On the nature of morphological awareness and vocabulary knowledge in school-age English-Japanese bilingual and monolingual children

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Contents

Abstract

Morphological awareness and vocabulary knowledge are two (among many) components of multi-faceted word knowledge critical for language development and ultimately, academic performance, as they strongly correlate with other essential, literacy-related skills, such as spelling, writing and reading comprehension (Ramirez, Chen, Geva & Kiefer, 2010). Developing these types of knowledge is a non-linear process for school-age children: morphological awareness, in particular, involves long-term learning towards a full mastery beginning in middle childhood and continuing through adolescence. Such learning processes can pose significant challenges especially for children attending a school entirely in a second language (L2) while speaking, as a first language (L1), a language which is ethno-linguistically minority in status in the larger (L2) society. Despite globally growing populations of L2 children in school settings, little is known about the nature of morphological/vocabulary knowledge in one language, relative to the other, especially when children are learning two typologically distant languages with different writing systems. The current study, situated within the theoretical framework of multicompetence (Cook, 2003), set out to investigate specific aspects of vocabulary knowledge and morphological awareness in different groups of English- and Japanese-speaking monolingual and bilingual children, whilst also examining the extent to which English morphological awareness influences/or is influenced by Japanese morphological awareness among the bilingual sample.

The purpose of the study is largely three-fold. One was to examine the children's ability to understand and express a connection between a word and its meaning. The former taps into receptive vocabulary knowledge, whereas the latter expressive vocabulary knowledge. Two vocabulary tests were administered to three groups of children per language: two bilingual groups (24 Japanese learners of English as a Second Language (ESL) and 21 learners of Japanese as a Heritage Language (JHL)) and a group of 25 English Language Monolinguals (ELMs) (English); and ESLs, JHLs and a group of 27 Japanese language Monolinguals (JLMs) (Japanese). The second purpose was to investigate the children's ability to identify morphemes included in a word and also to produce inflectional and derivational forms of a word, using two morphological tasks per language – a Word Segmentation (WS) task and a Word Analogy (WA) task. Lastly, the current study examined, through statistical analyses, the nature of an association between morphological awareness and vocabulary knowledge in each language, and also whether morphological awareness in one language could act as a significant predictor of morphological awareness in the other, i.e., cross-linguistic influence.

Four key findings were obtained. First, the patterns in which each group demonstrated vocabulary knowledge through English tests contrasted with the pattern observed in the Japanese results. In English, the ESL group scored more highly on the receptive test than the expressive test, whereas the reverse pattern was the case for the ELM group. The JHL group yielded comparable scores across tests. In Japanese, in contrast, all three groups (ESL/JHL/JLM) scored more highly on the expressive test than on the receptive test. Second, all groups of children typically demonstrated higher degrees of an awareness of inflectional morphemes than of derivational morphemes in the English morphological tasks (both the WS and WA tasks) and the Japanese WA task. A slightly different pattern was observed in the Japanese WS task, where the performances of ESL and JLM children were not sensitive to morpheme type, whereas the JHL group yielded higher scores on the inflectional morphemes than the root morphemes. As regards the relationship between morphological awareness and vocabulary knowledge in each language, in English, it was the ability to produce morphologi-

cally complex items, as opposed to recognising morphemes, that was positively related to vocabulary knowledge in all three groups (ESLs, JHLs & ELMs). In Japanese, in contrast, both morpheme recognition and production were positively related to vocabulary knowledge in all Japanese-speaking groups (ESLs, JHLs & JLMs). Lastly, the bilingual data identified a reciprocal nature of morphological transfer (Japanese ⇔ English) only in the ESL group. More specifically, the ESL children's ability to identify morphemes in Japanese words through segmentation may have a positive influence on the ability to produce English inflectional and derivational items. The latter ability is, in addition, likely to play a positive role in its Japanese equivalent, namely, the ability to produce Japanese inflectional and derivational items. No transfer effects were established in either direction for the JHL group.

These within-language and cross-linguistic investigations of the nature of, and the relationship between morphological awareness and vocabulary knowledge are discussed in terms of the existing evidence in the literature (e.g., Carlisle, 2000; Ramirez at al.,2010) and are graphically illustrated via the integration continuum based on the notion of multicompetence (Cook, 2003). Several limitations of the current study are reviewed and discussed, followed by the Conclusion chapter, where the unique contribution of the current study to the literature is revisited, together with a brief remark about its indirect links with the field of educational research in Japan and suggestions for future research.

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List of abbreviations

<u>Abbreviations (in alphabetical order)</u>

AMOS	Analysis of Moment Structures
ANCOVA	Analysis of Covariance
AOA	Age on Arrival
BPVS	British Picture Vocabulary Scale
CFI	Comparative Fit Index
CI	Confidence Interval
CUP	Common Underlying Proficiency
EAL	English as an Additional Language
EFL	English as a Foreign Language
ELL	English Language Learner
ELM	English Language Monolingual
ESL	English as a Second Language
EV	Expressive Vocabulary
EVK	English Vocabulary Knowledge
FET	Fisher's Exact Test
FL	Foreign Language
GFI	Goodness-of-Fit Index
HL	Heritage Language
JHL	Japanese as a Heritage Language
JLM	Japanese Language Monolingual
LOR	Length of Residence
JVK	Japanese Vocabulary Knowledge
L1	First language
L2	Second language
MA	Morphological Awareness
MP	Morpheme Production
MR	Morpheme Recognition
NESB	Non-English-Speaking Backgrounds
RMSEA	Root Mean Square Error of Approximation
RQ	Research Question
RV	Receptive Vocabulary
SPM+	Standard Progressive Matrices Plus
TJEV	Test of Japanese Expressive Vocabulary
TJLA	Test of Japanese Language Abilities
TOWK	Test of Word Knowledge
VIF	Variance Inflation Factor
VK	Vocabulary Knowledge
WA	Word Analogy
WS	Word Segmentation

