regular simple past and stem-final voicing

It has been established that epenthesis is not in evidence in this data set, and although token frequency does not appear to influence the suppliance of inflection on Reg. PT verbs, there is a pattern of suppliance which is greater on SV Reg. PT verbs than LV Reg. PT verbs.

A sub-model analysis was run in order to establish whether the voicing status of the stem-final consonant influences whether a regular simple past verb stem is more or less likely to be produced with inflection. The rationale for this is as follows. Whilst there is a process of post-lexical pre-lenis lengthening before voiced consonants in English (which is not in evidence before unvoiced consonants), this is not necessarily the case in Bengali.[7] Bengali vowels are lengthened in monomoraic monosyllabic forms whenever a subminimal form is the potential output, regardless of the status of the following consonant (e.g. Fitzpatrick-Cole, 1990; Roberts et al., 2014). However, assuming a sensitivity to vowel length in the input, it is proposed that L1 Bengali speakers will be sensitive to vowel length in English monosyllabic forms. It was previously predicted that whilst the LV verb stems will be considered bimoraic and well-formed, SV verb stems will be considered subminimal. However, if L1 Bengali speakers focus attention on L2 moraic structure and repair subminimal monomoraic forms with the addition of a mora and subsequent vowel lengthening, it could well be that only those SV verb stems with an unvoiced stem-

[7]See Wells (1995) and Chomsky and Halle (1968) for arguments for and against pre-fortis clipping or pre-lenis lengthening.

final consonant, the shorter vowel compared to SV verb stems with voiced stem-final consonants, are affected. There is some discussion suggesting that the Bengali vowel is /iˑ/, somewhere between a long and short vowel (Awal, 2013). If so, it could well be that attention is only focussed upon a subset of L2 English SV verb stems. The complete model build is shown in Table 5.27 and the tests of model effects is reported in Table 5.28. Note that the Reg.-ed verbs were removed from this analysis due to the different phonological implications for verbs with stem-final alveolar stops /t/ and /d/.

	Predictor	QICC	Δ QICC
1) Base	proficiency, SV & LV Reg college education, proficiency*SV & LV Reg	930.018	-
2) Full model	proficiency, SV&LV Reg college education, proficiency*SV&LV Reg, verb stem voice status, proficiency*verb stem voice status, SV&LV Reg*verb stem voicing, college education*verb stem voice status	929.133	0.885
3) Remove college education status by verb stem voice status	proficiency, SV & LV Reg, college education, proficiency*SV & LV Reg, verb stem voice status, proficiency*verb stem voice status, SV & LV Reg*verb stem voice status	927.397	2.621
4) Remove proficiency by verb stem voice status FINAL MODEL	proficiency, SV& LV Reg, college education, proficiency*SV& LV Reg, verb stem voice status, SV& LV Reg*verb stem voice status	923.510	6.508

Table 5.27: Sub-model build for effects of stem-final voicing on regular simple past verbs.

Factor	Wald χ^2	df	Sig.(p)
proficiency	119.701	3	.0005
verb type	2.609	1	.106
college education status	.5.822	1	.016
proficiency*verb type	11.938	3	.008
verb stem voice status	9.806	1	.002
verb type*verb stem voice status	5.426	1	.020

Table 5.28: Tests of model effects: Suppliance of inflection on SV and LV Reg. PT verb types.

Pairwise comparisons (as shown in Figure 5.6 and Table 5.29), reveal that the estimated mean difference between suppliance of inflection on unvoiced SV Reg. PT stem final segments compared to voiced SV Reg. PT stem final segments is statistically significant (mean difference .20, p=.0005). The LV Reg. PT verbs show no statistical significance in the difference between suppliance of inflection on unvoiced or voiced stem final segments (mean difference .02, p=.731). There is, however statistical significance in the difference between unvoiced SV Reg. and unvoiced LV Reg. PT verbs (mean difference .19, p=.011), but not between voiced SV Reg. PT and voiced LV Reg. PT verbs (mean difference .01, p=.884),

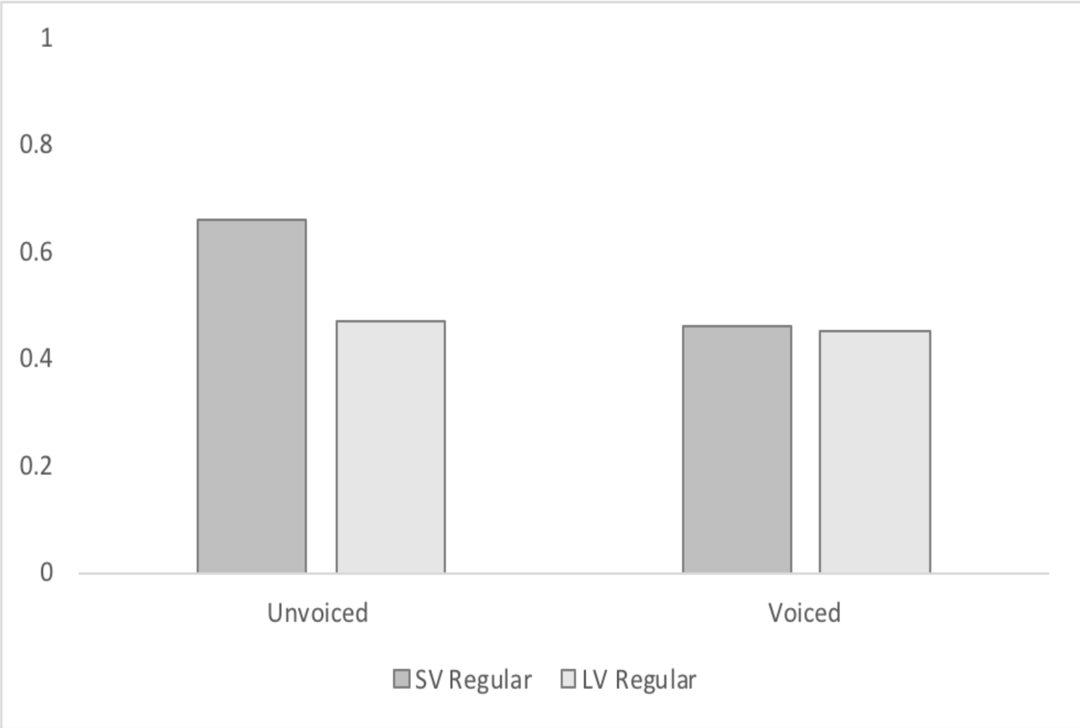


Figure 5.6: Suppliance of Reg. PT inflection in relation to stem-final segment voicing status.

Stem-final voicing status	Mean	SE	LI	UI
SV Regular				
Unvoiced	.66	.057	.54	.76
Voiced	.46	.074	.32	.60
LV Regular				
Unvoiced	.47	.069	.34	.60
Voiced	.45	.063	.33	.57

SE = standard error, LI = lower and UI = upper confidence interval

Table 5.29: Estimated marginal means for the suppliance of Reg. PT inflection in relation to stem-final segment voicing status.

It appears that when the data are analysed and presented in terms of voicing status of the stem-final consonant, there is a sizeable increase in the suppliance of inflection on SV Reg. verbs with an unvoiced stem-final segment, which is not in evidence on

SV Reg. verbs with voiced stem-final segments, or LV Reg. unvoiced or voiced stem final segments. The L1 Bengali speakers tested here produce L2 inflection in the pattern shown in Table 5.30, where a double checkmark illustrates a higher rate of suppliance of inflection than a single checkmark. In other words, the learners in this study inflect SV verbs in which the vowel precedes an unvoiced consonant (English vowel length is generally perceived to be shorter before an unvoiced consonant), but not before a SV verb which precedes a voiced consonant (English vowel length is generally perceived to be longer before a voiced consonant).

	unvoiced stem-final C + [t]	voiced stem-final C + [d]
SV Reg	packed ✓✓	grinned ✓
LV Reg	parked ✓	cleaned ✓

Table 5.30: Suppliance of inflection on voiced and unvoiced stem-final verbs.

One possible explanation for these results is as follows. If at some point L1 Bengali speakers recognise that English vowel length is also conditioned by the voicing status of the stem-final consonant (proficiency levels are conflated in this analysis), then it is only the SV. Reg verb in the unvoiced stem-final consonant which would be considered subminimal according to L1 Bengali requirements (recall that Bengali vowel lengthening can be considered part way between a long and short vowel). Assuming that an L2 verb stem is considered well-formed in terms of moraic structure, it is proposed that it is less likely that a bimoraic verb stem will be supplied with inflection (the rationale being that if the verb does not violate L1 minimal word requirements, it is not in need of further attention and will be supplied as a bare verb). A monomoraic and un-lengthened SV Reg. verb with a following unvoiced stem-final consonant, therefore, will be the most likely candidate to require repair.

If the vowel is lengthened, the stem can fulfil the L1 bimoraic minimal word requirements. At this point, it is possible that inflection is (sometimes) supplied. If this proposition is on the right lines, then this would account for the greater suppliance of inflection on SV Reg. unvoiced verb stems compared to the voiced stems (LV and SV) or LV unvoiced stems. It would also indicate that inflection is prosodically represented PWd adjoined, as the motivation for inflection is arguably post-lexical, as vowel lengthening is instantiated as a final course of action when faced with a subminimal form in the L1 (Fitzpatrick-Cole, 1990, 1996). If this was not post-lexical, this account would not be able to explain the asymmetry in the suppliance of inflection on the voiced SV stems compared to the unvoiced SV stems.

However, as the interaction between proficiency by verb stem voice status was not significant and therefore removed from the model, it is not possible to consider whether this pattern would be replicated across proficiency levels, and this remains, therefore, an area for further investigation.

5.4.3.1 Interim summary

To summarise, the treatment of SV Reg. PT verbs in unvoiced stem-final contexts is different from SV Reg. PT verbs in voiced stem-final contexts or LV Reg. PT stems in both voiced and unvoiced stem-final environments.

1. The evidence for this is the higher rate of suppliance of inflected forms in SV Reg. PT unvoiced stem-final contexts, and this is statistically significant in a conflated proficiency group. It is proposed that this difference in treatment can be attributed to learners becoming aware of English post-lexically conditioned vowel length in monosyllables before voiced consonants (longer) compared to unvoiced consonants (shorter).

2. If L1 Bengali speakers view L2 verb stems in the light of L1 minimal word requirements, and with sensitivity to relative L2 vowel length, then repair of the moraic structure and subsequent vowel lengthening is predicted as a characteristic of L1 transfer below the prosodic word. SV Reg verbs in unvoiced stem-final contexts is the environment in which the implication of L1 Bengali mora repair and vowel

lengthening is predicted.

3. Similarly, if L1 minimal word requirements instigate repair of the moraic structure by vowel lengthening in L2 verb stems, this is potentially accompanied with a greater degree of affixation of the PT morpheme, as repair is accompanied with noticing.

4. If vowel lengthening does occur to fill the additional mora in SV unvoiced forms, then this may indicate that inflection is attached in a PWd adjoined representation, post-lexically to a well-formed stem.

5.4.4 Results 5: Suppliance of inflection on irregular past tense

Inclusion of the log frequency in the analysis pointed to the influence of frequency on the the lower suppliance rates of inflection on irregular simple past verbs, but not regular verbs. In contrast, Lardiere (2007) records suppliance of inflection on irregular verbs as 41.30% in spoken data whereas inflection on regular verbs was only supplied 5.80% in obligatory contexts. However, it should be noted that the irregular verb data in Lardiere's (2007) study also included copula, auxiliary and modal verbs, whereas only lexical irregular verbs were analysed in the current study. It was proposed in (5.4.1) that the suppliance of inflection on irregular verbs may also be influenced by the verb type; ablaut or pseudo. This prediction was based on the potential effects of L1 minimal word requirements on pseudo-inflected verbs, as vowel-shortening would create a subminimal form. This could possibly create a bias in the suppliance of inflected ablaut verbs. Regularisation of irregular forms could also be in evidence, but this could be due to avoidance of vowel shortening rather than symptomatic of overgeneralisation of the regular -ed rule, or, indeed, a part of the acquisition process, akin to the three stage process of 'U-shaped' learning reported in L1 child acquisition (e.g Fromkin et al., 2013). The complete model build is presented in Table 5.31.

	Predictor	QICC	Δ QICC
1) Full model	college education, proficiency, log frequency, college education*proficiency, college education*log frequency, proficiency* log frequency	283.976	-
2) Remove college education by log frequency	college education, proficiency, log frequency, college education*proficiency, proficiency* log frequency	282.364	1.612
3) Remove proficiency by log frequency BASE MODEL	college education, proficiency, log frequency, college education*proficiency,	279.717	2.647
4) Irreg verb type	college education, proficiency, log frequency, college education*proficiency, irregular verb type, college education*Irreg verb type, proficiency*Irreg verb type Irreg verb type*log frequency	277.747	6.229
5) Remove proficiency by Irreg verb type	college education, proficiency, log frequency, college education*proficiency, Irreg verb type, college education*Irreg verb type, Irreg verb type*log frequency	274.132	9.844
6) Remove college education by Irreg verb type	college education, proficiency, log frequency, college education*proficiency, Irreg verb type, Irreg verb type*log frequency	273.023	10.953
7) Remove log frequency by Irreg verb type FINAL MODEL	college education, proficiency, log frequency, college education*proficiency, Irreg verb type,	274.799	9.177

Table 5.31: Submodel: Suppliance of inflection on irregular verb type.

In the base model, the interaction between college education and log frequency was not found to be statistically significant (p=.208) and, this was removed from the model, as was the interaction between proficiency and log frequency (p=.129). The suppliance of inflection on ablaut and pseudo-inflected forms cannot be analysed by proficiency, and the analysis accommodates all proficiency levels. After the inclusion of Irreg. PT verb type (i.e. pseudo-inflected or ablaut), the interaction between proficiency level and Irreg. PT verb type was not found to be statistically significant (p=.182), and this was removed. The tests of model effects also showed that the interaction between college education and Irreg. PT verb type was not statistically significant (p=.090), and this was removed. Finally, the interaction between Irreg. PT verb type by proficiency was not statistically significant (p=.059), and this was removed from the model, leaving the final model (Δ QICC =9.177). There were 169 ablaut and 164 pseudo Irreg. PT verbs input in this analysis.

The tests of model effects for the final model shows that everything in the model is statistically significant; college education (p=.047), proficiency (p=.0005), log frequency (p=.0005), Irreg. PT verb type (p=.006) and the interaction of college education by proficiency level (p=.018). The estimated marginal means show that there is a statistically significant difference in the suppliance of inflection on the ablaut and pseudo-inflected Irreg. PT verb types. Inflection is supplied on ablaut Irreg. PT verbs (mean = .43), almost twice as often as that supplied on the pseudo-inflected Irreg. PT verb type (mean =.24). The mean difference is statistically significant (mean difference = .19, p=.007). Notwithstanding the statistical significance between the production of inflected ablaut and pseudo-inflected Irreg. PT verbs, the overall rate of suppliance of inflection on Irreg. PT verbs is undoubtedly low. However, as was shown in Section 5.4.2.4, the suppliance of inflection on Irreg. PT verbs lags behind that on Reg. PT verbs. Even at Advanced levels of proficiency, there is a statistically significant difference between inflected SV and LV Reg. PT verbs and Irreg. PT verbs. In this respect, the effects of frequency on Irreg. PT verbs may, to some extent, be responsible for the lower overall rates of suppliance seen here. The results are illustrated in Figure 5.7 (note that this is across proficiency levels, as proficiency* Irreg. PT verb type was not significant and removed from the model).

Factor	Wald χ^2	df	Sig.(p)
college education status	3.936	1	.047
proficiency	84.688	3	.0005
log frequency	12.621	1	.0005
college education*proficiency	8.001	2	.018
Irreg verb type	7.662	1	.006

Table 5.32: Tests of model effects: Suppliance of inflection on Irreg. PT verb types.

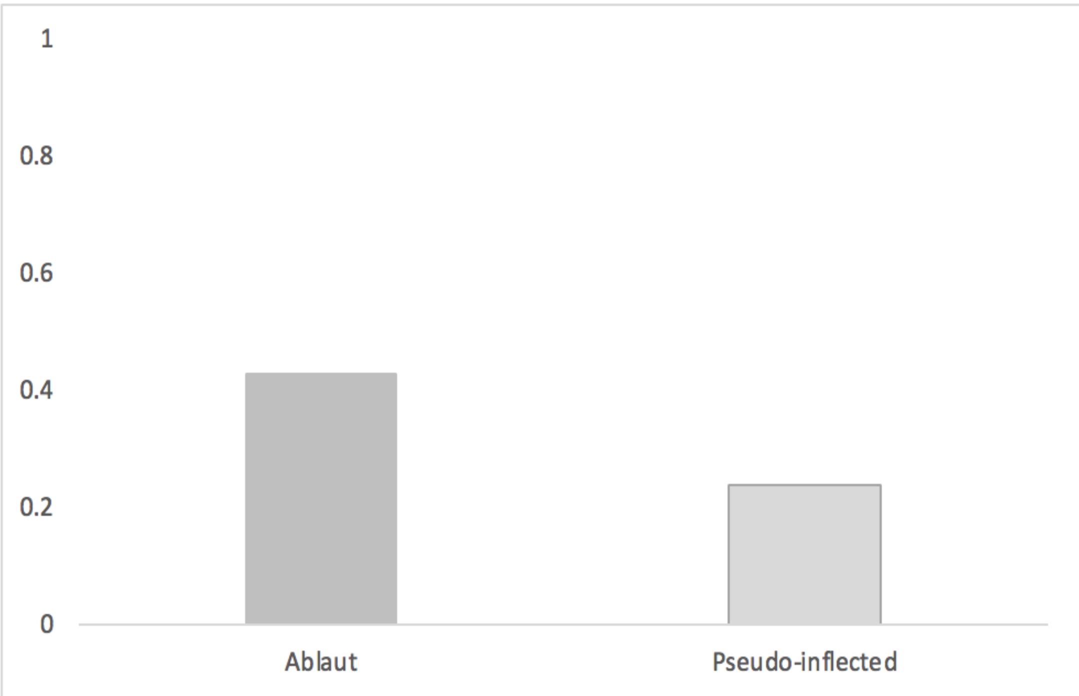


Figure 5.7: Suppliance of irregular verb types: Ablaut and pseudo inflected.