Chapter 1

INTRODUCTION

An increasing number of school-age children around the world are being educated entirely in a second language (L2) while at the same time learning and developing their first language (L1) by utilising various ‘funds of knowledge’ (i.e., skills, bodies of knowledge and cultural resources shared amongst family and/or communities) (Gregory, 2008). This global phenomenon also applies to Japanese school-age children. There are currently a total of 62,126 Japanese residents in the UK, 47,423 of whom have lived in the UK for longer than 3 months and hold non-permanent residential status. The total number shows a 4.53% increase from the previous year, whereas in the number of non-permanent Japanese residents there is a 5.75% increase (Ministry of Foreign Affairs in Japan (MFAJ), 2011). As of April 2011, 1,782 and 51 Japanese children of primary school age were registered with the Consulate General of Japan in London and Edinburgh respectively (MFAJ, 2011). Of these children, only 284 were reported to be attending a Japanese-medium (week-day) school, with the rest presumably being schooled in English. 987 of these remaining 1,498 children attend Japanese Saturday school, which is held for 2.5 hours every Saturday (approximately 80 hours a year) (Aizawa, 1999; MFAJ, 2011).

Learning an L2 in a primary school setting raises interesting questions about how/whether developing L2 knowledge of vocabulary both influences and is influenced by L1 knowledge when the two languages are typologically distant (Menyuk & Brisk, 2005; Paradis, 2007). The importance of investigating such L2 → L1 effects as well as L2 ← L1 is highlighted in the notion of multicompetence (Cook, 1991, 2003), a common theoretical framework throughout the current study. Multicompetence conceptualises the dynamic nature of L1-L2 relationships as follows: bilinguals (or multilinguals) possess varying degrees of L1 and L2 use and knowledge in one mind, which move along the integration continuum (separation to integration) depending on the linguistic domain concerned (e.g., lexicon and phonology) and also various other psychological and personal factors (e.g., motivation). The notion also encompasses the view that the nature of L1 and L2 knowledge in bilinguals is distinct from their monolingual peers and hence the specific characteristics of the linguistic development of each type of bilinguals warrant examinations in their own right.

Situated within the multicompetence framework, the current study investigates the nature of different aspects of word knowledge in English and Japanese which may be unique to each of the following four groups of children representing four different populations:

a. Japanese children learning English as an L2 (ESL) in the UK;
b. English learners of Japanese as a Heritage Language (JHL) in the UK
c. English Language Monolinguals (ELMs) in the UK;
d. Japanese Language Monolinguals (JLMs) in Japan.

The first two groups could be broadly categorised as belonging to the bilingual population in the UK. They are, however, narrowly defined as two distinctive bilingual populations for two reasons. Firstly, the current study focuses on a specific language group (i.e., Japanese), which is not among the common L1s (e.g., Bengali, Urdu and Punjabi) spoken other than English by bilingual/multilingual populations within the UK (National Association for Language Development in the Curriculum (NALDIC), 2012). For similar reasons, the Japanese ESL population is treated as distinct from the EAL (English as an Additional Language) population in the UK (see Section 1.1.4). The second reason is that there is likely to be extensive variability in a course of acquisition and an ultimate attainment within the Japanese-English bilingual population, depending on whether they are consecutive (ESL) or simultaneous bilingual children (JHL) (see Section 2.3 in Chapter 2 for further discussions). The groups c) and d) represent Japanese-L1 and English-L1 monolingual populations, who are schooled entirely in the L1 and speak the language only at home in Japan and UK respectively (i.e., the L1 is the only language they speak in the home).

1.1 Purpose of the current study - Types of word knowledge in focus

The overarching aim of the study is two-fold. One is to examine the nature of vocabulary knowledge (lexical meanings) and morphological awareness of inflections and derivations within languages (English and Japanese), together with the relationship between the two in each group of Japanese-English bilinguals and English-L1/Japanese-L1 monolinguals. Another is to focus on the bilingual groups (ESL and JHL groups) and examine the extent to which morphological awareness in one language acts as a significant predictor of morphological awareness in the other language, namely, morphological transfer between Japanese and English in the statistical sense. The current study involves a total of four groups of school-age children, as described above, consisting of two groups of bilingual children (ESLs and JHLs), a group of English Language Monolinguals (ELM) and a group of Japanese Language Monolinguals (JLM). It must be emphasised that comparing these bilingual groups with their monolingual peers is not to imply that the monolingual groups represent the target for the bilingual groups in each language and any difference found between these groups be considered abnormal or risks for specific language impairments or disabilities.