The more consistent suppliance of inflection on ablaut forms by L1 Bengali speakers (as predicted), differs from the results reported in Goad and White (2006), where advanced L1

Mandarin speakers of L2 English produced inflection equally on both ablaut and pseudo-inflected forms (94% and 93% respectively). As pseudo-inflected forms naturally create a word-final consonant cluster, it is possible that the pseudo-inflected forms in the current study are inflected less than the ablaut due to phonotactic rather than minimal word requirements transferred from the L1. Despite a prohibition of (word-final) consonant clusters in Bengali (Boyle David, 2015, p.23), the learners tested here did not show difficulties in the production of a small set of word-final clusters. Unlike the situation in, for example, Spanish or Japanese, which allow a restricted set of phonemes in word-final position (Campos-Dintrans, 2011; Broselow and Park, 1995), Bengali does not have such restrictions regarding word-final consonants, allowing the complete range of of consonants from the L1 phonemic inventory to take end position (e.g. Kostić and Das, 1972).

5.4.4.1 Monomorphemic word-final clusters

As the category for monomorphemic word-final consonant clusters was excluded from the initial statistical analysis due to the lack of variance, the results are briefly set out here as mean scores. As English irregular verbs are produced with a PWd internal prosodic representation it is necessary, particularly for pseudo-inflected verbs, to articulate the double coda created within the PWd (e.g. ke**pt**). It is relevant to this study, therefore, to establish whether the omission of inflection on Irreg. PT verbs (especially pseudo-inflected verbs) is due to a phonotactic difficulty in producing word-final consonants rather than issues with accessing or applying transferred L1 prosodic representation to L2 verbs. Of course, it is possible that the learners drop one or other of the consonants, avoiding a cluster. However, if C_1 is omitted but C_2 is retained, then it can be assumed that the pseudo-inflection morphrme *'-t'* has been applied.

The bar chart in Figure 5.8 (mean scores are set out in Table 5.33) illustrates the suppliance of word-final consonant clusters per proficiency level. The suppliance rates are remarkably high from Beginner through to Advanced proficiency levels. This suggests that even though Bengali does not permit word-final consonant clusters, this does not cause great difficulty for the participants tested here with respect to production of consonant clusters (C_1 and C_2) in the test clusters of /st/ (e.g. list) and /nd/ (e.g. sand).

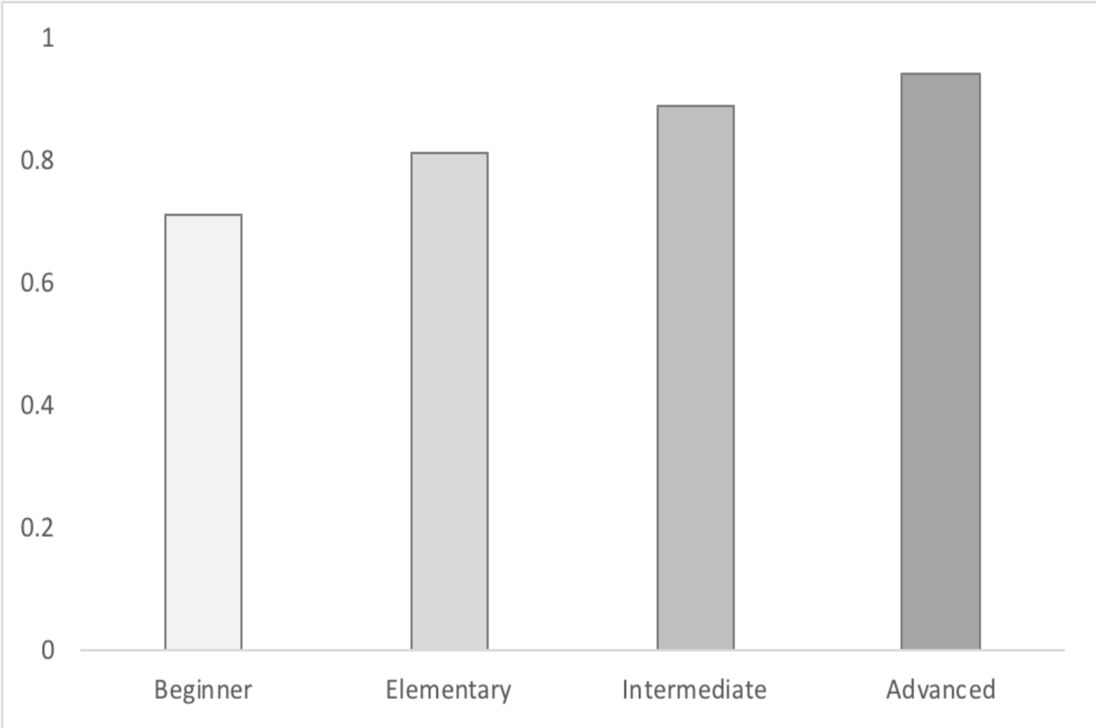


Figure 5.8: Suppliance of word-final consonant clusters in monomorphemic words.

Proficiency	Mean
Beginner	.71
Elementary	.81
Intermediate	.89
Advanced	.94

Table 5.33: Mean scores for the suppliance of word-final consonant clusters in monomorphemic words by proficiency level.

5.4.4.2 Regularisation of irregular verb forms

With respect to evidence of regularisation of irregular verbs by learners at lower levels of proficiency, as predicted in (5.4.1), analysis of the category of 'other responses' was carried out. It was found that a spike in the suppliance of regularised irregular verbs is apparent by Intermediate proficiency learners (13.5%), increasing from (5.6%) at Elementary level. It is, of course, not possible to discern whether this is caused by preservation of L1 moraic structure and an avoidance of vowel-shortening, or whether this is part of the acquisition process in dealing with unknown irregular forms.

5.4.4.3 Interim summary

1. In sum, the production of word-final CCs does not seen to be a problem for L1 Bengali speakers, despite word-final CCs being prohibited in the L1.

2. This suggests that production of pseudo-inflected Irreg. PT verbs, which require a word-final CC, should not necessarily be negatively influenced by an L1 prohibition of word-final CC. However, this should not be overstated. This was a very small set of monomorphemic words which were limited to /st/ (e.g. list) and /nd/ (e.g. sand) clusters, and not representative of the clusters generated in the pseudo-inflected verbs tested here. In other words, the monomorphemic tokens were not matched in terms of clusters with the pseudo-inflected verb forms, and in this respect can only suggest that clusters in word-final position are, in general, not seen to be problematic for the L1 Bengali speakers tested here.

3. The evidence suggests that as predicted in (5.4.1), ablaut forms are supplied with inflection more consistently than pseudo-inflected. The motivation for this is, however, unknown from this analysis.

5.5 Third person singular agreement

It was originally predicted that at all levels of proficiency, 3SG inflection would be supplied with some equivalence to that on Pl Noun and Reg. PT, as, according to the PTH, the availability of the required prosodic representation influences suppliance rates. This can be considered to be the case at Advanced levels of proficiency, and as there is no statistical significance between the suppliance of inflection on Reg. PT and 3SG and Pl Noun. This also partly holds for the lower levels of proficiency, as there is no statistical significance between Reg. PT and 3SG. However, there is statistical significance in the difference in suppliance rates between Pl Noun, 3SG and Reg. PT. The estimated means show a greater percentage increase in the suppliance of inflection on 3SG of 68% between Intermediate and Advanced proficiency levels. This is in contrast to a 24% increase on Reg. PT. Although the suppliance of inflection on 3SG is not statistically significantly different from that on Reg. PT, there is a marked difference in the consistency of suppliance between these levels of proficiency.

One explanation for this could be the greater complexity of the acquisition task for L1 Bengali speakers in the context of 3SG compared to Reg. PT verbs, because the syntactic features required for 3SG are not readily available to transfer from L1 Bengali to the interlanguage. As it was seen in the comparison of suppliance rates with the GJT scores, spoken suppliance of inflection on 3SG lagged behind the GJT for 3SG scores. However, although lower level learners scored highest on the GJT for Reg. PT the difference between the scores for the GJT for Irreg. PT and GJT for 3SG were not greatly different. The lower suppliance rates on spoken suppliance of inflection on 3SG, could, therefore be due to phonological issues. However, there is clear evidence from the suppliance of inflection on Pl Noun, that it is unlikely to be due to phonotactic issues. In the following section, a logistic regression mixed model was built to examine which factors provide the best goodness of fit for the suppliance of inflection on 3SG, in the context of the transfer of L1 moraic structure.

5.5.1 Results 6: Third person singular agreement

In the following analysis, the 3SG verbs are considered according to vowel length; long vowel third singular agreement (LV 3SG) and short vowel third person singular agreement (SV 3SG), and similar to the analysis for Reg. PT verbs, a category of Reg.-es 3SG is also included. This is to allow that an extra-syllabic inflection may be preferred, either accurately or inaccurately via epenthesis in a stem+VC configuration (e.g. wash -es) with non-target like forms (e.g. *stop -es), as in the Reg.-es 3SG structure. A summary of the breakdown of the test tokens is set out in Table 5.34.

Verb type	Count
Total 3SG tokens	34
LV 3SG	10
SV 3SG	16
Reg.-es-3SG	8

Table 5.34: Third person singular agreement token count.

It is predicted that (at least at lower levels of proficiency) inflection on SV 3SG and Reg.-es 3SG will be produced in higher quantities than that on LV 3SG (113), assuming that L1 Bengali minimal word requirements are transferred along with prosodic representation of PWd adjoined and PWd internal. It is again predicted that a well-formed verb stem, according to L1 Bengali minimal word requirements (LV 3SG), would be produced more readily without inflection, as it fulfils the L1 minimal word constraints, whereas SV 3SG verbs would violate the L1 minimal word in terms of well-formedness, and therefore require some form of repair to which an inflectional morpheme could be attached.

(113) Suppliance of inflection on SV 3SG $=$ Reg.-es 3SG $>$ LV 3SG

A numerical summary of the categorical variable information for the final model is supplied in Table 5.35.

Factor	Description	Input data
Proficiency	Beginner	130
	Elementary	137
	Intermediate	197
	Advanced	100
	Total	564
3SG verb type	SV 3SG	284
	LV 3SG	147
	Reg.-es 3SG	133
	Total	564
college education	college	469
	pre-college	95
	Total	564

Table 5.35: Summary of categorical variables: 3SG

The model build is set out in (Table 5.36). The Sylheti dialect was removed from the model as it created a warning in the Hessian matrix as singular, presumably a consequence of a smaller data set. Similar to the model build for Reg. PT verbs with respect to stem-final voicing status, the interaction between proficiency*3SG verb type was also not significant and removed from the model. As a result the suppliance of inflection on 3SG verb types is provided with conflated proficiency levels.

	Predictor	QICC	Δ QICC
1)Remove Sylheti dialect	proficiency, college education, log frequency, proficiency*college education proficiency*log frequency college education*log frequency	528.724	-
2) Remove college education by log frequency BASE MODEL	proficiency, college education, log frequency, proficiency*college education proficiency*log frequency	528.139	0.585
3) Third person singular agreement verb type FULL MODEL	proficiency, college education, log frequency, proficiency*college education proficiency*log frequency, 3SG verb type, college education*3SG verb type, proficiency*3SG verb type, 3SG verb type*log frequency	525.976	2.748
4) Remove 3SG verb type by log frequency and 3SG verb type by college education	proficiency, college education, log frequency, proficiency*college education proficiency*log frequency, 3SG verb type, proficiency*3SG verb type	519.615	9.109
5) Remove 3SG verb type by proficiency FINAL MODEL	proficiency, college education, log frequency, proficiency*college education proficiency*log frequency, 3SG verb type	517.423	10.964

Table 5.36: Model build for third person singular agreement.

The tests of models effect show that all factors and interactions in the final model are either significant or are in a statistically significant interaction (proficiency p=.0005, college education p=.003, log frequency p=.935, proficiency by college education p=.0005, proficiency by log frequency p=.016, 3SG verb type p=.004). This is illustrated in Table 5.37.

Factor	Wald χ^2	df	Sig.(p)
proficiency	53.104	3	.0005
college education status	8.665	1	.003
log frequency	.007	1	.935
proficiency*log frequency	10.327	3	.016
proficiency*college education status	23.423	2	.0005
3SG verb type	11.046	2	.004

Table 5.37: Tests of model effects: Suppliance of inflection on 3SG verb type.

Estimated marginal means predict statistically significant differences between the suppliance of inflection on LV 3SG compared to 3SG.-es (mean difference = .023, p=.009), and between SV 3SG compared to 3SG.-es (mean difference = .14, p=.056). However, similar to the results for LV and SV Reg. PT verbs, there is no statistical difference between LV 3SG and SV 3SG (mean difference = .09, p=.167). This is illustrated in Figure 5.9 and Table 5.38. Contra to the predictions, a difference in the suppliance of LV and SV verbs in 3SG verbs is not in evidence in this data set. The suppliance of inflection on 3SG.-es verbs is also lower than that that on SV and LV 3SG verbs, just as Reg.-ed PT verbs are produced in lower quantities than SV and LV Reg. PT verbs. However, although there is no statistical significance between the suppliance rates of inflection on SV 3SG and LV 3SG, the estimated means show that in contrast to the data for the Reg. PT verbs, the LV 3SG verbs are marginally more likely to be inflected than the SV 3SG verbs.

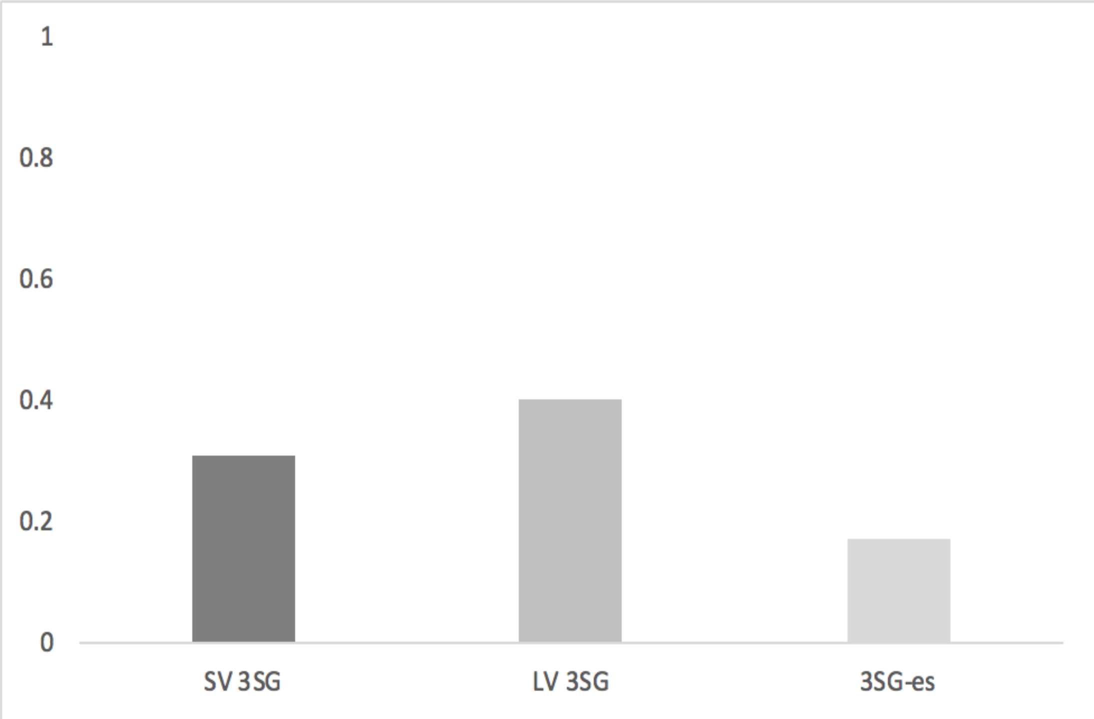


Figure 5.9: Suppliance of 3SG inflection according to verb type.

3SG verb type	Mean	SE	LI	UI
SV 3SG	.31	.083	.17	.49
LV 3SG	.40	.094	.24	.59
3SG-es	.17	.052	.09	.29

SE = standard error, LI = lower and UI = upper confidence interval

Table 5.38: Estimated marginal means for the suppliance of inflection on 3SG according to verb type.

In contrast to the predictions set out in (113), L1 Bengali speakers supply 3SG inflection on LV 3SG verbs more consistently than on SV 3SG verb stems, and the lowest suppliance rate is on 3SG.-es. Again, as in the case of Reg. PT verbs, the data set analysed here did not include any examples of inaccurately formed 3SG.-es verbs (e.g. stem-final stops with an extra-syllabic ending *[stɒp -əs] 'stop -s'). Whilst the pattern for SV Reg. PT shows that they are inflected more consistently than LV Reg. PT (as was predicted, although not statistically significant), the LV 3SG verbs were inflected more consistently than the SV 3SG verbs (in contrast to the predictions, but again not statistically significant). Both the Reg. PT and 3SG show a much lower suppliance of inflection on verbs which are inflected in a stem + VC configuration. This is surprising considering both the L1 bimoraic minimal word requirements and the disyllabic nature of simple past inflection in the L1 PWd internal inflection (*buj^h -l -am* 'I understood').

Superficially, the results shown here seemingly contradict those shown for Reg. PT verbs, where the suppliance of inflection is greater on the SV Reg. PT verbs than on the LV Reg. PT verbs. However, as the data for 3SG is across all proficiency levels, and as the interaction between proficiency*verb type was removed from the model due to lack of significance, it is not possible to draw such comparisons. Similarly, it was not possible to run a further model for voicing of stem-final consonants, and there was no further analysis of the data.

5.5.2 Chapter summary

This chapter began with a discussion on the organisation of the data with relation to the approach to statistical analysis reported here (relative to both Experiment 1 and Experiment 2). Following this, an overview of the spoken suppliance data and grammaticality judgement test was presented. The simple past tense was then analysed in more detail; regular verbs were subdivided according to vowel length and stem-final consonant, and irregular verbs were further tested according to the type of inflection (ablaut or pseudo-inflection). This section ended with an analysis of the suppliance of inflection on 3SG with respect to verb type.

The overview of suppliance of inflection illustrated that at Advanced proficiency levels, there were no statistically significant differences between inflection across word types. Whilst this is as predicted according to the PTH, it was unknown whether inflection was produced in a target-like representation. However, the developmental stages provide a window on how word type (and therefore type of required prosodic structure) interacts with the suppliance of inflection. At lower levels of proficiency the GJT scores outperform suppliance of inflection in spoken data, indicating that syntactic knowledge or at least metalinguistic knowledge of inflectional paradigms outweighs the spoken performance. It is only at Intermediate and Advanced proficiency levels, however, that GJT scores are above chance. For lower levels of proficiency (i.e. below Advanced), the suppliance of inflection which requires the PWd internal representation (i.e. Irreg. PT) is not supplied more than that which requires a PWd adjoined representation (i.e. Pl Noun, 3SG and Reg. PT). Of the inflection which requires a PWd adjoined representation, only the suppliance of inflection on Pl Noun is statistically significant.

Looking more closely at the suppliance of simple past inflection, the best goodness of fit for the model to predict the suppliance of simple past inflection according to verb type is when log frequency and college education status are included in the build. Whether the participant is a speaker of the Sylheti dialect is not seen to influence suppliance rates, whilst college education status has an effect on interactions, but is not otherwise a statistically significant factor. When log frequency is included in the build, estimated marginal means indicate that SV Reg. PT verbs are inflected more frequently than LV Reg. PT verbs, which in turn are inflected more than Reg.-ed or Irreg. PT verbs. This is consistent both within and between proficiency levels, although the estimated means for the suppliance of inflection on SV and LV verbs is virtually equal at Beginner proficiency level and again at Advanced proficiency level. Assuming L1 transfer of prosodic representation, there are two unexpected results. First, the suppliance of inflection on Irreg. PT verbs does not appear to benefit from the direct accessibility afforded from the L1 transfer to the interlanguage of a structure which represents the simple past tense in the L1 and L2, and secondly, the suppliance of inflection on Reg. PT verbs does not appear to suffer from delay (either compared to increasingly high proficiency levels or compared to suppliance rates on Irreg. PT) despite the claim that there should be some re-licensing of the structure to a new position. This suggests that the data here fits with the weak interpretation of the PTH.

The suppliance of inflection on Irreg. PT was produced more consistently in the ablaut than pseudo-inflected forms, possibly indicating an avoidance of vowel shortening. Irreg. PT verbs were also seen to be sensitive to the frequency of the irregular verb, so that inflection is supplied more consistently on high frequency verbs compared to low frequency verbs. This is not apparent with LV or SV Reg. PT verbs or Reg.-ed verbs, where suppliance of inflection is not influenced by verb frequency effects.

Although the Reg.-ed verbs were categorised according to whether they were (a) accurately formed (i.e. attached to verbs with a stem-final /t/ or /d/), or (b) inaccurately formed (i.e. attached to verbs with a stem-ending other than /t/ or /d/) there were no instances of (b) inaccurately formed Regular-ed verbs within the results. This indicates that the L1 Bengali speakers tested here did not insert an epenthetic vowel to create a disyllabic past tense form which would either mirror the L1 simple past forms or provide a well-formed bimoraic word according to the L1 constraints. In this respect, it is possible to discount the prediction that an epenthetic vowel may be inserted as a repair strategy to form English past tense.

Whilst not statistically significant, the pattern of higher suppliance on SV Reg. PT verbs compared to LV Reg. PT verbs was examined further. Working within the bounds of well-formedness according to the L1 minimal word constraints. it was seen that suppliance of inflection was higher on SV Reg. PT verbs with unvoiced stem-final consonants. It was proposed that this could be due to (a) L1 Bengali speakers being sensitive to vowel length in L2 English contexts dependent upon the final consonant and (b) applying the L1 Bengali repair strategy to fix subminimal moraic structure by adding a mora and lengthening the vowel to fill the mora, and (c) inflecting the verb because repair of the verb stem induces noticing of the structure, which does not happen as consistently on verb stems which do not flag up a need for repair (i.e. verbs with a SV voiced stem-final consonant and LV verbs in both voiced and unvoiced contexts). In this respect the non statistically significant differences in suppliance patterns for LV Reg. and SV Reg. PT verbs can perhaps partially be accounted for. The relevance of investigating L1 transfer of moraic structure, especially when there is a mismatch between the L1 and the L2, and its role with respect to the suppliance of inflectional morphology, is tentatively proposed to be as relevant as the transfer of L1 prosodic representation (i.e. the PTH) of inflectional morphology at the level of the prosodic word. However, this proposal is stated tentatively because the data for suppliance of past tense forms could not be collaborated with data from 3SG verbs. This was possibly due to the conflation of proficiency levels and both Reg. PT verbs and 3SG verbs showed a lack of significance in the interaction between proficiency level and verb type.

Chapter 6

Results for Experiment 2

6.1 Introduction

Experiment 1 focuses on the suppliance and omission of L2 English inflection (primarily simple past and third person singular agreement) by L1 Bengali speakers. It was predicted that within the simple past regular verbs and third person singular verbs, inflection would be supplied more consistently on SV verbs than on LV verbs. It was proposed that in relation to the L1 minimal word requirements, the LV verbs would fulfil the bimoraic minimal word requirements, whereas the SV verbs would be deemed subminimal. In this respect, it was expected that the LV verbs would be accepted as well-formed and, conforming to L1 minimal word requirements would, at least at lower levels of proficiency, be produced without inflection, in the bare form. It was further predicted that in the case of SV verbs, L1 minimal word requirements would prompt repair, in the form of an epenthetic vowel, which would create an additional mora. It was proposed that the additional mora created by epenthesis would result in a greater likelihood that inflection would be attached to SV verb forms (in both simple past and third person singular agreement forms). The suppliance of inflection on SV PT and SV 3SG forms was therefore predicted be more consistently supplied than that on LV verbs.

The results from Experiment 1 revealed that there was no evidence of epenthetic vowel insertion by L1 Bengali speakers in either SV Reg. PT or SV 3SG contexts, and whilst patterns of inflection showed that simple past inflection was supplied more consistently on SV Reg. PT verbs, this was not statistically significant. It was found, however, that inflection was supplied more consistently on SV Reg. PT verbs with an unvoiced stem-final consonant. It was suggested that in this environment the SV verb stem would present the phonetically shortest vowel in respect to post-lexical vowel length changes, and that L1 Bengali speakers could be sensitive to the need to lengthen the vowel in this condition. The argument for greater suppliance of inflection derives from the premise that any form of repair of L2 moraic structure will invoke noticing, and promote other changes to the verb stem, such as inflection. The results for 3SG verbs showed the opposite pattern than that which was predicted, with inflection supplied more consistently on LV verbs than SV verbs. However, these results reflect a combined proficiency group, and differences between proficiency levels may reveal a different picture, as could suppliance rates in relation to the voicing of the stem-final consonant.

6.2 Experiment 2: Moraic structure and prosodic representation

Experiment 2 was guided by the following research questions.

1. Does L1 repair of moraic structure transfer to the interlanguage, and does it determine the shape of the prosodic word in L2 productions?
2. Can instances of vowel lengthening in the L2 production of base and affixed forms demonstrate whether L2 inflection is produced in a target-like prosodic representation?

6.2.1 Predictions

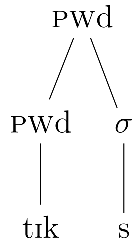
With the absence of evidence of epenthetic vowel insertion in potentially subminimal (SV) forms, and assuming that L1 transfer of prosodic representation entails the transfer of L1 minimal word requirements, it is predicted that L1 Bengali speakers will apply L1 repair of moraic structure, and subsequent vowel lengthening, to L2 English CVC forms, which are considered subminimal according to L1 Bengali constraints. Vowel lengthening is a 'last resort' L1 repair strategy to ensure a well-formed bimoraic minimal word in the L1 Bengali output (Fitzpatrick-Cole, 1996, p.315). The relevance of this in relation to Experiment 1, and with reference to the PTH, is that instances (or absence) of vowel lengthening in L2 English productions by L1 Bengali speakers can potentially provide insight into the prosodic representation of the affixation of L2 inflectional morphology.

As illustrated in Chapter 4, the test tokens for this experiment were designed in tetrads or sets of four; a monomorphemic word, a stem+C affix, a disyllabic monomorphemic word and a stem+VC affix. Stem-final segments included both voiced and unvoiced stop consonants. Example (114) shows the prosodic representation required for the PWd internal representation for a monomorphemic verb (or noun) and (115) shows the PWd adjoined representation in a monosyllabic verb+C affix. Example (116) illustrates the PWd internal representation required for bimoraic disyllabic form and (117) the PWd adjoined monosyllabic verb+V(C) affix.

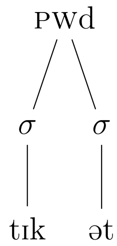
(114)

PWd
|
|
tɪk

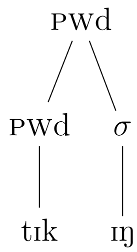
(115)



(116)



(117)



It is predicted that for some L1 Bengali speakers (at lower levels), an English monosyllabic monomorpheme which is also monomoraic would, according to the L1 Bengali minimal word requirements, undergo mora insertion and vowel lengthening in order to ensure a bimoraic output (118a). This would result in a target-like prosodic representation (PWd internal). Similarly, as shown in (118b), vowel lengthening is predicted to repair the lower PWd before affixation, although it is equally feasible that a non target-like PWd internal representation could accommodate the inflection (118c). In this case, it is predicted that VL would still apply post-lexically once affixation is complete, as there is no second mora.

(118)
a. ?(tiːk)ω
‘tick’

b. ?((tiːk)ω -s)ω
‘ticks’

c. *(tiːk -s)ω
‘ticks’

d. (tik -ət)ω
'ticket'

e. *(tik -ɪŋ)ω
'ticking'

f. ?((tiːk)ω -ɪŋ)ω
'ticking'

There is no prediction for vowel lengthening in disyllabic and bimoraic monomorphemes as shown in (118d), as the L1 minimal word requirement is fulfilled within the PWd, and production and prosodic representation are predicted to be target-like. For verbs with a V(C) affix, there is again an option that the inflection is absorbed within the PWd as illustrated in (118e). In this example, vowel lengthening is not predicted as vowel lengthening as a repair strategy would apply after affixation, and the affixation supplies the required second mora to create a bimoraic minimal word. However, if the affixation is adjoined to a PWd, then it is predicted that vowel lengthening will first take place in the lower PWd, to allow affixation to adjoin to a well-formed PWd, as shown in (118f).

In looking for evidence of vowel lengthening within this data set, there are two possible patterns which could illuminate how prosodic boundaries are drawn in the L2, and with different implications regarding the prosodic representation of L2 affixation. Prediction (a) is that the vowel is lengthened in monosyllabic monomorpheme (118a), verb+C (118b) and verb+V(C) (118f), and these vowels are equally long, and longer than the vowel length in a disyllabic monomorpheme (118d). In this scenario, the vowel lengthening pattern would suggest that the PWd adjoined representation is target-like in the verb+C and verb+V(C) inflections, as the lower PWd is lengthened to allow affixation to a well-formed (bimoraic) PWd.[1]

Prediction (b) is that the vowel length in the monosyllabic monomorpheme (118a) and verb+C (118c) structures are equally long, and longer than the vowel length in both verb+V(C) (118e) and disyllabic monomorphemic forms (118d), which are also equal

[1]The production of a lengthened vowel in a verb+V(C) inflection would not necessarily be 'native-speaker like', but that is irrelevant to this analysis which is concerned with the possible effects of transfer of L1 minimal word requirements and constraints on L2 prosodic representation of affixation.

in vowel length. In this case, the vowel lengthening pattern would suggest that the prosodic representation of verb+C and verb+V(C) inflections are non target-like, and absorbed PWd internally. This is because vowel length is repaired post-lexically in the L1 (Bengali), following affixation. In the case of the monomoraic monomorpheme and verb+C configuration, vowel length is naturally longer than the bimoraic verb + V(C) and disyllabic monomorpheme. The predictions are summarised in (119).

(119) a. Prediction (a): VL in monomorpheme = verb+C = verb +V(C) > disyllabic monomorpheme
Affixation is represented in a target-like PWd adjoined structure
b. Prediction (b): VL (monomorpheme = verb+C) > (verb+V(C) = disyllabic monomorpheme)
Affixation is represented in a non target-like PWd internal structure

It is predicted that at some levels of proficiency, Bengali vowel lengthening (which occurs regardless of whether the syllable is closed or open, and in a voiced or unvoiced environment) will be applied selectively to L2 forms which have a phonetically shorter vowel (i.e. SV stem with unvoiced stem-final consonant). In other words, differences in L2 production of unvoiced vowel length may be detected if learners are sensitive to (a) English moraic structure and (b) English vowel length in the environment of voiced final-stem consonants. This is summarised in (120).

(120) a. Vowel lengthening in CVC prosodic words is not affected by SV or LV stem or voicing status of stem-final consonant (i.e. vowel lengthening repairs a subminimal stem post-lexically, regardless of the following voicing environment).
b. Vowel lengthening in CVC prosodic words is affected by SV or LV stem and voicing status of stem-final consonant (i.e. vowel lengthening is sensitive not to whether a stem is subminimal, but because of the following voicing environment).

6.2.2 The participants

As discussed in Chapter 4, the participants for Experiment 2 were recruited separately from the participants in Experiment 1, and were conflated into three proficiency levels of Beginner (n=4), Elementary (n=3) and Intermediate (n=3). The Beginner and Elementary level learners (n=7) had all resided in the UK for between one and four years, and five of these participants had also resided in Europe (Spain or Italy) for between ten and thirteen years. The Intermediate participants were all based in Dhaka, Bangladesh, and had never resided outside of Bangladesh.

Data for Experiment 2 were also collected from a NS Control group, to confirm that the task worked as intended. Although there is some comparison between vowel duration between L1 Bengali speakers and the NS Control group, particularly in a principal component analysis (PCA), the main focus of this analysis is vowel duration across sets of tetrads by L1 Bengali speakers of L2 English in relation to the distinction of prosodic boundaries. Whether the vowel length is similar or not to the NS Control group is largely inconsequential to the purpose of this second experiment.

6.2.3 Overview of vowel lengthening analysis procedure

A linear mixed model was run with the probability distribution of dependent variable specified as normal, and the link function selected as identity. The independent correlation structure was found to provide the best goodness of fit, and this was the working correlation matrix selected for the model builds throughout the analysis for Experiment 2. The reported significance is the sequential sidak, with a probability value $p \leq 0.05$. The dependent variable was set as vowel length (measured in milliseconds), the subject effect was participant ID (data were normalised and speaker variation was controlled for by having an error structure with speaker ID input with every build, catering for random factors) and within subjects effect was the vowel according to word type. The predictors were defined as follows: 'vowel', whether the vowel in question in the CVC word was /ɪ/ or /æ/, 'L1', whether the first language was Bengali or English, 'stem-final C', the status of the stem-final consonant as 'voiced' (lenis) or 'unvoiced' (fortis), and 'word type', whether the token in question was a monosyllabic verb, monosyllabic verb+C affix, disyllabic word or monosyllabic verb stem+V(C) affix. A summary of the factors entered into the model is set out in Table 6.1.

Factor	Description	Input data
Proficiency level	Beginner (n=4)	173
	Elementary (n=3)	138
	Intermediate (n=3)	136
	Total	447
Word type	stem	116
	stem + C	106
	disyllabic word	111
	verb + V(C)	114
	Total	447

Table 6.1: Experiment 2: Summary of input data for participants and word types.

6.2.3.1 Vowel length by proficiency level and word type

The base, full and final model is reported in Table 6.2. During the build some terms were removed, notably Sylheti dialect and college education status, as the tests of model effects showed that some factors were confounded with others within the model. Factors remaining in the model include length of residence in the UK (LOR in UK), residency (whether learners have lived in Europe as well as the UK and Bangladesh), word type (whether the word was a monosyllabic verb stem, monosyllabic stem+C, disyllabic stem or monosyllabic stem+V), and token (i.e. specific test tokens within the word type category). The tests of model effects shows that all interactions are significant even if the individual factors are not; proficiency by word type (p=.0005), residency by word type (p=.029), word type by age (p=.001) and word type by LOR in UK (p=.0005).

	Predictor	QICC	Δ QICC
Base model	proficiency, age, residency, LOR in UK	557420.496	-
Full model	proficiency, word type, age, residency, token, LOR in UK, proficiency*word type, word type*age, word type*LOR in UK, word type*residency, proficiency*token, word type*token, token*age, token*LOR in UK, token*residency	120280.241	437140.255
Final model	proficiency, age, residency, LOR in UK, word type, proficiency*word type, residency*word type, word type*age, word type*LOR in UK,	374576.131	182844.365

Table 6.2: Vowel length by proficiency and word type.

The estimated marginal means are summarised in Table 6.3.

	Beginner	Elementary	Intermediate
Overall vowel length	104.973	91.013	113.216

Table 6.3: Estimated means for overall vowel length according to proficiency level.

The Elementary proficiency level speakers perform differently in the overall vowel length measure compared to the Beginner or Intermediate proficiency level speakers, producing shorter vowels than the other groups (mean = 91.013 for Elementary proficiency level, mean = 104.973 for Beginner and mean = 113.216 for Intermediate level learners). However, there is no discernible difference in the overall estimated means regarding whether learners have lived only in the UK and Bangladesh, that is a UK group (mean = 103.276), or if learners have lived elsewhere in Europe as well as in the UK and Bangladesh, as a UK and Europe group (mean = 102.858), as shown in Table 6.4.