1.1.1 Vocabulary knowledge

Vocabulary knowledge enables one to recognise, understand and produce words and sentences and thus is a prerequisite for both receptive and expressive (or productive) language development. Developing vocabulary is a complex and at the same time challenging task, involving acquiring multi-faceted aspects of word knowledge, going beyond knowledge of a connection between a word and its meaning, such as knowledge of spoken and written forms, word parts (morphological information), concept and referents, associations, grammatical functions, collocations and register traits (Richards, 1976; Henriksen, 1999; Webb, 2005). Enriched knowledge about words in turn facilitates the comprehension of text and hence can be indicative of the development of children's reading comprehension skills (Kieffer & Lesaux, 2008). Investigating different aspects of word knowledge in children offers useful insight into the rate and complexity of children's learning of L1, which in turn can provide a basis for understanding child Second Language Acquisition (SLA) and bilingualism.

Children who are developing L1 skills experience a burst in their vocabulary and grammar between two and four years of age, when they make remarkable progress with the basics of vocabulary, syntax and phonology, which in turn enable them to combine words to create sentences (Bialystok, 2001a; Karmiloff & Karmiloff-Smith, 2001). However, some subcomponents of word knowledge appear to develop beyond the early school years, one of which is knowledge of whether a word consists of one or more meaningful components (Anglin, 1993; Tyler & Nagy, 1989). The purpose of the current study is to investigate this word-specific knowledge, referred to as morphological awareness, together with another subcomponent of word knowledge, namely, knowledge of a connection between a word and its meanings (i.e., lexical meanings). Knowledge of lexical meanings concerns how many words a learner knows, thus being indicative of his/her vocabulary size. There seem to be largely two tendencies in the way vocabulary size has been investigated to date in L1 and L2 studies: a) researchers provide the exact estimate of how many words children know or acquire in the school years (e.g., Anglin, 1993; Biemiller, 2005; Nagy & Anderson, 1984); b) researchers test children on their knowledge of lexical meanings by administering standardised tests (e.g., British Picture Vocabulary Scale (BPVS) (Dunn, Dunn, Whetton & Burley, 1997) and Peabody Picture Vocabulary Test (PPVT) (Dunn & Dunn, 1997)). The current study falls under the latter category: its aim is to investigate the nature of receptive and expressive knowledge of lexical meanings using appropriate standardised and/or experimental measures. Hence, children's vocabulary knowledge will not be quantified as exact estimates. In order to reflect this focus, the term *vocabulary knowledge* or *vocabulary* will be used throughout, instead of *vocabulary size*, except when reviewing past vocabulary estimation studies. The terms *expressive* and *productive* are typically used interchangeably both in child L1 and L2 vocabulary studies, to denote the ability to correctly use the meaning of the target lexical item in spoken or written production (e.g., Golberg, Paradis & Crago, 2008; Simcock & Hayne, 2002). The term *expressive* is used in the current study, to be consistent with the terminology of the vocabulary tasks (i.e., Expressive Vocabulary in English and Test of Japanese Expressive Vocabulary in Japanese), and also to avoid confusion with the equivalent aspect of morphological awareness (i.e., morpheme production), another subcomponent of word knowledge to be addressed in the current study.

It is to be acknowledged and emphasised that vocabulary knowledge, in the current study, is investigated within its limited scope. Using only two standardised/experimental vocabulary tests per language does not lead to capturing the full or comprehensive extent of receptive or expressive vocabulary knowledge in either language which children constantly develop during the school years. The traditional standardised vocabulary tests, such as the BPVS and PPVT, are knowledge-based, designed to measure children’s *current* knowledge of lexical meanings at a single point in time. Data obtained through such tests and procedures do not provide information about the rate of, or direction of change in their vocabulary learning (i.e., longitudinal data) or the children’s ‘potential’ to learn vocabulary items through interacting with the assessor in problem-solving activities (i.e., dynamic assessment procedures) (Burton & Watkins, 2007; Camilleri & Law, 2007; Watkins & DeThorne, 2000). Moreover, due to their knowledge-based nature, these traditional tests do not tap into lexical processing, namely, the efficiency with which children learn or access new words, as measured, for instance, by novel word learning or rapid naming tasks (Kohnert & Kan, 2007). Ideally, an investigation of vocabulary knowledge would accommodate, in a complementary manner, a range of knowledge-based and processing-dependent measures which tap into the integration of phonological, orthographic, morphological, syntactic properties of target items for comprehension and production (e.g., Henriksen, 1999; Snow & Kim, 2007; Webb, 2005). Incorporating this approach was not feasible in the current study in the absence of available measures which not only assess vocabulary knowledge in a comprehensive manner but also are appropriate for assessing bilingual children with diverse cultural/educational backgrounds (Jordaan, 2008; Kohnert & Kan, 2007; Stockman, 2000). In this regard, the results of the vocabulary tests used in the current study are *not* to be interpreted or generalised as the nature of English and Japanese vocabulary knowledge in school-age children in general, but rather as a snapshot of learned (receptive and expressive) knowledge of lexical meanings (i.e., a connection between a target item and its meaning) demonstrated at the time of testing. One important aspect of such snapshots, however limited in scope they may be, is that, within the framework of multicompetence, it helps to enhance our understanding of the specific characteristics of receptive and expressive knowledge of lexical meanings in each group of bilingual and monolingual children and also in each language. Issues surrounding language assessment will be revisited and discussed further in Chapter 2 (Section 2.4).