	UK	UK and Europe
Overall vowel length	103.276	102.858

Table 6.4: Estimated means for overall vowel length according to residency.

Based on the final model, a sub-model was run (Table 6.5) to also include stem-final consonant (i.e. whether voiced or unvoiced) and vowel type per token (i.e. whether /ɪ/ or /æ/ vowel).

	Predictor	QICC	Δ QICC
Sub-model	proficiency, age, residency, LOR in UK, word type, proficiency*word type, residency*word type word type*age, word type*LOR in UK, stem-final C, vowel proficiency*stem-final C, stem-final C*LOR in UK proficiency*vowel, vowel*age, stem-final C*vowel, proficiency*stem-final C*vowel	173296.351	-

Table 6.5: Sub-model: Vowel and stem-final consonant by word type.

Tests of model effects showed that all interactions were significant, as shown in Table 6.6.

Factor	Wald χ^2	df	Sig.(p)
proficiency*word type	60.395	6	.0005
residency*word type	9.515	3	.023
word type*age	18.106	3	.0005
word type*LOR in UK	49.055	3	.0005
proficiency*stem-final C	18.961	2	.0005
stem-final C* LOR in UK	10.013	1	.002
proficiency*vowel	18.376	2	.0005
vowel*age	3.936	1	.047
stem-final C*vowel	39.843	1	.0005
profociency*stem-final C*vowel	10.871	2	.004

Table 6.6: Tests of model effects: Vowel length by proficiency, vowel and stem-final consonant by word type.

6.2.3.2 Combined vowel length according to word type and proficiency level

There is an effect of proficiency on the estimated vowel means for word type, and the test results are set out in Table 6.7.

Word type	Wald χ^2	df	Sig.(p)
stem	23.615	2	.0005
stem+C	40.034	2	.0005
disyllabic	20.391	2	.0005
stem+V(C)	11.439	2	.003

Table 6.7: Overall test results: Estimated means for vowel length according to word type and proficiency level.

The Beginner and Elementary groups show statistically significant differences between the estimated means for combined vowel length (i.e./ɪ/ and /æ/ vowel tokens) in monosyllabic stem (p=.0005) and monosyllabic stem+C (p=.0005), and between disyllabic stem (p=.0005) and monosyllabic stem+V(C) (p=.011). Although the Beginner group produce longer vowels than the Elementary group, the production patterns run in parallel, showing that learners in both groups produce vowels in comparative duration across tetrads. The Intermediate level group, however, show greater differences in VL between monosyllabic stem and monosyllabic stem+C tokens, and is statistically significantly different to the Elementary group on stem vowel length (p=.004), disyllabic forms (p=.016) and stem+V(C) (p=.019). The estimated means and differences are shown in Table 6.8 and illustrated in Figure 6.1 (the covariates are fixed at age 29.79 and LOR in UK 1.69).

Word type	Beginner	Elementary	Intermediate
stem	130.697	111.301	152.451
stem+C	129.069	112.603	122.337
difference	**1.628**	**-1.302**	**30.114**
disyllabic	89.608	79.556	96.608
stem+V(C)	89.228	77.163	101.176
difference	**0.38**	**2.393**	**-4.568**

Table 6.8: Estimated means of combined vowel length according to verb type and proficiency level.

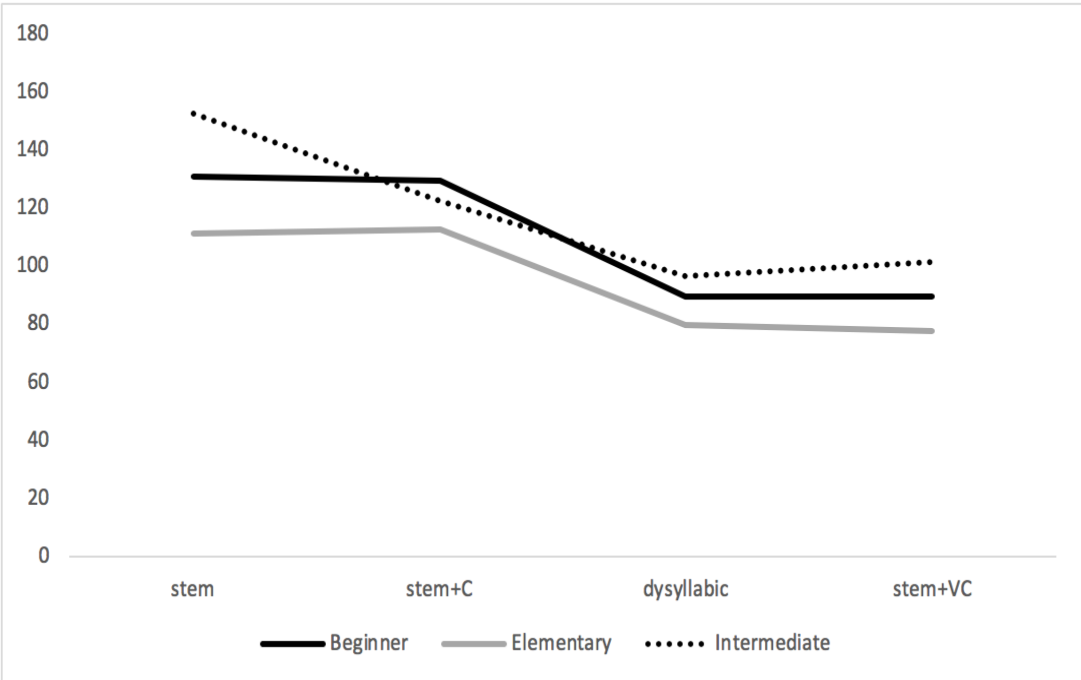


Figure 6.1: A comparison of vowel length according to word type and proficiency level.

6.2.3.3 Interim discussion

The results reported here could be understood to indicate that at lower levels of proficiency, there is some evidence that both L1 prosodic representation and L1 minimal word constraints exert an influence on L2 production of inflectional morphology. The overall pattern suggests that, at Beginner and Elementary proficiency levels, the production of of L2 English inflectional morphology is PWd internal. Although the Elementary group produce shorter vowels than the Beginner group in all contexts, the vowel length difference between stem and stem+C forms, and between disyllabic and stem+V(C) forms, is similar to that predicted in (119b). This suggests that L2 inflection is produced in a non-target PWd internal rather than the required PWd adjoined representation. The data recorded here also indicate that by Intermediate proficiency level, a shift in vowel length first occurs within the monomorphemic stem and stem+C contrast, where production of the vowel in the stem+C configuration becomes shorter than that in the stem. Although the vowel length in stem and stem+C tokens is greater than the stem+V(C), the vowel in the disyllabic stem is the shortest. It is possible that the framework for a target-like PWd adjoined prosodic representation, if not target-like vowel length, becomes more accessible with increased proficiency. In this respect, the delay between proficiency levels regarding the suppliance of inflection could be related to the adjustment of minimal word constraints in relation to prosodic representation between the L1 and L2, rather than a delay allowing for re-licensing of an existing structure in a new position in the interlanguage.

On the other hand, however, when the NS Control group is also plotted in the graph (Figure 6.2), it is unclear whether vowel length plotted for the L1 Bengali speakers can be interpreted as evidence of transfer of L1 minimality requirements or target-like productions, as the NS Control group show a very similar pattern to the Beginner and Elementary proficiency groups, but differ from the Intermediate proficiency level. In the following section the analysis turns to whether the vowel and voicing of the stem-final consonant influences vowel length.

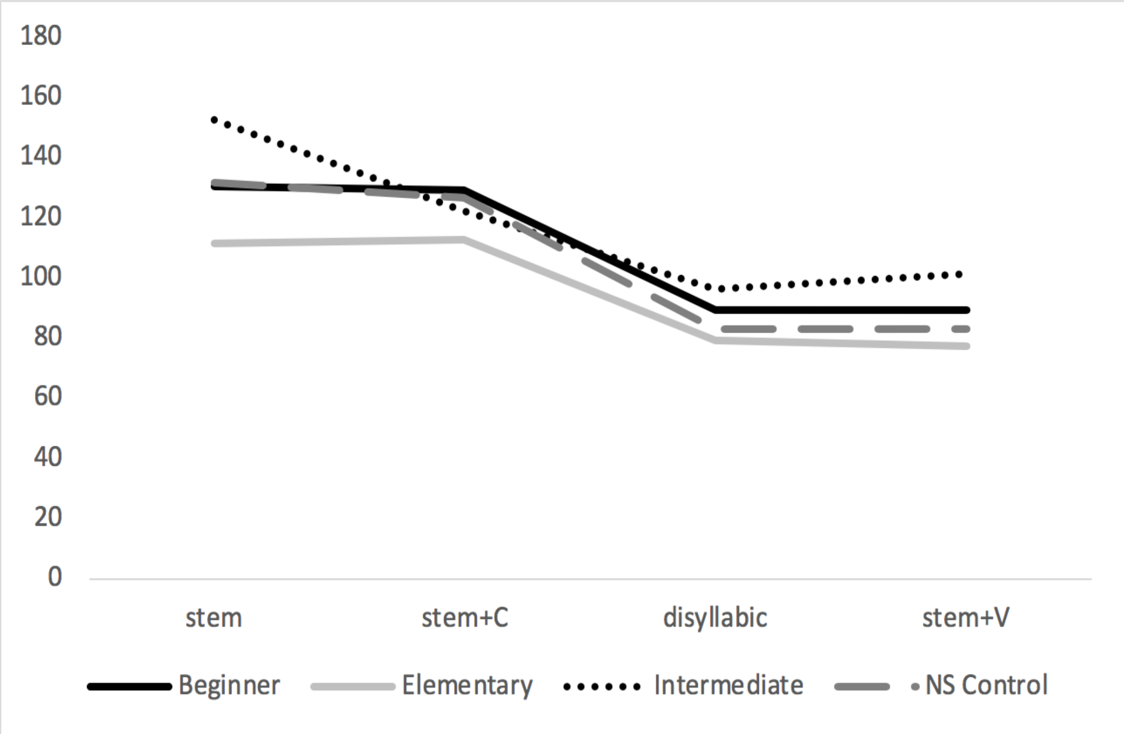


Figure 6.2: A comparison of vowel length: NS Control and L1 Bengali speakers.

6.2.3.4 Vowel length according to vowel type and stem-final consonant

The interaction between proficiency level and combined word types was analysed according to whether the stem-final consonant was voiced or unvoiced and whether the token involved an /ɪ/ or /æ/ vowel. It was predicted that if transfer of L1 moraic structure repair and vowel lengthening was in evidence, then vowel lengthening would not be affected by the voicing status of the stem-final consonant, as proposed in (120). Otherwise, if learners showed sensitivity to English post-lexical lengthening in an unvoiced environment, then vowel lengthening would be asymmetrical across the data. Pairwise comparisons showed that there are statistically significant differences between the Beginner and Elementary group in vowel length in both voiced and unvoiced stem-final consonants with an /ɪ/ vowel (p=.0005), and between words with voiced stem-final /æ/ vowels (p=.028). Beginner level learners, therefore, produce statistically significantly longer vowels than Elementary level learners in all conditions except unvoiced stem-final /æ/ vowel tokens. Vowels in voiced stem-final consonant tokens are always longer than those in unvoiced stem-final consonants. There are also statistically significant differences between Elementary and Intermediate proficiency levels in the production of voiced and unvoiced /æ/ stems (p=.028 and p=.020 respectively). The mean estimates are set out in Table 6.9 and Figure 6.3. 'U' denotes unvoiced, and 'V' a voiced stem-final consonant.

Vowel type & voicing	Beginner	Elementary	Intermediate
U /ɪ/	82.927	68.808	77.143
V /ɪ/	120.567	95.493	113.160
difference	**-37.64**	**-26.685**	**-36.017**
U /æ/	106.920	100.053	125.147
V /æ/	128.188	116.269	157.123
difference	**-21.268**	**-16.216**	**-31.976**

Table 6.9: Vowel length according to vowel type, voicing status of stem-final consonant and proficiency level.

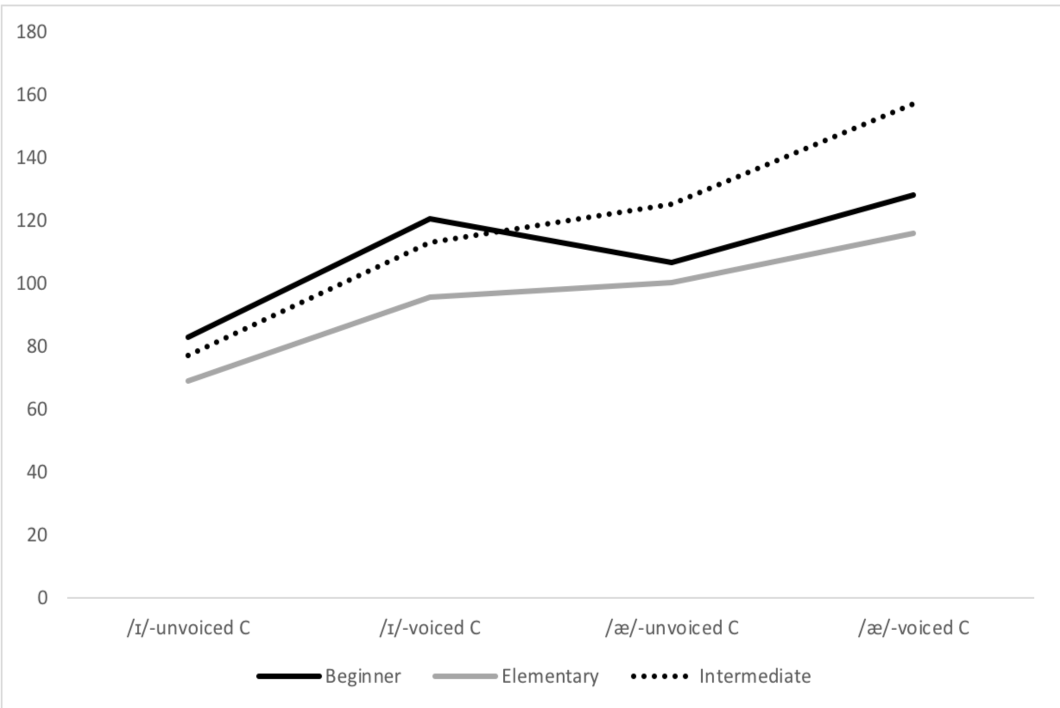


Figure 6.3: Vowel length according to vowel type and voicing of stem-final consonant.

6.2.3.5 Interim discussion

The voicing status of the stem-final consonant seemingly influences vowel length, but it should be noted that the token type (i.e. stem, stem+C, disyllabic and stem+VC) are conflated within the stem-final vowel category. The difference in estimated means between voiced and unvoiced /ɪ/ and /æ/ vowel words (Table 6.9) shows that at all levels of proficiency, there is a pattern of longer vowel production on voiced counterparts.

6.2.3.6 Combined vowel length according to residency in the UK or in the UK and Europe

The test results are set out for the combined vowel length according to residency in the UK or in the UK and Europe in Table 6.10, and a discussion follows.

Word type	Wald χ^2	df	Sig.(p)
stem	.417	1	.518
stem+C	1.892	1	.169
disyllabic	5.660	1	.017
stem+V(C)	.576	1	.448

Table 6.10: Overall test results: Estimated means for vowel length according to place of residency.

Although the overall combined vowel length was not significantly different between L1 Bengali speakers who have lived in Bangladesh or in Bangladesh and the UK compared to participants who have lived in Bangladesh and either Spain or Italy and the UK, there is a statistically significant difference in the estimated means for disyllabic words (p=.017). A relatively lengthy exposure to Italian (n=4) or Spanish (n=1) seemingly influences the production of vowel length, but only with respect to disyllabic words. Spanish does not have a minimal word constraint (e.g. Harris, 1987), and Italian is said to have a disyllabic minimal word constraint (Thornton, 1996). As Spanish and Italian both do not have vowel length contrast, and as stressed vowels become longer, then these results would appear to suggest the effects of transfer, not from the L1, but from the L2, is in evidence in English as the L3. In a superficial analysis, Italian and Spanish both have dominant penultimate stress patterns, meaning that a number of disyllabic words would be stressed, and therefore have a longer vowel, on the first syllable. This is not the general pattern for either English or Bengali, which have phonetically shorter vowels in polysyllabic words than in monosyllabic words. Yet when it comes to a stem+V(C) configuration, the non-Europe based group lengthen the stem vowel in comparison to the disyllabic form and the Europe based group shorten the vowel compared to the disyllabic form, taking away any significance in difference both within and between groups of learners.

Overall, there is a much flatter line between vowel length differences for the learners who have lived in the UK and Europe between monosyllabic verbs compared to the other three conditions of monosyllabic verb+C, monosyllabic verb+V(C) and the disyllabic form as shown in Figure 6.4 (although, of course, this is not statistically significant except for the disyllabic forms). This is illustrated in Figure 6.4, where the estimated means for vowel length for the four word types for learners who have lived in the UK only or in the UK and Europe are plotted. The values are estimated at an assumed age of 29.79 and LOR in UK of 1.69.

word type	UK	UK and Europe
stem	139.594	123.371
stem+C	134.776	107.898
difference	**4.818**	**15.473**
disyllabic	74.126	103.055
stem+V(C)	80.750	97.628
difference	**-6.624**	**5.427**

Table 6.11: Estimated means of vowel length according to verb type and residency.

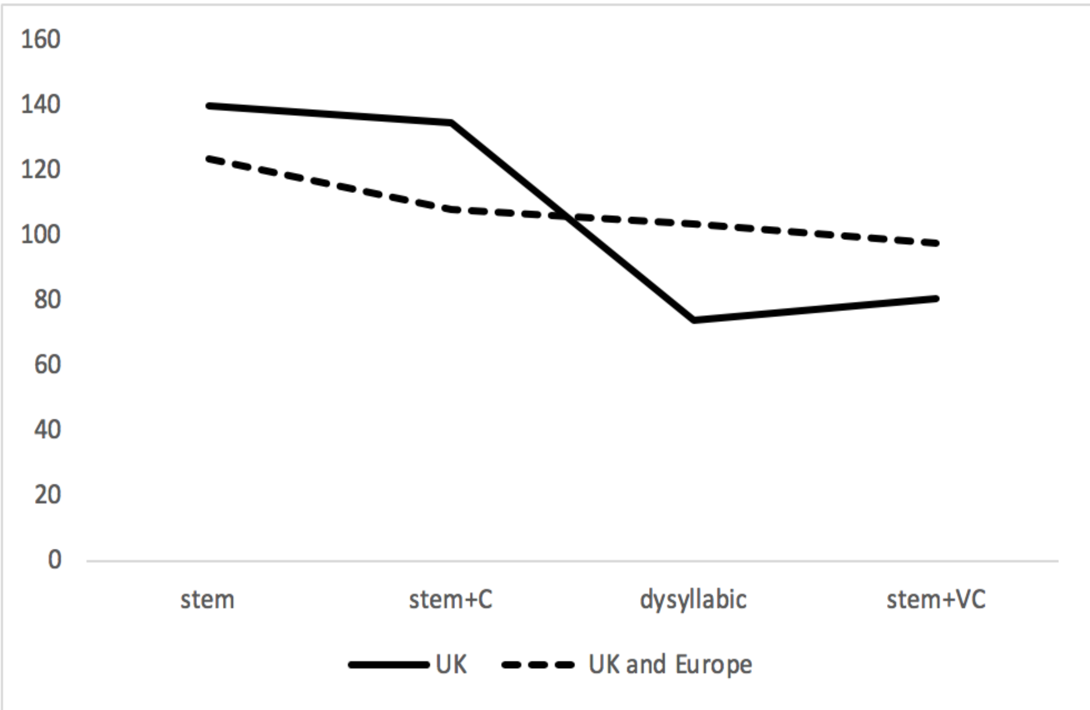


Figure 6.4: A comparison of vowel length according to residency in the UK and Europe.

6.2.4 Interim summary

When vowel length is analysed according to proficiency level and word type, the Beginner and Elementary proficiency groups show near parallel results. The Elementary group produce shorter vowels in all word type contexts, but comparative vowel length differences between word types are very similar for both groups; stem and stem+C tokens are produced with longer vowels than disyllabic and stem+V(C) tokens, which in turn show similar vowel lengths. These results appear to agree with the prediction set out in (119b), indicating that inflection is produced in a non target-like PWd internal representation. In contrast, the Intermediate proficiency group produce notably longer vowels in the context of bare stem tokens compared to stem+C tokens. It was also predicted that at some levels of proficiency, vowel lengthening may be applied selectively to L2 forms, potentially targeting those L2 forms which have a phonetically shorter vowel, such as tokens with a short stem vowel and unvoiced stem-final consonant.

The difference in vowel length patterns between the Beginner and Elementary groups with the Intermediate group was further analysed according to the type of vowel and voicing status of the following stem-final consonant with respect to conflated word types. The Beginner and Elementary groups show significant differences in vowel length in both stem-final voiced and unvoiced /ɪ/ word types and also stem-final voiced /ae/ tokens. In other words, it is only in the context of unvoiced stem-final /æ/ tokens that both the Elementary and Beginner groups produce a vowel which is not statistically significantly different in length. This is not unexpected considering the Elementary group produced a much shorter vowel length compared to both Beginner and Intermediate groups in the analysis of verb type and proficiency level. However, the difference in vowel length pattern seen in the production data from the Intermediate group appears to be in relation to vowel type rather than stem-final voicing status. In this respect, both stem-final voiced and unvoiced stems are produced with a statistically significantly longer vowel when in the context of an /æ/ vowel (in comparison to the Elementary production data). Rather than being a result of sensitivity to English post-lexical lengthening in an unvoiced environment, it would appear that the Intermediate group produce the /æ/ vowel with greater duration than those tokens with an /ɪ/ vowel, regardless as to whether the vowel is followed by a voiced or unvoiced stem-final consonant. The statistical significance related to vowel length between groups should not, however, obscure the overriding pattern which is that in all cases, vowels which are followed with a voiced stem-final consonant are always longer than their counterpart vowel in an unvoiced stem-final context.

Finally, it was asked whether the fact that some participants had lived in Europe (notably Spain or Italy) before coming to the UK influenced vowel length in different word types compared to those who had resided only in Bangladesh or Bangladesh and the UK. In this respect, it was found that there were statistically significant differences in vowel length between the two groups, but only in the context of disyllabic tokens. This was proposed to be accounted for with respect to the influence of an additional language other than those included in the analysis so far, particularly in relation to the minimal word (or the lack of minimal word requirement), stress placement and subsequent vowel duration patterns in Spanish or Italian.

6.3 A principal component analysis: Vowel length and word types

As the data are showing a number of different patterns but not a cohesive picture, a principal component analysis (PCA) was performed to test whether there are any discernible correlations in vowel length between stem or stem and affix configurations and between the L1 Bengali speakers and the NS Control. This approach can identify any underlying trends which are not immediately visible from the data analysis, and which are perhaps overlooked when the effect of variables are plotted in bar charts or line graphs. Four factors were taken (the elbow of the scree plot), which altogether explained 68% of the variation. A direct oblimin matrix was carried out, and regression scores were saved. Average scores were substituted for missing values, and whilst this is perhaps not standard procedure, this system was adopted in order to prevent reduction of an already relatively small data set. The pattern matrix was used as the basis for factor interpretation, and the test tokens were grouped as shown in Table 6.12 (for purposes of space, the column for disyllabic word type tokens is headed '$\sigma\sigma$'). There is no clear demarcation between the four stem configurations, but taking the highest proportion of stem type in each grouping, Component 1 (C1) is dominated by /æ/ stem words and /æ/ stem+C tokens, Component 2 (C2) is the most mixed group, but there is a predominance of /ɪ/ stem+C tokens and /æ/ stem+VC words. Component 3 (C3) is dominated by /ɪ/ words of disyllabic, stem+VC and bare stem, and Component 4 (C4) is dominated by /æ/ disyllabic and /æ/ stem+VC tokens.

	/æ/ stem	stem+C	σσ	stem+V(C)	/ɪ/ stem	stem+C	σσ	stem+V(C)
C 1	bag bat dab pack pat	pats packs			bid			
C 2		dabs bats	tapas packet	tapping dabbing batting	kick dig	kicks digs bids sits ticks	sitter	
C 3	tap		dabble		tick sit pick	picks	ticket picker bidder kicker	digging ticking bidding sitting
C 4		bags taps	pattern baggage batter	patting packing bagging			digger	picking kicking

Table 6.12: A principal component analysis: Vowel length by word type

Independent-samples Mann-Whitney U tests were run to compare the distribution of vowel length for each of the four components between NS Control and L1 Bengali speakers. There is a predicted statistically significant difference in the production of vowel length between the NS Control and L1 Bengali speakers with regard to Component 2 (p=.003). The NS Control are predicted to produce a longer vowel in the words grouped in Component 2 (13.50)[2] compared to the L1 Bengali speakers (6.30), a speculative lengthening predominantly on /æ/ stem+VC and /ɪ/ stem+C. As Component 2 is the

[2]This is a comparative measurement and not vowel length in milliseconds.

most mixed grouping, the pattern for this is still unclear. However, there is more vowel lengthening on the /æ/ words by the NS Control group than L1 Bengali speakers, and in the case of the /ɪ/ words, on the stem+C words.

Similarly, independent-samples Kruskal-Wallis tests reveal that there are also statistically significant differences predicted between the words grouped in Component 2 (p=.012) and Component 3 (p=.016) between proficiency levels. The Elementary proficiency level is predicted to produce shorter vowels (4.67) on disyllabic and and verb+VC /ɪ/ words (Component 3), whilst the Beginner group is predicted to produce much longer vowels (16.25) than the other proficiency levels (Intermediate = 11.00, NS Control = 7.38).

Finally, there is a predicted statistically significant difference (p=.042) in vowel length for the words grouped in Component 4 (disyllabic and stem+VC /æ/ words) between the UK and Europe group and the UK only group. For the participants who have lived in Italy, the predicted vowel length is numerically the longest at a value of 14.75, whilst for those who have lived in Spain, it is predicted to be 14.00. This is compared to 7.54 for the UK only group (remember that the UK only group refers to those who have lived in Bangladesh and/or the UK, but who have not lived elsewhere in Europe), and this collaborates with the findings set out in Section 6.2.3.6.

6.3.1 Interim summary

In sum, the data presented in the PCA show that there are some patterns within the dataset, but there are no clear trends. The analysis collaborates that L1 Bengali speakers who have resided in Italy and Spain produce longer vowels on the first vowel in disyllabic /æ/ words than Bengali speakers who have not resided in Europe.

6.4 Vowel lengthening versus vowel quality in L2 English productions

Finally, as illustrated in Chapter 2 there is a mismatch between Bengali and English in how moraic weight is distributed across the rhyme. Post-lexical vowel change in English is connected to the quality of the vowel, evident in minimal pairs such as that shown in (121) for the commonly cited 'ship' and 'sheep' distinction, particularly notable in classroom textbooks (e.g. Baker, 2006).

(121) /ɪ/ — /iː/
/ʃɪp/ — /ʃiːp/
'ship' — 'sheep'

If minimal word constraints are, as predicted, transferred from the L1 alongside L1 prosodic representation of inflectional morphology, and if repair strategies for subminimal words are similarly accessible, then vowel duration in English monosyllabic tense-lax minimal pairs, such as (121), should, at some levels of proficiency, show vowel lengthening on the lax counterpart by L1 Bengali speakers. Bengali has phonetic vowel length and phonological consonant length, but Bengali vowels do not change in terms of phonological vowel length.

The relevance of the English tense-lax distinction with respect to the predictions for Experiment 2 is largely cautionary. It is predicted that, at least at some levels of proficiency, L1 Bengali speakers will not encapsulate a tense-lax distinction in vowel production. Indeed, in order to rule out the possibility that L1 Bengali speakers do not lengthen vowels but instead articulate the English tense-lax distinction, a small subset of data was also analysed to check whether the participants tested here distinguish between vowels in the tense-lax dimension.

6.4.1 Tokens: Minimal pairs

The subset of target tokens are reproduced in Table 6.13.

Bimoraic monosyllable (tense vowel)	Monomoraic monosyllable (lax vowel)
sheep (n)	ship (n)
seat (n)	sit (v)
peek (v)	pick (v)
bead (n)	bid (v)

Table 6.13: Test tokens: Tense-lax distinction between /iː/ and /ɪ/ vowels.

As discussed in Chapter 4, although the responses were recorded with the intention of measuring the F1 and F2 formants, there were a number of extreme formant values, particularly in the data from L1 Bengali speakers based in Bangladesh. An AX discrimination task was created by splicing together utterances from the participants responses. In this task, three of the NS Control group were trained to listen to vowel sounds in minimal pair sets and then asked to listen to the test data. The task was to note whether the 'A' token was the same or different from the 'X' token. No distinction was noted between any of the minimal pairs, and this was confirmed with the rudimentary analysis of the formant values, which indicated virtually no variation between token pairs. This subset of tense-lax vowels illustrates that the L1 Bengali speakers tested here did not show variation between the vowels for the /ɪ/ and /iː/ pairs tested here. In this respect, it is assumed that any comparative vowel duration measurements reported in Experiment 2 reflect the treatment of vowel length in different contexts, and that the vowel duration measurement is not representative of the change in quality as embodied in the English tense-lax distinction.

6.5 Chapter summary

The data presented in this Chapter suggests that there are differences in vowel length between levels of proficiency and whether a participant has resided in Europe or not. When the verb types are conflated, vowels are longer before voiced stem-final consonants, which is target-like, but does not reflect patterns of transfer from the L1. The learners tested here do not show evidence of differentiating between tense or lax vowels, and any changes in vowel length are therefore taken to be durational rather than related to changes in vowel quality. However, other than a clear increase in vowel length in disyllabic forms by L1 Bengali speakers who have resided in Europe, the variation between levels with respect to verb and vowel type do not produce clear patterns on which to support or reject the proposed transfer of moraic structure repair or whether L2 affixation is produced in the required L1 prosodic representation.

Chapter 7

Findings

7.1 Introduction

This study set out to research the variable production of L2 inflectional morphology in adult L2 acquisition in the light of the PTH with L1 Bengali speakers, a language hitherto not tested against the predictions of the PTH. A preliminary to the empirical research of this thesis was a theoretical analysis of Bengali prosodic representation of inflectional morphology. This chapter endeavours to provide a summary of some of the factors relevant to the of testing L1 Bengali speakers in relation to the PTH, as well as an interpretation of the main findings from Experiment 1 and Experiment 2 with respect to the PTH, and in comparison to some of the findings from previous studies.

7.2 Summary of preliminary findings: Prosodic representation in Bengali

A preliminary finding relates to the analysis of the prosodic representation in Bengali, and in doing so, a secondary analysis of prosodic representation in the Sylheti dialect. A theoretical analysis of Bengali prosodic representation was first carried out, taking into account phonological processes of vowel height assimilation and vowel lengthening as well as the sociolinguistic features of diglossia and dialectal continuum. As a result of this, it was proposed that Bengali has both a PWd adjoined and a PWd internal prosodic representation, readily available to transfer to the interlanguage grammar. This distinguishes Bengali from languages such as Mandarin, which has but one of the required prosodic representations, a PWd internal representation of affixation (e.g. Goad et al., 2003), and also from languages such as Turkish, which, for English tense and agreement, must not only build the required representation from existing structures, but also license the representation to a new position in the interlanguage (e.g. Goad and White, 2004). In contrast, it was found that Bengali represents simple past tense (and person morphology) internal to the PWd, and present and past perfect tense adjoined to the PWD.

As a number of participants were also speakers of the Sylheti dialect, an analysis of the prosodic representation of Sylheti inflectional morphology was also undertaken on the grounds that any differences in prosodic representation between Bengali and Sylheti could be controlled for in the experimental design. However, although the Sylheti analysis was inconclusive, whether participants were also speakers of Sylheti was entered into the statistical model as a factor, and was, therefore, accounted for in the main analysis. The prosodic representation of inflectional morphology in the Sylheti dialect remains an area for future investigation.

7.3 Recapitulation of assumptions, research questions and predictions

7.3.1 The PTH

The PTH proposes that production of L2 inflectional morphology is partly dependent upon the availability of the required prosodic representation in the L1, or the ability to combine structures or re-license structures to a new function in the interlanguage. It provides a phonological explanation for the variable suppliance of L2 inflectional material by adult learners at advanced stages of proficiency. One of the features of the PTH is the development of a 'weak' and 'strong' version. Under a 'weak' version, the very existence of the PWd adjoined representation in the L1 would, once transferred to the interlanguage, secure its availability for the prosodification of L2 inflectional morphology. Under a 'strong' version of the PTH, the Bengali PWd internal representation for Irreg. PT can be considered a straightforward transfer, or 'T', but Bengali PWd adjoined representation would be in need of licensing to a new position for L2 Reg. PT, 3SG and Pl Noun agreement. A comparison of difficulty of the initial state of L1 transfer to the interlanguage grammar helps differentiate between the implications for the acquisition process, adapted from Goad and White (2006).

(i) T = straightforward transfer from the L1 to the interlanguage

(ii) T(a) = target representation achieved via transfer under the condition of 'when they can be built through combining L1 licensing relations'

(iii) T(b) = target representation achieved via transfer under the condition of 'when they involve L1 structures being licensed in new positions'

(iv) T (a,b) = target representation achieved via transfer under the condition of 'when they can be built through combining L1 licensing relations' and 'when they involve L1 structures being licensed in new positions'

7.3.2 The research questions

The overarching question which is addressed in Experiment 1 and Experiment 2 is whether L1 transfer of prosodic representation necessarily entails transfer of prosodic constituents, namely moraic structure below the level of the PWd, in relation to minimal word requirements. The first research question focuses on the extent to which the production of inflectional morphology by L1 Bengali speakers supports the predictions set out in relation to the PTH. The aim is to provide additional data from a relatively under-studied language to the production data already reported on in other studies. The second research question asks whether transfer of moraic structure below the level of the PWd influences whether some L2 forms are more readily inflected than others. The aim is to determine whether repair of the moraic structure according to L1 minimal requirements, perhaps by epenthesis, is addressed, and if so, if this influences whether inflectional morphology is supplied in some cases, but not in others. The analysis of moraic structure and possible repair strategies is also proposed to provide a way of determining prosodic boundaries, facilitating a way of measuring whether inflection is supplied in a target-like prosodic representation or absorbed into a non-target like representation.

7.3.3 The predictions

Predictions were made for higher and lower levels of proficiency, primarily to consider whether any developmental stages were visible in the acquisition and suppliance of L2 inflectional morphology. It was predicted that by Advanced proficiency level, any minimal adaptations required by the 'strong' version for the re-licensing of the PWd adjoined representation to a new position in the interlanguage would be complete, and that inflection would be supplied equivalently across the test categories of Reg. PT and Irreg. PT, 3SG and Pl Noun agreement. Similarly, it was also predicted that learners would perform equally well on a grammaticality test and spoken production data, and that this would be commensurate with the NS Control group. It was also predicted that there would be no difference in the suppliance of inflection according to the moraic structure below the level of the PWd and that learners would have adapted to L2 minimal word requirements. By higher levels of proficiency, it was predicted that regular verbs with both long and short vowels (LV and SV respectively) would be treated the same, as would irregular verbs, whether ablaut or pseudo-inflected. Assuming the 'strong' version of the PTH, it was also predicted that the Bengali PWd adjoined representation would potentially require re-licensing to a new position in the interlanguage, and it was also predicted that if this was the case, a developmental stage would be visible at lower levels of proficiency whereby Irreg. PT verbs would be supplied more consistently than Reg. PT verbs, due to the transparency of the one-to-one match in the PWd internal prosodic representation between English Irreg. PT and Bengali simple past representation.