1.1.2 Morphological awareness of inflections and derivations

An additional subcomponent of word knowledge in focus is morphological awareness. Morphological awareness concerns the ability to identify morphemes, the smallest meaning-bearing units in language (e.g., *un-* and *-kind* in *unkind*), included in a word and also involves the ability to appropriately use word formation rules to construct inflectional (*forget* → *forgot;* 読む /yomu/ “to read” → 読んだ /yonda/ “read, past tense”) and derivational forms of a word (*forget* → *unforgettable;* 温かい/atatakai/ “warm” → 温かさ/*atatakasa/* “warmth”) (Kuo & Anderson, 2006). A distinction needs to be made between morphological awareness and acquisition of morphology. Although the former is conceptualised, in the literature, as a subset construct within the broader scope of the latter, the latter concerns a different type of morphological ability, namely, the development of the ability to comprehend and produce morphologically complex items in natural speech (Kuo & Anderson, 2006). It is the former type of morphological ability that the current study focuses on and hence the participating children are tested on the more explicit representation and manipulation of morphological rules which they are likely to have implicitly acquired. It should be noted that compounds, another type of word formation which involves forming a new word by combining two or more words (or root morphemes), are not examined in the current study.

As commonly reported in child L1 and L2 studies respectively, morphological awareness is integrally related to other essential aspects of linguistic knowledge (e.g., vocabulary) , metalinguistic awareness (e.g., phonological awareness) and literacy-related skills (e.g., reading and writing). Researchers have, therefore, reached the consensus that the development of morphological awareness plays a critical role in linguistic performance and ultimately academic success in school (e.g., McBride-Chang, Wagner, Muse, Chow & Shu, 2005b; McBride-Chang, Cheung, Chow, Chow, & Choi, 2006; McCutchen, Green & Abbott, 2008). What this agreed-upon view does not portray, at least explicitly, is the extent to which the nature of the association between morphological awareness and vocabulary knowledge differs when each knowledge type is further broken down into its receptive and expressive/productive aspects. As commonly reported in past research both on child (Carlise, 2000; Duncan, Casalis & Colé, 2009; Saville-Troike, 1984) and adult learners (Hayashi & Murphy, 2011; Webb, 2008), learners' linguistic performance varies across tasks, owing to differing levels of cognitive demands required between recognition/comprehension and production. It is possible, for instance, that children, who perform well in reading (i.e., recognition of words and comprehension of text), still systematically omit plurals, tense markers, derivational affixes in writing/speaking (i.e., productive skills) (Saville-Troike, 1984). Hence digging deeper into the type of word knowledge concerned should allow the researcher to illuminate an association which has not been identified in the existing evidence.

The current study, in line with the definition of morphological awareness put forward by Kuo and Anderson (2006), measures morphological awareness using two tasks: one involves identifying morphemes in morphologically complex items, whereas the other involves producing morphologically complex items by employing appropriate word formation rules (i.e., inflection and derivation). This approach is, however, far from being comprehensive, particularly since, as stated above, morphological awareness, just like vocabulary knowledge, is a multi-faceted concept, intertwined with other aspects of linguistic and metalinguistic knowledge. One issue with such a multi-dimensional nature is that researchers have great difficulty in arriving at a *pure* measure of morphological awareness. Ideally, a wider range of tasks would need to be administered in order to factor out effects of any related aspects of metalinguistic awareness (e.g., phonological, orthographical, syntactic awareness) (Kuo & Anderson, 2006). Employing such methods was impractical in the current study primarily due to the lack of available assessment tools and also to time constraints. As pointed out in Section 1.1.1, within the field of morphological awareness research too, no standardised morphological instruments have been developed which are designed to be appropriate for bilingual children with varying linguistic and cultural backgrounds as well as monolingual children. Time constraints were an inevitable issue due to the complexity of the research design and also to working with school teachers. The number of tests/tasks to be used had to be kept to a reasonable number for the following reasons: a) not to cause too much interruption to participating schools' regular activities; and b) not to cause fatigue or stress to participating children, especially bilingual children whose testing session took approximately twice as long as it did the monolingual groups, tested both in English and Japanese. Within its limited scope, the current study is aimed at examining the ability to identify and produce morphemes both within each language (i.e., English and Japanese) and across languages. The latter, which is relevant to the bilingual groups (i.e., ESL and JHL children), is an issue of which there is a gap in understanding in the literature, especially in the context of children learning two languages which are typologically distant and also differ in morphological systems, as elaborated on further below.