7.4 Summary of main findings

7.4.1 Overview and between studies comparison

The summary of the main findings proceeds with discussion of the overview of the suppliance of inflectional morphology data and the grammaticality judgement test (GJT), and this is considered against the results shown for previous studies which have tested the PTH with other languages with learners at Intermediate and Advanced proficiency levels. Following this, a discussion of the main findings for the more detailed analysis of the production of simple past forms is considered with respect to prosodic transfer of L1 minimal word requirements and potential repair of subminimal forms. This is developed further in the following section, with a discussion of the main findings related to transfer of L1 moraic structure and vowel lengthening across minimal tetrads.

The production data were collected through a semi-spontaneous elicitation task with picture-based stimuli and a statistical analysis was run with a straightforward base model without accommodating other factors. This was to allow better comparison with previous studies. Following Goad and White (2006), the test tokens had been loosely matched for frequency values according to Leech et al. (2001). The GJT was presented as a true-false reading task. A comparison of GJT and overall production data showed that at the Intermediate proficiency level, there was a dissociation between a higher score showing knowledge of the correct and incorrect forms of inflectional morphology in a GJT compared with a lower score on spoken suppliance. This indicates that problems with suppliance are phonological rather than syntactic (but not necessarily phonotactic, as performance on the production of word-final consonant clusters was high across all levels of proficiency). Proficiency levels below Intermediate performed at chance on the

GJT and similarly showed lower levels of output in the spoken elicitation task. The Advanced learners, however, whilst not quite performing at the level of the NS Control (except in the production of Pl Noun agreement) consistently performed with high scores across both tasks and across all test categories.

The overview of the results can be considered against those from previous studies, as shown in Table 7.1. The table is organised as follows: In column (1), the details of the study including the L1 and proficiency level are noted. The intended purpose (where stated) of the GJT is set out in column (2); (x) indicates that the test intention is to measure the presence of syntactic representation of [± TENSE], (y) [AGR] or (z) metalinguistic knowledge. Column (3) and (4) report the percentage suppliance rates of inflectional morphology in spoken production; morphology which is represented in a target PWd internal structure is stated in column (3) and in a PWd adjoined structure in column (4), and also the potential state of affairs regarding initial transfer from the L1 are added according to the transferability hierarchy of T, T(a), T(b) or T(a,b). Individual studies are reported in the rows (i) to (vi). For example, the study in line (iv), Goad and White (2004), shows two results which correspond to data collection at Time 1 (e.g. 77%) and Time 2 (e.g. 57%) for Reg. PT. The data from the current study is input in lines (v) and (vi), allowing suppliance rates for L1 Bengali speakers at both Advanced and Intermediate proficiency levels, and the GJT scores for the L1 Bengali speakers are given as a combined mean average over the three GJTs to allow a more obvious comparison between studies. The question mark ($^?$) is added here to denote whether the proposed circumstances necessarily create condition T(b), or whether L1 availability of the required L2 PWd representation to transfer is sufficient (i.e. straight transfer 'T'), without need for any re-licensing in the interlanguage (i.e. the weak version of the PTH).

Attention is drawn to the similarities between the performance of the L1 Bengali speakers at Advanced proficiency level, with a less onerous task of accommodating the PWd adjoined representation in the interlanguage ('T' or 'T(b)'), with study (ii), L1 Mandarin speakers at Intermediate proficiency level (Goad and White, 2006), with a much more demanding process of building and licensing a PWd adjoined representation ('T(a,b').

(1) **Study** a) L1 b) Proficiency	(2) **GJT** (x) [± TENSE] (y) [AGR] (z) metalinguistic	(3) **pwd internal** (Irreg PT)	(4) **pwd adjoined** (Reg PT, 3SG, PL Noun)
(i) Goad et al. (2003) a) L1 Mandarin b) high int/low adv	100 (z)	78 T(b)	57 Reg PT, 28 3SG T(a, b)
(ii) Goad and White (2006) a) L1 Mandarin b) int	83 (x)	94 (ablaut) 93 (pseudo) T(b)	92 (long stem Reg PT) 87 (short stem Reg PT) T(a, b)
(iii) Cabrelli Amaro et al. (2018) Campos-Dintrans (2011)			
a) L1 Japanese b) high adv	86-100 (x, z)	n/a	83 Reg PT T
a) L1 Spanish b) high adv	86-100 (x, z)	n/a	77 Reg PT T(b)$^{?}$
a) L1 Mandarin b) high adv	86-100 (x, z)	n/a	71 Reg PT T(a, b)
(iv) Goad and White (2004) White (2003) a) L1 Turkish (SD) b) adv	100 (x, y)	n/a	77 or 57 Reg PT 77 or 83 3SG 87 or 90 Pl Noun T(a) or T(b)
(v) current study a) L1 Bengali b) adv	92 (x, y)	93 T	97 Reg PT, 96 3SG T(b)$^{?}$ 100 Pl Noun T or T(b)$^{?}$
(vi) current study a) L1 Bengali b) int	83 (x, y)	71 T	78 Reg PT, 57 3SG T(b)$^{?}$ 95 Pl Noun T or T(b)$^{?}$

Table 7.1: Comparison of spoken production and GJT across studies.

Goad et al. (2003, p.255) report in study (i) that the L1 Mandarin speakers performed at ceiling (equivalent to the study's NS Control group) on the GJT, leading the authors to propose that the speakers in that study represent tense and associated features in their interlanguage grammars, and, at the least, a metalinguistic knowledge that English marks tense and agreement with overt morphology. In contrast, the same L1 Mandarin speakers supply inflection in spoken production in obligatory contexts at a rate of only 28% on 3SG, 57% on Reg. PT and 78% on Irreg. PT, which the authors propose is evidence that the issues in producing spoken inflectional morphology are phonological in origin rather than syntactic.

The Advanced level L1 Bengali speakers tested in the current study do not perform at ceiling on the GJT (92% overall and 86%, 92% and 94% on the individual GJT for Reg. PT, GJT for Irreg. PT, and GJT for 3SG respectively), but the overall suppliance of inflection on spoken data (97% on Reg. PT, 93% on Irreg. PT and 96% on 3SG) far exceeds that reported for the L1 Mandarin speakers in the Goad et al. (2003) study. Notably, the Advanced L1 Bengali speakers do not perform statistically significantly differently between the suppliance of inflection rates on Reg. PT or Irreg. PT, and, as can be seen from the raw scores, there is very little difference suggesting (a) the possible availability of both prosodic representations and (b) the levelling of any frequency effect on Irreg. PT verbs with increased proficiency. Of interest then from the current study in relation to previous studies, therefore, is the marked absence of difference between the suppliance rates of inflection on Reg. PT compared to Irreg. PT verbs, as seen in study (i) (Goad et al., 2003). This is not in evidence in the production data of either the Intermediate or Advanced proficiency L1 Bengali learners tested here. This could well indicate the availability of the transferred required prosodic representation of PWd adjoined representation for Reg. PT from the L1 to the interlanguage grammar, possibly supporting the weak version of the PTH and the availability of prosodic representation facilitating suppliance of L2 inflectional morphology requiring both prosodic representations.[1]

[1]That the subjects in the Goad and White (2006) study should perform so differently from the participants in the Goad et al. (2003) study is attributed to possible task effect (Goad and White, 2006,

Study (iii) primarily reports on the PWd adjoined affixation of Reg. PT for L1 Japanese, Spanish and Mandarin speakers. The Advanced L1 Bengali speakers in the current study somewhat unexpectedly outperform the L1 Japanese group on spoken production (Japanese representation for tense is a straightforward 'T'). In many ways, the situation for L1 Bengali speakers can perhaps be compared to that for L1 Spanish speakers, as Spanish prosodifies tense, aspect and mood in a PWd internal structure, and the plural marker in a PWd adjoined representation (Campos-Dintrans, 2011; Cabrelli Amaro et al., 2018). However, adopting a 'strong' version, Cabrelli Amaro et al. (2018) claim that L1 Spanish learners must rearrange the L1 prosodic representation in order to meet the requirements of L2 English morphology, by licensing the PWd adjoined representation to a new position in the interlanguage (i.e. 'T'(b) involving the licensing of an L1 structure). This is unlike the task for L1 Japanese speakers, however, who prosodify L1 tense adjoined to the PWd, and are therefore the most well placed in terms of readiness for the suppliance of English regular simple past tense, person agreement and plural marking on nouns (Campos-Dintrans, 2011; Cabrelli Amaro et al., 2018).

Bearing in mind the conditions and adaptations for transfer of prosodic structure, it could arguably be predicted that the L1 Bengali speakers at Advanced proficiency level would supply inflection with some equivalency between the L1 Spanish and L1 Japanese speakers. Either way, if re-licensing of an available L1 structure is a prerequisite of availability in the interlanguage, then both L1 Spanish and L1 Bengali speakers are equally well placed to produce L2 inflectional morphology in a PWd adjoined representation. Perhaps as a result of task effect or other external factors, the Advanced L1 Bengali speakers tested here appear to supply inflection more consistently than either the L1 Japanese or Spanish speakers.

The particularly low performance on 3SG which is recorded in study (i) at 28% compared to 57% on Reg. PT and that for the Intermediate L1 Bengali speakers in study (vi) at 57% for 3SG compared to 78% for Reg. PT, is also a point of interest. Goad et al. (2003) state

p255).

that there should be no difference in the suppliance of tense and agreement morphemes as they are prosodified in the same way, but should this difference be significant, the authors propose that this difference may be attributed to performance issues related to the application of person agreement on the third person only. In the current study, there is no statistical significance between the suppliance of inflection on Reg. PT and 3SG (at any proficiency level), although there is a statistically significant difference in the suppliance of the -*s* morpheme on the Pl Noun category compared to 3SG for all levels from Beginner to Intermediate (but not Advanced). There is, therefore, no inherent problem supplying a sibilant morpheme word-finally. There is no explanation for this asymmetry between Pl Noun and 3SG compared to Reg. PT with respect to the assumptions of the PTH. This disparity, although it remains unexplained and unaccounted for in either the 'weak' or 'strong' version of the PTH, does not necessarily refute the assumptions of the PTH. It does, however, require a supplementary argument in order to account for the greater omission of inflection in one manifestation of a PWd adjoined representation, but not in another, when the inflectional morpheme shares the same segment. Of course, by Advanced proficiency level, there is no statistically significant difference in the production of 3SG compared to Pl Noun. The main issue, however, is that without looking back to the developmental stages from Beginner or Elementary to Intermediate proficiency levels, the issues in the production of 3SG, which cannot readily be accounted for by the PTH, are obscured.

7.4.2 The suppliance of inflection on simple past forms

It was proposed that English and Bengali have in common a bimoraic minimal word (Fitzpatrick-Cole, 1990; Gordon, 2013). However, the positioning of weight on coda consonants differ between the two languages; in English, word-final coda consonants are moraic whereas in Bengali word-final coda consonants are assumed to be non-moraic. This means that in Bengali, syllable weight is centred on the nucleus in the rhyme, whereas in English, syllable weight can be spread across the rhyme. According to L1

Bengali minimal word constraints, an English CVC verb with a LV (e.g. ‘smoke’) would be considered a heavy syllable, bimoraic and well-formed, whereas an English CVC verb with a SV (e.g. ‘crack’) would be considered a light syllable, monomoraic and subminimal. The prediction was that at lower levels of proficiency, the moraic structure and minimal word requirements of the L1 would interfere with the suppliance of inflection (English minimal word requirement is CVC compared to Bengali CVV). It was predicted that LV verb stems would satisfy the Bengali bimoraic minimal word requirement (CVV), and these tokens would be more likely to be produced in the uninflected form. The SV verb stems, however, were predicted to be seized upon as subminimal forms. It was predicted that these verbs would be repaired, possibly with an epenthetic vowel, and with attention drawn to the SV verb stems, inflection would be more likely to be affixed, particularly with the help of an extra vowel. At higher levels of proficiency, it was predicted that awareness of the moraic structure of the L2 would supersede the requirements of the L1, and the stem vowel would not influence suppliance of inflection, either on Reg. PT verbs, or the pseudo-inflected Irreg. PT verbs in comparison to the ablaut forms (where vowel shortening is in evidence, as in *‘keep - kept’*). The evidence for the acceptance of L2 moraic structure and minimality at higher levels of proficiency is therefore implicit in the treatment of the stems at lower levels of proficiency. With this in mind, further statistical analysis of the simple past data was conducted and factors, including a log frequency of the test tokens, were included in the model to account for some of the variables. The purpose was to examine if the type of stem vowel in the test token influenced whether inflection was more readily supplied. Reg. PT tokens were subcategorised further into LV and SV verb stems.

One of the main findings was the absence of epenthesis, and one explanation for this is that whilst epenthesis is a phonological process used to incorporate loan words into Bengali, mora repair in Bengali is achieved by creating an additional mora and the stem vowel spreading to fill it by a process of vowel lengthening. Whilst there is no evidence of epenthesis, the supposition that SV verb stems would be inflected more readily than LV verb stems no longer holds true, and indeed there was no evidence of this in the data set. Curiously, however, it was observed that although not statistically significant, it appeared that SV verb stems were always slightly more frequently inflected than LV verb stems. An additional analysis was therefore run to examine whether another factor - the voicing status of the stem-final consonant - was responsible for some verb stems to be inflected more consistently than others within a verb type category. Indeed, it was found that SV verbs with an unvoiced stem-final consonant were statistically significantly more likely to be inflected than the other verb stems. In relative terms, a SV verb stem which is monomoraic with an unvoiced-stem final consonant, is the most likely candidate for repair given that it constitutes the shortest vowel in relative circumstances compared to, for example, a SV verb with a voiced stem-final consonant, or a LV verb with an unvoiced stem-final consonant. Given the word minimality requirements of Bengali, it is possible that the shortest vowel configuration within the subset of LV and SV Reg. PT verbs attracted more attention, and although this verb type was not subject to epenthesis, it may well have been subject to L1 moraic repair, and subsequently inflected as a by-product of 'noticing'. The data was conflated across proficiency levels, but this finding provides an inkling of how, in the absence of epenthesis, the potential transfer of L1 moraic structure may be subject to L2 influences in vowel and consonant environments. In sum, this appears to be an area for further research, as well as running the same analysis on the data for 3SG verbs.

The analysis on the subcategorised simple past verbs, however, also unearthed a trend across all proficiency levels which was otherwise obscured in the overall suppliance analysis discussed at the beginning of this chapter. The disparity between the performance on the Irreg. PT compared to Reg. PT verbs was seen to be statistically significant between LV Reg. PT and SV Reg. PT verbs when compared to Irreg. PT verbs. Another main finding from this study, then, is the effect of the log frequency of test tokens on suppliance rates for Irreg. PT verbs. Whilst token frequency does not influence suppliance rates for Reg. PT verbs (SV, LV, -ed), the effect of frequency on Irreg. PT verbs is quite remarkable. Furthermore, this is in evidence across all levels of proficiency, including Advanced. In this respect, the higher suppliance rates for Reg. PT verbs and the lower suppliance rates for Irreg. PT verbs can, at least in part, be attributed to verb frequency. It should be noted that this was not evident in the base model for the overview of the suppliance rates, even though the tokens had been 'matched' as far as possible in shape and frequency scores.

With respect to Irreg. PT verbs, the moraic structure and L1 minimal word requirements are also predicted to influence suppliance of inflected forms. English pseudo-inflected forms require vowel shortening (e.g. 'keep' to 'kep -t') in order to avoid a four position rhyme (e.g. Goad et al., 2003; Goad and White, 2006). This conflicts with the weight distribution across the nucleus in Bengali minimal prosodic words, whereby no coda is moraic, and weight is distributed in the nucleus. Similar to the voicing status of stem-final consonants, and despite the fact that suppliance rates were generally much lower on Irreg. PT verbs than Reg. PT verbs, when the proficiency levels were conflated (to allow the model to run), it was found that of the Irreg. PT verb types, ablaut forms were also inflected statistically significantly more consistently than pseudo-inflected forms. The inflection of irregular verbs is potentially conditioned according to L1 moraic structure, in effect, an avoidance of vowel-shortening.[2]

7.4.3 Interim summary

It is opportune at this point to return to the first research question, which was set out at the end of Chapter 2 and is reproduced below in (122a) :

(122) a. Are the predictions of the PTH regarding the suppliance and omission of inflectional morphology and transferability of prosodic representation supported by the data from L1 Bengali speakers?

b. Is there evidence of transfer of L1 minimal word requirements and moraic structure to the interlanguage, alongside prosodic representation of inflec-

[2]Although vowel-shortening is also attested in ablaut forms (e.g. hide → hid), the internal vowel change does not also involve the affixation of the morpheme '-t', and not all ablaut Irreg. PT verbs invoke vowel-shortening (e.g. fly → flew).

tional morphology? If so, can this help define prosodic word boundaries and prosodic representation of L2 inflectional morphology?

Looking at the Advanced proficiency level, it would seem that the answer to this is 'partly'. Regardless as to whether the 'strong' or 'weak' version of the PTH is invoked, the prediction for higher proficiency levels is that spoken data will be produced with equivalence across the categories of Pl Noun, Reg. PT, Irreg. PT and 3SG. This is because it was proposed that any minimal adaptation required for the re-licensing of the PWd adjoined representation would be achieved by Advanced proficiency level (if required). As Bengali has both prosodic representations available to transfer (or more or less ready with reference to the potential re-licensing of the PWd adjoined representation), then Advanced L1 Bengali speakers are, theoretically, well placed to supply L2 English inflectional morphology.