1.1.3 Transfer of morphological awareness between Japanese and English

Transfer, another factor to be examined in the current study is a phenomenon comparatively under-investigated within the subfield of child SLA and bilingualism (Philp, Oliver & Mackey, 2008). There are several other terms used to refer to this phenomenon in the literature, including *cross-linguistic influence*, *linguistic interference* and *the role of the native language*. Following Odlin (2003), the current study uses the terms *transfer* and *cross-linguistic influence* interchangeably, as they are the most commonly employed terms in contemporary SLA research. In addition, the term *cross-linguistic influence* reflects the notion that transfer can occur in both directions (L1 → L2 and/or L1 ← L2) as well as in a single direction, as indicated by Odlin's (1989, p.27) view of transfer as 'the influence resulting from similarities and differences between the target language and any other language that was previously (and perhaps imperfectly) acquired'. This phenomenon can be observed in learners' production (e.g., over-use of certain features) as well as recognition (e.g., decoding) in the different domains of language (e.g., pronunciation, vocabulary and syntax). Employed in the current study is the following definition of language transfer, proposed by Ellis (2008, p.351), who combined Odlin's (1989) definition of cross-linguistic influence which allows for bidirectional transfer and Jarvis's (2002) view of transfer as general tendencies and probabilities:

> 'Language transfer refers to any instance of learner data where a statistically significant correlation (or probability-based relation) is shown to exist between some feature of the target language and any other language that has been previously acquired.'

Cross-linguistic influence illuminates an issue particularly relevant to child L2 learners, which is the influence of early L2 learning on their subsequent L1 (and L2) development especially when their L1 is not widely spoken in their L2 community. Early onset of L2 exposure leads to various outcomes including the following: balanced development in both languages; a shift in dominance/preference from L1 to L2; and/or loss of L1 proficiency (Kohnert & Bates, 2002; Wong Fillmore, 1991). Each outcome is the consequence not only of the multiple interactions of linguistic factors such as proficiency in each language, but also is mediated by other factors including psychological (e.g., motivation, attitude, parents' cultural orientation), sociolinguistic (e.g., language use at home and the presence/absence of the L1 community) and socio-cultural (social class and parents' socioeconomic status) factors (Hamers & Blanc, 2000; Okamura-Bichard, 1985; Riches & Genesee, 2006). Linguistic factors and those related to sociolinguistic environments are of particular relevance to this study. Following the above definition by Ellis (2008), evidence of cross-linguistic influence/transfer is examined, using statistical techniques (multiple regression). In other words, a significant amount of variance in a dependent variable explained by a between-language morphological awareness predictor will be interpreted as evidence of morphological transfer. Examining morphological transfer concerns two types of Japanese-English bilingual children in the current study: Japanese children learning English as a Second Language (ESL) and L1 English children learning Japanese as a Heritage Language (JHL) in the UK context. By including these groups, this study aims to explore whether or not transfer of morphological awareness, if identified, is specific to each group of bilinguals.

1.1.4 Defining bilingual children

Child learners of English can be labelled in various terms, primarily depending on the context in which they learn English as an L2. These terms include the following: English as an Additional Language (EAL, a term primarily used in the UK context); English Language Learner (ELL, a term primarily used in the US context); English as a Second Language (ESL); English as a Foreign Language (EFL); or learners with non-English-speaking backgrounds (NESB). EAL children denote those who come from ethnic minorities where L1 is not English and hence use English in addition to their L1 (Cameron, 2002). In this respect, Japanese children learning English as an L2 in the UK can be considered as EAL children. However, these children are referred to as ESL children in the current study for the following two reasons. Firstly, the current study focuses on a particular L1 group (i.e., Japanese), rather than looking at groups of EAL children with L1s such as Punjabi, Urdu and Bengali, which are amongst the most commonly spoken L1s other than English in the UK (NALDIC, 2012). Another reason is concerned with the issues commonly addressed in the literature on language minority children. These issues involve the need to identify factors underlying the commonly observed achievement lag of minority children in comparison to their monolingual peers, including the particular constellation of factors (e.g., pedagogical practice at school and parents' socio-economic status) which may influence success in their language learning (Cummins, 2000; Genesee, Lindholm-Leary, Saunders, & Christian, 2006; Gregory, 2008; Murphy, 2010). Investigating these issues in any detail is beyond the scope of the study.

Another group of Japanese-English bilingual children involved are those of mixed parentage in England, each of whom has a Japanese mother and a British father. They are simultaneous bilinguals in the sense that they have been exposed to both languages since birth. However, English is the L1 or the more dominant language of the two for all JHL children and they have received literacy instruction in English by attending a local school. These JHL children have been learning Japanese, an ethonolinguistically minority language in the UK, mainly through interaction with their Japanese mother and Japanese-learning environments (e.g., a Japanese Saturday school) provided outside their week-day English-medium school. In this respect, they are termed as learners of Japanese as a Heritage Language (JHL). Referring to these two types of Japanese-English bilingual children as ESLs and JHLs is essential for reflecting the focus of the study (i.e., to examine the group-specific characteristics of vocabulary knowledge and morphological awareness), and also for differentiating this research from that on EAL children (and language minority children in general) where the focus is often on trying to understand possible variables contributing to academic and linguistic lags relative to monolingual samples.

1.2 Rationale behind the current study

Over the past few decades, vocabulary knowledge has been extensively researched in two overarching ways: research on a) how many words a learner knows and b) how much a learner knows about a particular word. Different terminologies have been used in the literature on vocabulary testing, to make a distinction between these two dimensions, such as *breadth and depth of vocabulary knowledge* (e.g., Anderson & Freebody, 1981; Nagy & Herman, 1987), *size and lexical richness* (Laufer & Nation, 1995), and *size and lexical organisation* (a network of associations) (Meara, 1996; 2009). The current study is not intended to classify vocabulary knowledge and morphological awareness using one of these distinctions, but to treat these as two different subcomponents (among many) of word knowledge and ultimately as two essential aspects of academic success at school for children.

Learning vocabulary involves acquiring various receptive and expressive subcomponents of word knowledge (Henriksen, 1999; Nation, 2001; Snow & Kim, 2007). Receptive knowledge involves the ability to recognise and understand a word and its meaning when encountered during listening or reading, whereas expressive knowledge concerns the ability to produce a word and express its meaning its meaning correctly when speaking or writing (García, 2009). An investigation of both receptive and expressive vocabulary knowledge has witnessed asymmetric developmental patterns in a number of L1 and L2 studies to date. For example, young L1 children understand words well before they can produce these words (Benedict, 1979; Clark, 1993; Karmiloff & Karmiloff-Smith, 2001). Adult L1 speakers also have a greater receptive vocabulary size than productive vocabulary size (Zechmeister, D'Anna, Hall, Paus, & Smith, 1993). Research on bilingual children suggests that the development of receptive and expressive vocabulary may be qualitatively different in such a way that some possess receptive abilities (i.e., reading and listening) in two languages whereas others can write or speak only in one of the languages (Hamers & Blanc, 2000; Tabors & Snow, 2003). These strands of evidence, however, derived mostly from studies that investigated learners' knowledge of lexical meanings, and comparatively few studies have explored the relationship between receptive and expressive aspects of vocabulary and (an)other(s) subcomponent(s) of word knowledge especially in children.

Addressing the paucity of evidence on these issues is one motivation for the current study. Another primary motivation originates in the researcher's previous study on a similar topic with adult Japanese learners of English and native speakers of English (Hayashi & Murphy, 2011). Hayashi and Murphy examined the relationship between vocabulary knowledge and morphological awareness and illuminated a relationship which differed across groups and was also specific to each aspect of morphological awareness measured. That is, morphological awareness, as measured by a production task (i.e., producing inflectional/derivational forms in a minimal sentential context), was in a positive relationship with both receptive and productive vocabulary scores among Japanese ESL participants. It was, in contrast, morphological awareness, as measured by a recognition task (i.e., identifying morphemes through segmenting a word), that was positively related to both sets of vocabulary scores for native speakers of English. Clearly, children are cognitively less developed than adults, and the type of L2 instruction they receive is qualitatively different between these two groups. (ESL participants in the Hayashi and Murphy study were recruited from a language school where they were receiving explicit instruction about formal aspects of morphology in their vocabulary classes.) Hence the relationship identified in the Hayashi and Murphy study might not hold for L1/L2 children. There is, on the other hand, emerging evidence to suggest that aspects of morphological awareness demonstrated through morpheme recognition and production may each be differently related to vocabulary knowledge in children. Carlisle (2000), for instance, found that a significant association between morphological awareness and vocabulary knowledge held only when the morpheme production task was included in her statistical analysis (and the association was not significant when the receptive task was entered). This evidence was obtained from L1 English children and hence there remains a strong need for pursuing this matter in the context of children learning an L2. By addressing this matter, the current study might be able to offer farther-reaching educational implications from developing a better understanding of how each subcomponent of word knowledge develops in children.

The current study investigates morphological awareness further by examining the degree of its transferability across Japanese and English, thus involving the ESL and JHL children. One might assume that, influenced by multiple factors such as age, varying degrees of L1 entrenchment and/or L1 support in and outside school, transfer could occur not only in a single direction (e.g., L1 → L2) but also in both directions (L1 → L2 and L1 ← L2). These factors could be relevant particularly with the ESL children in this study, who came to the UK, where Japanese is not widely spoken, with certain degrees of Japanese entrenchment and were exposed to English extensively through schooling. Morphological transfer itself is not an under-researched area: as reviewed in detail in Chapter 2, it has been investigated in children learning various pairs of other languages. However, to the researcher's knowledge, little evidence is available between Japanese and English at present, despite the rising populations of Japanese bilingual (or multilingual) children abroad (MFAJ, 2011). The existing evidence from other various language pairs is diverse in nature, due to different kinds of data collection techniques employed by researchers. This diversity makes it difficult to pin down certain studies and hypothesise results for the current study. Odlin (2003), in his review of transfer research, suggests that convincing evidence be obtained by using multiple sources, such as spoken and written performances as well as a consideration of both recognition/comprehension and production. Incorporating this approach, the current study measures different aspects of morphological awareness using recognition and production tasks in each language and examines whether or not the occurrence of transfer, if any, is specific to each aspect. It is hoped that this study offers preliminary evidence which will lead to further lines of research in these populations in the future.