An initial objection to answering 'yes' to (122a), then, is the statistically significant differences in the suppliance of Irreg. PT compared to SV Reg. PT and LV Reg. PT across all proficiency levels, including the Advanced group. This is only evident once the Reg. PT verbs are subdivided and tested alongside the Irreg. PT verbs, and when token frequency is included in the analysis. This finding is further compounded by the lack of statistical significance in the development of the suppliance of Irreg. PT between the Beginner and Elementary proficiency groups, whilst all other categories (Reg. PT, 3SG, Pl Noun) show a statistically significant difference in suppliance rates between proficiency groups. In other words, Irreg. PT lags behind Reg. PT and 3SG in the early stages of acquisition, and this it would seem, could also be attributed to the relationship between suppliance of Irreg. PT and exposure to Irreg. PT forms. Frequency is not accounted for in the PTH, as it is access to the required prosodic representation in the interlanguage which is decisive in the acquisition process. However, it is also stated that the failure to supply inflectional morphology can, 'at least in part' (Goad et al., 2003, p.244), be related to the properties of L1 prosodic phonology which are transferred to the interlanguage grammar. So, the answer, it seems, is still 'partly', because although the prosodic representation is arguably available and presumably transferred to the interlanguage, this alone is seemingly not sufficient to ensure suppliance of L2 Irreg. PT inflectional morphology, even at an Advanced level of proficiency.

This, of course, raises the question as to why this pattern is not also evident in other studies, such as that by Goad et al. (2003), although it should be noted that there are only a few studies which appear to incorporate either Reg. PT and Irreg. PT or 3SG, as can be seen from the small snapshot of studies collated in Table 7.1. In fact, Cabrelli Amaro et al. (2018, p.256) note that the inclusion of Irreg. PT verbs brings about additional issues, particularly with the effect of frequency and classroom-style rote learning of the irregular forms. A finding of this study was the clear effect of frequency on the suppliance of Irreg. PT verbs which was not in evidence in any permutation of the Reg. PT verbs, nor , it should be said when the data was analysed as 'matched' with comparable tokens across Irreg. PT and Reg. PT verb types. There are a few considerations which are posited here. Firstly, it may well be a simple case of token selection. Perhaps the tokens in the current study weigh more heavily on less frequently occuring items in the corpus than those in other studies. Secondly, in the study by Goad et al. (2003), it is proposed that the availability of the PWd internal, but not PWd adjoined representation, makes production of Irreg. PT verbs fairly straightforward for the L1 Mandarin speakers in that study. However, if L1 Bengali speakers have (more or less) access to both required representations for English tense and agreement, it would seem less than economical to omit suppliance of inflection on the required representation which also supplies simple past morphology in the L1. A final possibility suggested here is that it could, after all, be due to phonotactics, despite the suggestion earlier that word-final consonant clusters in monomorphemic forms were produced to a high degree across all proficiency levels (from 71% at Beginner level increasing to 94% at Advanced proficiency level). The higher production of ablaut compared to pseudo-inflected Irreg. PT forms was taken above to demonstrate an aversion to vowel shortening, when perhaps it is an avoidance of word-final consonant clusters and a preference for the singleton word-final consonants associated with the ablaut forms. If this is the case, then this might by inference suggest that

Reg. PT forms are produced in a target-like PWd adjoined representation, as absorbing inflection PWd internally would create a word-final cluster, and would seemingly also be produced in the uninflected form more consistently. The lower suppliance of Irreg. PT in this study compared to Reg. PT is not predicted under the assumptions of the PTH at any level of proficiency tested here. Further testing of the suppliance of inflection on Irreg. PT with reference to the effects of frequency is evidently required, not only with L1 Bengali speakers.

Returning to the question posed in (122a), it would appear that, on the other hand, the data for 3SG does in fact support the predictions of the PTH for L1 Bengali speakers, despite the slower development of the suppliance of 3SG compared to Reg. PT. By the time a learner is at Advanced proficiency level, there is no statistically significant difference in the suppliance of 3SG compared to the other morphemes which also require the PWd adjoined representation. The Pl Noun data was removed from this analysis for the Advanced group (because they scored a perfect 100%), and Pl Noun inflectional morphology was statistically significant in its suppliance rate compared to the other inflectional morphemes in the overall suppliance data across the remaining proficiency levels. There is, then, some evidence of developmental patterns for learners, whereby despite accessibility to the required prosodic representation, some morphemes, such as 3SG are more prone to potential performance related issues and perhaps external factors than others. Maybe in the case of 3SG and tense, this is visible cross-linguistically as it is reported both in the case of L1 Mandarin speakers (Goad et al., 2003) and in the current study with L1 Bengali speakers. Perhaps in other cases, it is language specific, allowing for some variability between studies as exemplified in Table 7.1. For L1 Bengali speakers, the Pl Noun morpheme appears not to pose a problem even at lower levels of proficiency compared to tense or agreement, but this is not necessaruly so for learners from other language backgrounds. However, whilst the suppliance rates for 3SG at Advanced proficiency level superficially appear to support the predictions of the PTH, taking a view from the high levels of proficiency only arguably belies the asymmetry in production, (unaccountable by the PTH alone) evident at lower levels of proficiency.

To summarise, with respect to (122a), the predictions regarding the suppliance and omission of inflectional morphology at the Advanced level of proficiency are partly supported by the data from L1 Bengali speakers. The statistically significant differences in suppliance rates shown between Irreg. PT, SV Reg. PT and LV Reg. PT is not predicted by the PTH, and whilst it can be explained due to the effect of frequency on Irreg. PT verbs, this is not accommodated for in the assumptions of the PTH. Furthermore, by Advanced proficiency level, inflectional morphology that requires a PWd adjoined representation is equally supplied across word types. However, the developmental stages show a very different picture, particularly for 3SG and Pl Noun inflection, which to some degree undermines the apparent outcome. A further point which has not been addressed so far is whether suppliance of inflection equates target prosodic representation, and this is addressed in the following section.

7.4.4 Transfer of L1 moraic structure and minimality

There is a possibility that the difference in suppliance rates between L1s, and at lower levels of proficiency, is not specifically due to the availability of the required prosodic representation, but to the reorganisation of the moraic structure when there is a mismatch between the L1 and the L2. This was considered in terms of the minimal word requirements, where the English minimal word shape is CVC compared to Bengali CVV. In other words, whilst L1 transfer of prosodic representation of affixation may facilitate or impede production of L2 functional morphology, so too might the ability to adapt to the moraic structure of the L2. Although there was no evidence of epenthesis in the data set (it was predicted that this was one way to add a mora and repair the structure to satisfy L1 Bengali minimality requirements), it was found that Reg. PT verbs with a SV stem and unvoiced stem-final consonant were inflected more than other verb types. This was an interesting observation because it had been predicted that epenthesis would go hand in hand with an increase in suppliance of inflection on the SV verb stems, by noticing a structure as subminimal and prompting repair.

This can be explained as follows. If repair of a subminimal L2 moraic structure is not by epenthesis, but by the addition of a mora and vowel lengthening occurs automatically to fill the mora in an L1-like fashion (Fitzpatrick-Cole, 1990, 1996), then the argument is that attention is automatically drawn to the form. If attention is drawn to the form, then much the same argument holds as in the case of epenthesis, inflection is arguably more likely to be supplied when 'noticing' is triggered. In contrast, a well-formed verb stem has no reason to attract attention and therefore would be more likely to be supplied without inflection in the bare form. Assuming that L1 Bengali speakers have sensitivity to phonetic vowel length, then it would appear that SV Reg. PT verbs with unvoiced stem-final consonants are the most likely candidates to be noticed, and all other forms (e.g. LV Reg. PT verbs with both voiced and unvoiced stem-final consonants and SV Reg. PT verb stems with voiced stem-final consonants), will be deemed to have relatively phonetically longer vowels and satisify L1 minimal word requirements. Epenthesis was predicted to phonologically repair the subminimal verb forms (as perceived by L1 Bengali speakers), but in many respects, the easiest way for L1 Bengali speakers to repair a subminimal form is in accordance with the L1 addition of moraic structure. In terms of the overarching question which bounds Experiment 1 and 2, the evidence from higher suppliance rates for certain SV verb stems suggests that learners may well show influence from the requirements of minimality in the L1. However, it should be noted that proficiency levels were conflated in this analysis, and stages of development would provide more insight into whether the L1 moraic structure can be seen to influence inflectional patterns.

In order to test whether moraic structure below the level of the word is transferred alongside prosodic representation of inflectional morphology, Experiment 2 compared vowel length between minimal tetrads of a bare stem with alternate forms of stem+C, disyllabic form or stem+V(C). It was proposed that vowel lengthening to repair moraic structure could (a) indicate where a prosodic boundary was drawn and (b) inform whether inflection is supplied adjoined to the PWd or internal to the PWd, and (c) inform whether prosodic transfer of moraic structure is a relevant factor in the suppliance of L2 inflectional morphology.

At Beginner and Elementary proficiency levels, there is virtually no difference in estimated vowel length between verb stems (for stems with both /æ/ and /ɪ/ vowels combined) for vowels in bare stem and stem+C affix. This is as would be expected according to L1 minimal word constraints, as the vowel in both the bare stem and stem+C affix is lengthened to fill the extra mora which is required to create a bimoraic foot. Similarly, when the same vowels are considered in the disyllabic form and verb+V(C), the difference in the estimated vowel length is also virtually non-exsistant, but shorter than that in the bare stem and stem+C tokens. Again, this is as would be expected according to L1 minimal word constraints, as the initial stem vowel is not in need of repair with a second mora already present. In the case of the stem+V(C) affixation, this assumes that the second mora ('-ing') is incorporated into the prosodic word, otherwise vowel lengthening would be expected to repair the stem before affixation can occur. In this respect, at Beginner and Elementary level, the bare stem and stem+C share the same estimated vowel length and the disyllabic form and stem+V(C) share the same vowel length, suggesting that affixation is supplied in a PWd internal representation.

There were some differences between vowel length. It was found that learners who had resided for an average of ten years in Italy or Spain as well as in Bangladesh and the UK produced the first vowel in disyllabic words statistically significantly longer compared to those learners who had resided in Bangladesh and the UK (or only Bangladesh). This was considered feasible in terms of the usual stress placement on Italian verbs on the penultimate syllable, and as stress is associated with an accompanying longer vowel duration, the effects of the L2 (or L_n) was proposed to be in evidence in this data set, as neither Bengali or English have a tendency to lengthen vowels in polysyllabic forms. There was some difference in the observed patterns of vowel duration between the tetrads according to proficiency level. L1 Bengali speakers at Beginner and Elementary levels closely resembled the pattern of vowel duration as shown by the NS Control group (i.e. they lengthened and shortened vowels in parallel) but whether this was due to L1 transfer or not is not so clear as the Intermediate participants (n=3), showed a different pattern to both the NS Control and other L1 Bengali speakers, which was neither L1-like nor L2-like. This could signify a development stage in the reorganisation of moraic structure, but there is insufficient data to draw any conclusions on what this might mean regarding the proposed transfer of L1 moraic structure and minimality requirements.

With reference to the second research question, (122b), it would appear that there is some evidence that the L1 or at least prior linguistic experience, as in the case of those participants who had previously resided in Europe, exerts some influence over L2 productions with respect to vowel length. However, whether this can be taken to be representative of L1 moraic structure operating when there appears to be a mismatch between L1 and L2 minimality is not evidenced in this data set.

However, only tentative claims can be made about any findings here because the data show a number of different, and not necessarily cohesive, patterns. Indeed, the patterns were so varied that a principal component analysis was conducted in order to try to draw out some of the main correlations between vowel length and verb stem type. Taken together as a whole, it would seem that between Experiment 1 and Experiment 2, there is some evidence that prosodic constituents below the level of the prosodic word may exert some influence (e.g. SV verb stems in unvoiced stem-final condition), and there is some suggestion that prosodic boundaries can be determined by the instantiation or absence of vowel lengthening (e.g. Beginner and Elementary vowel length across bare stem and stem+C compared to the disyllabic form and stem+V(C) form). In sum, whilst the findings reported here are speculative, it would appear that (a) for a language such as Bengali, comparative vowel length measures is a valid analysis in order to ascertain whether L1 prosodic constituents below the PWd are are transferred alongside prosodic representation of inflectional morphology and to determine PWd boundaries relative to prosodic representation, and (b) more extensive analysis with a greater data set than the one collated here may well produce a more readable output regarding the contexts in which stem vowels show, or do not show, lengthening.

7.5 Chapter summary

This chapter has attempted to provide an overview of the main findings from the experimental studies carried out in Experiment 1 and Experiment 2. The analysis was based upon the terms of the PTH, and also upon the findings of the initial theoretical analysis, which was carried out to determine the prosodic representation of L1 Bengali inflectional morphology in relation to English. This chapter has also outlined the findings of some key studies on the production of L2 inflectional morphology by L2 learners, providing opportunity to consider where the results from the current study fit with respect to previous research. The data was examined from two angles, whether there was evidence of L1 transfer of prosodic representation in the production of L2 inflectional morphology, and whether there was evidence that transfer of L1 moraic structure also influences the suppliance of inflectional morphology.

The data for L1 Bengali speakers at Advanced level could be interpreted as showing evidence that transfer of L1 prosodic representation is facilitative in the suppliance of L2 inflectional morphology, although there are some discrepancies. This is particularly so with regards the data of comparable languages in other studies, and the developmental stages in lower proficiency levels, especially considering the bias towards Pl Noun inflection and away from 3SG and the statistically significant difference in production between Irreg. PT, LV Reg. PT and SV Reg. PT. Whilst some predictions, such as the insertion of an epenthetic vowel or a proliferation of inflection upon SV Reg. PT verbs were not found to be in evidence in the data presented here, there was some evidence to suggest that SV verb stems were targeted (but only the phonetically shortest) and it was speculated that this could be as a result of the transfer of L1 moraic structure and minimality requirements. Rather than invoking phonological processes, such as epenthesis, it is possible that L1 minimality requirements may be in operation, introducing an extra mora to subminimal forms and prompting vowel lengthening to fill the mora. It is, however, still unclear as to whether L1 moraic structure and L1 minimality are transferred hand in hand with the prosodic representation of inflectional morphology, and further research is required.

Chapter 8

Conclusions

The initial motivation for the current study was the proposal for missing inflection in spoken production as reported in (White, 2003) and the Prosodic Transfer Hypothesis (PTH) as proposed in (Goad et al., 2003; Goad and White, 2004, 2006). According to the PTH, the inconsistency in the suppliance of inflection in spoken production can, to some extent, be explained relative to whether the required L2 prosodic structure is available in the L1 to transfer to the interlanguage. The PTH encompasses the apparent dissociation between syntactic knowledge and L2 phonological outputs; omission of inflection in spoken production outweighs that in written production.

It is proposed, for example, that the difficulties L1 Mandarin speakers encounter with the spoken production of English inflectional affixes can be traced to the absence of the required PWd adjoined prosodic structure in the L1 (White, 2003, p.140). The phonological situation for the production of tense and agreement by L1 speakers of Mandarin, therefore, involves minimal adaptation of existing L1 structures to create a PWd adjoined representation. Similarly, the omission of determiners by the end-state L1 Turkish speaker SD, is argued to be due to the L1 constraints on prosodic structure; prohibition of functional material on the left-edge of a prosodic word (Goad and White, 2004). For L1 speakers of Turkish, not only must a PWd adjoined representation be built from existing structures (Goad and White, 2006), but also a required L2 English representation which allows free clitics on the left edge of a PWd in the production of English determiners. In a strong version of the PTH, it is deemed impossible to build the required representation from existing structures in Turkish (Goad and White, 2004); a weak version (Goad and White, 2009) allows that new structures may be built, which may not necessarily be adapted or built from existing components in the L1.

The current study set out to test whether the PTH could account for the suppliance of inflectional morphology by L1 Bengali speakers. L1 Bengali speakers have not been tested with respect to the production of L2 inflectional morphology and analysed under the terms of the PTH. As a relatively underresearched language, particularly in relation to DCB, the Bengali dialect spoken in and around Dhaka, Bangladesh, another aim was to further contribute with an analysis of Bengali inflectional morphology. This was particularly in relation to Bengali prosodic representation of inflectional morphology in contrast to English inflection and affixation. Whilst it was found that Bengali inflection is arguably represented in both a PWd internal and PWd adjoined representation, facilitating the opportunity to more consistently supply L2 inflection (according to the PTH), it was also found that Bengali differed from English in moraic structure and word minimality requirements.

From these findings it was hypothesised that whilst the transfer of available structure in L1 prosodic representation may well influence the suppliance of L2 inflection, so too might the requirements and moraic structure below the level of the PWd, especially when there is a mismatch between the L1 and the L2. In relation to the PTH, it was considered that perhaps attention to moraic structure below the prosodic word could contribute to understanding of the apparent transferability of prosodic representation. Focus was placed on how L2 inflection could be attached to a prosodic word if an L2 prosodic word could initially be deemed subminimal in terms of moraic structure transferred from the L1. Similarly, whether delays in the suppliance of inflectional morphology which, for example, require a PWd adjoined representation, could be better explained when also taking into account any mismatches in L1 and L2 moraic structure (and application of L1 repair strategies), and how this might help explain unexpected cross-linguistic differences.

The experimental tasks for this study included a semi-spontaneous elicitation task and an elicited imitation task. Participants were recorded and the data analysed according to whether inflection was supplied or not (Experiment 1) and whether vowels were lengthened or not (Experiment 2). The data from the Advanced learners, does, to some extent, support the predictions of the PTH, but the developmental stages and cross-comparison to the results from other studies for L1s, such as Spanish, both require further explanation. Whilst the high suppliance rates could be due to the availability of L1 transfer of prosodic representation, the end-state does not necessarily relate the whole story. It was not possible to draw convincing conclusions regarding the predicted vowel lengthening at prosodic boundaries, so there is still no real indication as to whether inflection was actually supplied in a target-like fashion. Looking across the data for both experiments, learners appear to have some interaction with SV verbs in certain phonological environments, and further research may tell whether this is due to the application of L1 repair of moraic structure. As a new way of looking at transfer, at the level of moraic structure and minimality requirements, there is further opportunity to test the effects of the L1 on the suppliance of inflectional morphology still within the bounds of the PTH.

The participants recruited for this study were L1 Bengali speakers, a number of whom also spoke Sylheti, a dialect considered to be at the extreme of a dialectal continuum. A brief analysis of the Sylheti prosodic representation was carried out, and provision for the effect of the dialect on the suppliance of L2 inflection was taken into account during the statistical analysis. It was found that there was no effect on suppliance rates regarding whether participants were also speakers of another dialect. However, for those participants who had also resided in Europe, there did seem to be an effect on vowel length in disyallbic words. One of the implications of this, therefore, is that learner variation should be incorporated into a statistical analysis. This is relevant even if the factor does not have a significant effect in itself, as it may take away some of the variance in interactions which may otherwise confound results.

8.1 Limitations of the current study

There are a number of limitations related to this research which should be discussed as conclusions are drawn in this study. A number of these limitations revolve around participant recruitment; sample size, recording quality and subsequent experimental design.

The participants in this study were recruited within a community setting. This was partly because any ESOL language classroom setting in the UK will necessarily encompass multilingual groups. If a larger sample size, but a non-homogenous L1 group is appropriate for a study, then the first port of call would naturally be language schools, university language courses and social-media generated recruitment. However, in the case of seeking out a homogenous UK-based group of L1 Bengali speakers, it was necessary to look within the community. Community-based research is subject to the goodwill, availability and willingness of participants and local providers to interrupt and rearrange their own daily affairs and planning. In this respect, any researcher involved in community-based research naturally attempts, in return, to conduct the study with as little disruption as possible. Whilst this study started off with a reasonably large population size, given the circumstances and population of recruitment, the final sample size was very small across proficiency levels. One approach to minimise the attrition and exclusion of potential participants who do not complete all components of the test, is to limit the length of task(s) and reduce the number of required meetings. However, placement testing, student questionnaires and consent forms can easily take up to one session alone, particularly with lower level learners, and particularly when literacy in the L2 is not a regular feature in language use.

Related to literacy and lower level learners is the difficulties in recruiting L1 Bengali speakers based in the UK who had not been educated in English. The majority of learners recruited through the community setting were at lower proficiency levels, and were mostly speakers of L1 Bengali and Sylheti with L2 English. As English and Sylheti, but not Bengali, are reported to be usually spoken in the home, there is a sub-community of L1 English and Sylheti speakers who do not speak Bengali, and are fluent in spoken and written English and fluent in spoken Sylheti. This was the motivation for recruiting higher proficiency L2 speakers who were based in Bangladesh, but this brought other limitations related to arranging virtual meetings and making recordings over the internet, using software such as Skype.[1] This was also subject to the availability and quality of the internet connection, weather related interference and, similarly, attrition and exclusion also resulted due to issues of recording reliability, sound quality, and in some cases (gentle, but understandable) exasperation when connections were repeatedly failed to be secured.

The experimental design also had its limitations, and this is perhaps inevitable when recruiting participants across a range of proficiency levels. In order to make the tasks and stimuli accessible to lower level learners, and being mindful of reducing a literacy-based approach, the task materials were necessarily pictorial or audio elicitation imitation tasks. For higher levels, this involved creating extension questions to reduce the risk of learners becoming aware of the purpose of the task, and this in itself extended the task time (although in all cases the learners were kindly very willing to engage in extended discourse). The quality of recordings of both UK-based and Bangladesh-based participants is a limitation of this study, but it must be pointed out that the UK-based participants would not otherwise have participated in the study, had attempts been made to take it out of a community-based setting. As a generally underresearched language group, experimental task design should take some priority in order to secure and preserve good quality data that can be accessible to other researchers.

8.2 Suggestions and implications for future research

Although reference has already been made to some of the possible areas for further research, some other suggestions concern proficiency groups. Whilst it was theoretically ideal to chart the development stages of learners from Beginner through to Elementary proficiency levels, with consideration to the limitations discussed regarding the current

[1] *About Skype* http://www.skype.com/en/about/

study, future research could focus more on the productions of a larger sample size of Elementary, Intermediate and Advanced proficiency learners. This would help reduce some of the other issues to some extent regarding not only recruitment across proficiency levels, but also task design and test stimuli. Although a Bangladesh-based research study might be more appropriate, it is still possible, however, that some of the issues regarding recording quality could equally well apply in situ in Bangladesh. However, if the purpose of the task is to test suppliance of inflectional morphology in line with the predictions of the PTH, then an auditory judgement is largely sufficient with observation of a spectrogram for confirmatory evidence.

The area which is most ripe for further research, however, is the exploration into the role of transfer of L1 moraic structure, and how this might interact with (a) the suppliance of L2 inflectional morphology and (b) with the predictions of the PTH. Whilst the relevance of this to L1 Bengali speakers of L2 English is hopefully clearly explicated in this thesis, there is opportunity to develop this more with the inclusion of other languages to extend this line of research further. An initial study could also look at the moraic structure and minimality requirements (if any) of some of the languages already tested in line with the predictions of the PTH (particularly Japanese, Spanish, Turkish and Mandarin) and examine whether there might be an interaction between the suppliance rates of L2 inflectional morphology and the L1 structure below the level of the prosodic word.

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Appendix A

Grammaticality judgement test

1	Regular past tense: Acceptable items (n=12)
1	They smoked two cigarettes after dinner last night.
2	I missed the train to work this morning.
3	The plane from Paris landed half an hour ago.
4	I cleaned the kitchen yesterday morning.
5	The children pointed at the animals in the zoo yesterday.
6	The workmen drilled a big hole in my garden last week.
7	Last year we sailed to France and then Spain.
8	The tow truck pulled the car out of the ditch earlier today.
9	The babies cried for twenty minutes this morning.
10	The children played football and basketball yesterday.
11	We picked three kilos of strawberries yesterday.
12	The examiner marked one hundred test papers last week.

2	Regular past tense: Unacceptable items (n=10)
1	We went to the theatre last night but the play ends twenty minutes early.
2	I drop my favourite cup this morning.
3	We pick some mushrooms last weekend.
4	Two cats chase a mouse last night.
5	I fill a bucket with cold water this morning.
6	The waiters wipe all the tables last night.
7	Last night, I stay at home with some chocolates and a film.
8	They frame some holiday pictures last night.
9	I phone you three times last night, but you didn't answer.
10	The twins want a puppy for their last birthday.

3	Regular past tense: Distractors (n=3)
1	The little girl showed the dentist her three new tooths.
2	Bella missed three trains yesterday.
3	We watched the geese in the park this morning.

4	Irregular past tense: Acceptable items (n=12)
1	My parents went to London on Saturday.
2	I lent my friend £20 last week.
3	Last year the children fed the chickens in the morning.
4	This morning, a white cat leapt over our wall.
5	They built a new hospital in 2015.
6	I wrote a long letter to my sister this morning.
7	We left the restaurant at ten o'clock last night.
8	I sent my mother some flowers for her birthday.
9	It took us two hours to drive to the seaside.
10	When they were younger, the twins had a pet dog.
11	Last Christmas, we gave everyone a pair of socks.
12	The children made chocolate cookies yesterday.

5	Irregular past tense: Unacceptable items (n=3)
1	I send two hundred emails last week.
2	The dog and the kitten hide under the sofa last night.
3	We go to the cinema after dinner last night.
4	I buy an expensive watch in the sales last week.
5	I bend my credit card this morning.
6	They keep a snake in the house for five years.
7	Yesterday, we find a £5 note and a £1 coin at the train station.
8	They give me a lamp for my new house last week.
9	I feel sick last night after dinner.
10	They get top marks in the test last week.

6	Irregular past tense: Distractors (n=3)
1	Yesterday, the old man lost two pairs of glasses.
2	The farmer sold five cow at the auction last month.
3	We gave Sam box of chocolates yesterday.

7	Third person singular agreement: Acceptable items (n=12)
1	My friend plays tennis every week.
2	The boy crosses the road every morning.
3	The little boy always races his sister to school.
4	My neighbour chops wood every morning.
5	The tractor pulls a trailer on the farm.
6	Their daughter works for a bank in the city.
7	My friend cracks eggs with one hand.
8	My boss always pins her hair back for work.
9	The referee often yells at the footballers.
10	The jeweller always presses a button to open the shop door.
11	The student picks fruit every summer for five weeks.
12	This window always slams shut.

8	Third person singular agreement: Unacceptable items (n=10)
1	He usually cook rice for breakfast.
2	The student go for a ten kilometre run every morning at 6 o'clock.
3	The little boy always kiss his mother goodnight.
4	My friend usually cry at sad films.
5	The school ban mobile phones on Mondays and Thursdays .
6	She often drop her books on the way to school .
7	My neighbour love playing guitar on Sunday afternoons.
8	My sister always look great in anything red.
9	He usually keep eggs in the refrigerator.
10	My best friend always miss my birthday.

9	Third person singular agreement: Distractors (n=3)
1	My uncle lives in a very big bungalow.
2	My friend washes her hairs every other day.
3	My son always sits the back of the car.

10	Distractors: Acceptable items (n=18)
1	The are some strawberries in the fridge.
2	My best friend can swim ten kilometres.
3	Your car keys are in the drawer.
4	We are leaving by train this afternoon.
5	The black cat is asleep on the chair.
6	There is a sofa in our living room.
7	Our teacher comes from Australia.
8	I am driving to work now.
9	We both like singing and dancing.
10	I was wearing a blue and green shirt yesterday.
11	Look! That cat is chasing a big dog.
12	The baby is crying. Maybe she's hungry.
13	We are having eggs for breakfast today.
14	The children love chocolate cake.
15	My brother is taller than my friend.
16	There are three pens and a box of pencils on the desk.
17	I've got a red car.
18	They're playing football now.

11	Distractors: Unacceptable items (n=16)
1	The farmer sold five cow at the market last month.
2	Here is some eggs for the omelette.
3	There aren't some cookies left on the plate.
4	In my living room, there is a lamp next the fireplace.
5	This is my friend Alfio, his from Italy.
6	My niece showed me her new tooths.
7	My friend washes her hairs every day.
8	My husband no working this week.
9	I think English is easy to learn than Polish
10	This black cat is more big than the brown cat.
11	She is wearing blue dress and a green hat.
12	My son always sits the back of the car.
13	Yesterday, we gave Sam box of chocolates.
14	The old man has got three pair of glassess.
15	I don't have many money today.
16	It raining again.

Appendix B

Semi-spontaneous elicitation task stimuli

Token	Category	Sub-category	Lemma frequency
apples	plural noun	vowel	35
bins	plural noun	voiced	11
books	plural noun	unvoiced	374
boxes	plural noun	unvoiced	114
boys	plural noun	vowel	213
cats	plural noun	unvoiced	155
clocks	plural noun	unvoiced	33
days	plural noun	vowel	940
dogs	plural noun	voiced	124
flies	plural noun	vowel	16
foxes	plural noun	unvoiced	13
glasses	plural noun	unvoiced	0
grapes	plural noun	unvoiced	0
pills	plural noun	voiced	12
toys	plural noun	vowel	21
watches	plural noun	unvoiced	0

Table B.1: Plural noun agreement n=16

Token	Category	Sub-category	CC	Lemma frequency
bent	Irregular	pseudo	-nt	35
built	Irregular	pseudo	-lt	230
dealt	Irregular	pseudo	-lt	168
fed	Irregular	pseudo	-	67
felt	Irregular	pseudo	-lt	624
kept	Irregular	pseudo	-pt	505
left	Irregular	pseudo	-ft	647
leapt	Irregular	pseudo	-pt	21
lent	Irregular	pseudo	-nt	29
sent	Irregular	pseudo	-nt	250

Table B.2: Irregular past tense: Pseudo-inflected n=10

Token	Category	Sub-category	CC	Lemma frequency
drove	Irregular	ablaut	-	156
fell	Irregular	ablaut	-	273
found	Irregular	ablaut	-	990
hid	Irregular	ablaut	-	64
ran	Irregular	ablaut	-	406
sat	Irregular	ablaut	-	301
won	Irregular	ablaut	-	241
wrote	Irregular	ablaut	-	400

Table B.3: Irregular past tense: Ablaut n=8

Token	Category	Sub-category	Lemma frequency
drives	LV 3SG	voiced	156
feels	LV 3SG	voiced	624
finds	LV 3SG	voiced	990
keeps	LV 3SG	unvoiced	505
leaves	LV 3SG	voiced	647
needs	LV 3SG	voiced	627
shows	LV 3SG	voiced (vowel)	598
types	LV 3SG	unvoiced	11
works	LV 3SG	unvoiced	646
writes	LV 3SG	unvoiced	400

Table B.4: Third person singular agreement: Long vowel (LV) 3SG n=10

Token	Category	Sub-category	Lemma frequency
asks	SV 3SG	unvoiced	610
chops	SV 3SG	unvoiced	10
cracks	SV 3SG	unvoiced	16
drills	SV 3SG	voiced	11
drops	SV 3SG	unvoiced	107
gives	SV 3SG	voiced	1284
lives	SV 3SG	voiced	329
looks	SV 3SG	unvoiced	1151
picks	SV 3SG	unvoiced	150
pins	SV 3SG	voiced	13
plans	SV 3SG	voiced	141
pulls	SV 3SG	voiced	140
sits	SV 3SG	unvoiced	301
tells	SV 3SG	voiced	775
wants	SV 3SG	unvoiced	945
yells	SV 3SG	voiced	12

Table B.5: Third person singular agreement: Short vowel (SV) 3SG n=16

Token	Category	Sub-category	Lemma frequency
crosses	3SG-es	unvoiced	70
faces	3SG-es	unvoiced	164
kisses	SV 3SG	unvoiced	36
misses	3SG-es	unvoiced	103
presses	3SG-es	unvoiced	73
races	3SG-es	unvoiced	36
washes	3SG-es	unvoiced	49
watches	3SG-es	unvoiced	202

Table B.6: Third person singular agreement: 3SG-es n=8

Token	Category	Sub-category	CC	Lemma frequency
beeped	LV Regular	unvoiced	p-t	0
blamed	LV Regular	voiced	m-d	44
boiled	LV Regular	voiced	l-d	11
chased	LV Regular	unvoiced	s-t	21
cleaned	LV Regular	voiced	n-d	40
faced	LV Regular	unvoiced	s-t	164
forced	LV Regular	unvoiced	s-t	113
framed	LV Regular	voiced	m-d	11
gained	LV Regular	voiced	n-d	89
joined	LV Regular	voiced	n-d	174
leaked	LV Regular	unvoiced	k-t	0
marked	LV Regular	unvoiced	k-t	77
moved	LV Regular	voiced	v-d	627
parked	LV Regular	unvoiced	k-t	19
peeped	LV Regular	unvoiced	p-t	0
phoned	LV Regular	voiced	n-d	31
poured	LV Regular	voiced (vowel)	V-d	37
raced	LV Regular	unvoiced	s-t	36
sailed	LV Regular	voiced	l-d	27
saved	LV Regular	voiced	v-d	118
sealed	LV Regular	voiced	l-d	15
shaped	LV Regular	unvoiced	p-t	21
showed	LVRegular	voiced (vowel)	V-d	598
smiled	LV Regular	voiced	l-d	112
smoked	LV Regular	unvoiced	k-t	29
stayed	LV Regular	voiced (vowel)	V-d	183
stirred	LV Regular	voiced (vowel)	V-d	25
stroked	LV Regular	unvoiced	k-t	13
tied	LV Regular	voiced (vowel)	V-d	42
timed	LV Regular	voiced	m-d	13
warmed	LV Regular	voiced	m-d	15
wiped	LV Regular	unvoiced	p-t	24
worked	LV Regular	unvoiced	k-t	646

Table B.7: Regular past tense: Long vowel (LV) Reg PT forms n=33

Token	Category	Sub-category	CC	Lemma frequency
asked	SV Regular	unvoiced	k-t	610
banned	SV Regular	voiced	n-d	28
blocked	SV Regular	unvoiced	k-t	27
chopped	SV Regular	unvoiced	p-t	10
cooked	SV Regular	unvoiced	k-t	37
cracked	SV Regular	unvoiced	k-t	16
crossed	SV Regular	unvoiced	s-t	70
drilled	SV Regular	voiced	l-d	11
dropped	SV Regular	unvoiced	p-t	107
filled	SV Regular	voiced	l-d	110
grinned	SV Regular	voiced	n-d	24
hummed	SV Regular	voiced	m-d	0
jammed	SV Regular	voiced	m-d	0
kissed	SV Regular	unvoiced	s-t	36
licked	SV Regular	unvoiced	k-t	0
lived	SV Regular	voiced	v-d	329
looked	SV Regular	voiced	k-t	1151
missed	SV Regular	unvoiced	s-t	108
packed	SV Regular	unvoiced	k-t	0
picked	SV Regular	unvoiced	k-t	150
pinned	SV Regular	voiced	n-d	13
planned	SV Regular	voiced	n-d	141
pressed	SV Regular	unvoiced	s-t	73
pulled	SV Regular	voiced	l-d	140
slammed	SV Regular	voiced	m-d	14
slipped	SV Regular	unvoiced	p-t	51
trimmed	SV Regular	voiced	m-d	0
washed	SV Regular	unvoiced	ʃ-t	49
watched	SV Regular	unvoiced	tʃ-t	202
wrapped	SV Regular	unvoiced	p-t	24
yelled	SV Regular	voiced	l-d	12

Table B.8: Regular past tense: Short vowel (SV) Reg PT forms n=31

Token	Category	Sub-category	CC	Lemma frequency
ended	Regular-ed	disyllabic	d-əd	158
waited	Regular-ed	disyllabic	t-əd	213
landed	Regular-ed	disyllabic	d-əd	38
painted	Regular-ed	disyllabic	t-əd	0

Table B.9: Regular past tense: Reg-ed forms n=4

Token	Category	Sub-category	CC	Lemma frequency
band	monomorpheme	control CC	-nd	88
cold	monomorpheme	control CC	-ld	25
dust	monomorpheme	control CC	-st	26
gold	monomorpheme	control CC	-ld	75
list	monomorpheme	control CC	-st	140
mist	monomorpheme	control CC	-st	13
mould	monomorpheme	control CC	-ld	10
nest	monomorpheme	control CC	-st	18
past	monomorpheme	control CC	-st	86
pond	monomorpheme	control CC	-nd	22
post	monomorpheme	control CC	-st	111
sand	monomorpheme	control CC	-nd	34
toast	monomorpheme	control CC	-st	10

Table B.10: Monomorphemic forms n=13