This study involves children of different school age. The theoretical motivation for this sampling frame is that children's morphological awareness (as well as other literacy-related skills) develops with age and tends to accelerate in the later primary school years, as is well-documented in previous L1/L2 studies (e.g., Anglin, 1993; Wang, Cheng & Chen, 2006). During these school years, children's reading vocabulary becomes more complex, leading them to encounter more morphologically complex words (Anglin. 1993; McCutchen at al., 2008; Tabors & Snow, 2003). This also corresponds with the period where metalinguistic awareness begins to emerge and develop further in children (Nagy, 2007; Philp, et al., 2008). Furthermore, converging evidence of bi-literacy development in Japanese-English bilingual children suggests that the nature of L1-L2 relationships may begin to diverge during the mid to late primary school years as follows. L1 knowledge offers a facilitative basis for subsequent development of L2 academic skills and continued development of L1 skills for ESL children who were exposed to English after the age of ten, whereas earlier ESL starters are likely to accelerate in English at the expense of Japanese maintenance or development

(Cummins, Swain, Nakajima, Handscombe, Green, & Tran, 1984; Ono, 1994, 1995; Shiba, Ōhama & Noguchi, 1980). Thus, focusing on this age range (mid-to-late primary school years) should offer some insight into developing word knowledge in bilinguals as well as monolinguals at the critical stage of literacy development in each language. Ideally, a study would adhere to a cross-sectional design with different age groups of equal size, in order to capture age effects on linguistic performance in detail. This was not feasible in the current study due to the insufficient number of children available for participation during the recruitment process. This resulted in each group consisting of children in different school years. Thus, age was used as a control variable when analysing the data.

Focusing on Japanese children adds practical value indirectly to the field of educational research in Japan. In Japan, under the previous teaching guidelines (valid until March, 2010), Years 3-6 primary school children were provided with classes of Integrated Studies (*Sōgōtekina gakushū no jikan*) approximately three hours a week, whereby engaging in English language activities is one of various other options (e.g., learning activities about local history, environment, welfare/health, etc.). The new teaching guidelines state that from 2011 onwards, Years 5-6 children in primary schools be provided with English language activities once a week (35 hours a year), separately from Integrated Studies, indicating that these children have more exposure to English in school (MEXT, 2008). The rationale behind this new policy, which promotes early exposure to English, is partly framed within the notion of 'younger is better', as claimed by the Critical Period Hypothesis (Kanno, 2007). This new policy is also aimed at equipping children with communicative competence, and also with a positive attitude towards English prior to their subsequent English learning as a subject in secondary and high schools (MEXT, 2008). It is, however, still debatable whether an early onset of English learning is beneficial for L1 (Japanese) development (e.g., Ohtsu, 2005; Trikai, 2006 (against early English learning); Matsukawa, 2004 (for) in the contexts of Japanese children). The current study focuses on the ESL/JHL populations and not on the EFL (English as a Foreign Language) population to which the above new educational policy applies. Therefore, no generalisations or direct pedagogical implications are to be inferred about the EFL context. The current study could, however, be indirectly linked to the Japanese EFL context and the ongoing debate, in terms of the extent to which early exposure to another language influences children's developing L1 as well as linguistic knowledge in the other language, and how differing educational backgrounds play a part in their bilingual development. Potential indirect links between the current study and the Japanese EFL context are revisited and discussed further towards the end of the thesis (Section 8.3).

Japanese-speaking primary school children in Years 3-6 were involved in the current study. However, a few bilinguals beyond Year 6 were recruited, due to great difficulty in finding Year 3-6 bilinguals through primary schools in the UK, which made it necessary for the researcher to loosen her sampling criteria and recruit some older children (see Section 3.1 for background statistics of the participating children). These school years were chosen primarily as a) previous research suggests that mid-to-late primary years can be a transitional period during which the sophistication of children's vocabulary and metalinguistic awareness accelerates (Tabors & Snow, 2003); and b) these children vary significantly in the amount of exposure to literacy instructions at school, which could result in the observation of individual differences in linguistic development within and between school years.

1.2.1 Links with real-world concerns for bilingual development

'I fear my children's Japanese is disappearing.'

'Our children no longer practise *kanji* in writing and hence the development of their literacy skills may be lagging behind the age-appropriate level.'

'Getting them to respond to us in Japanese is becoming difficult. They understand us fine but seem to find it difficult to talk about what happened at school in Japanese.'

These are, amongst others, three prominent concerns which the vast majority of Japanese mothers raised to the researcher during the course of data collection. What these quotations inform us is that the mothers were concerned that extensive exposure to English in the UK context might be decelerating their children's Japanese vocabulary development (and other linguistic skills), and that expressive aspects of Japanese vocabulary, in particular, were at risk. Pressure to maintain and develop Japanese linguistic skills (e.g., vocabulary and literacy-related skills) adequately is probably high especially for the family with a non-permanent residential status in the UK (i.e., those with an intention to return to Japan in the future). Japan is a highly literate nation with 90-99 % of the population estimated to possess knowledge of at least 3,000 *kanji* enough to read newspapers and magazines (Morton & Sasanuma, 1984; Carson, 1992). Such an almost perfect rate of adult literacy is achieved rather naturally, although its process can be painful and exhausting (Duke, 1986), the tradition of which originates from the Tokugawa Era (1600s - mid 1800s) where literacy was highly valued at all levels of society (Carson, 1992, Sakamoto & Makita, 1972). With the prospect of returning to this highly literate nation in mind, the Japanese parents expressed their dilemma between keeping up their children's Japanese linguistic skills and at the same time improving their English skills via schooling with their monolingual peers.

The current study will not be able to provide solutions to all their concerns. Nevertheless, within its non-diagnostic scope, it bears some relevance to these concerns by illuminating the potential influence of extensive exposure to the L2 (English in this context) on the development of the L1 (Japanese), especially when the L1 is an ethnolinguistically minority language in status in the L2 context. Moreover, the current study examines different aspects of word knowledge by testing each group of bilingual children both on Japanese and English, so that it can offer useful insight into dimensions of bilinguality in children, such as relative competence in each language (e.g., balanced or dominant bilinguality).

1.3 The structure of the Thesis

The following chapter (Chapter 2) begins with a brief overview of models and typologies of bilingualism, which act to provide a theoretical framework for the classification of the bilingual children involved in the current study: one group consists of simultaneous bilinguals (exposed to both languages since birth), whereas the other consists of consecutive bilinguals (who had acquired core aspects of the L1 before starting to learn the L2). The Chapter then moves onto discuss issues surrounding language assessment for children, especially bilingual children with diverse linguistic and cultural backgrounds. This is followed by a critical review of the literature on the development of vocabulary knowledge and morphological awareness (especially inflections and derivations), together with relationships between these types of knowledge in children. The review of the nature of morphological awareness is accompanied by a description of morphological systems in English and Japanese respectively. This raises another important issue in SLA research, i.e., cross-linguistic influence. Reviewing a body of research on morphological transfer between various pairs of languages (especially those with different scripts) offers a basis for hypothesising a potential occurrence of morphological transfer between Japanese and English, a pair of languages which have received little attention in this field (particularly so in child L1/L2 studies).

Chapter 3 presents the design of the current study, including the research questions, participants, measures used and procedures followed. The specific research questions to be addressed are as follows:

1. What is the nature of receptive and expressive knowledge of lexical meanings in (a) English and (b) Japanese speakers, and to what extent does it differ (a) between ESL, JHL and ELM children and (b) between ESL, JHL and JLM children?

2. What is the nature of the ability to recognise and produce inflectional and derivational morphemes in (a) English and (b) Japanese speakers, and to what extent does it differ (a) between ESL, JHL and ELM children and (b) between ESL, JHL and JLM children?

3. What is the nature of the relationship between morphological awareness and vocabulary knowledge in English speakers and to what extent does it differ between ESL, JHL and ELM children? Similarly, how does the relationship in Japanese speakers differ between ESL, JHL and JLM children?

4. Does morphological awareness in one language act as a significant predictor of morphological awareness in the other language among ESL and JHL children?
   4a) If it does, is the nature of transfer different between groups?

The results of a small-scale pilot study are also reported via describing the children's performance and feedback on each task, which informed the decision-making process for a range of measures to be used in the main study. This chapter is concluded with a remark on ethical considerations.

The results of the main study will be reported over three chapters. Chapter 4, the Results part I, concerns the analysis of performances on the English tasks completed by the following three groups of children: ESL, JHL, and ELM children. A series of statistical techniques including t-tests, Analysis of Covariance (ANCOVA) and multiple regression (via path diagrams) will be used to examine the nature of different aspects of vocabulary knowledge and morphological awareness respectively. This chapter ends with error analysis of the English morphological tasks so that further detail could be added to the statistical analysis conducted on the correct responses. This error analysis also involves examining potential effects of morphological properties of the target items (e.g., semantic transparency and morphemic complexity) on the degrees (low, medium and high) of variability in children's responses. In doing so, Fisher's exact tests are performed, as a method for computing the exact probability of the chi-square statistic, to examine whether there is a significant relationship between each morphological factor and the level of variability within the responses.

Following the same procedures as in Chapter 4, Chapter 5 reports on the findings of the Japanese tasks completed by the following three groups: ESL, JHL, and JLM children. This chapter also presents error analysis of the Japanese morphological tasks, together with an examination of the relationship between the morphological factors and the level of variability within their responses. A Japanese-specific factor was included in this examination, namely, script effects, since the target items were presented in three combinations, namely, in *hiragana* only, *hiragana* + *kanji* in combination and *kanji* only.

Chapter 6, the last of the Results chapters, presents the results on the nature of the relationship between morphological awareness and vocabulary knowledge. It begins with correlational and regression analyses to examine the nature of the relationship within language. This is followed by an examination of morphological transfer between languages in the ESL and JHL children. Of particular interest here is to examine whether the cross-linguistic contribution of morphological awareness differs between groups. This was achieved by running multiple regressions via path diagrams and examining whether a pathway (standard regression coefficients) from morphological awareness in one language to morphological awareness in the other was statistically different between groups.

In Chapter 7, the findings from all three Results chapters are summarised and synthesised under a sub-heading of each research question and are discussed in relation to the relevant theories and studies reviewed in the literature review (Chapter 2). Limitations of the current study are presented at the end of the chapter.

Chapter 8 reminds the reader of the context and focus of the current study, followed by a summary of the key findings obtained. It concludes by highlighting the theoretical and empirical contributions that this study makes to the literature, together with its indirect links with the field of educational research in Japan. It also identifies issues which may warrant further investigation in future research.

Chapter 2

LITERATURE REVIEW

2.1 Structure of the Chapter

This chapter presents a theoretical background for the current study, providing an overview of relevant theories and empirical evidence. It is structured as follows. It begins with a review of various existing definitions and dimensions of bilingualism and bilinguality, which acts to provide a theoretical framework for the different types of bilingual children involved in the current study and also situate the current study within the complexity of bilingualism (Section 2.3). This is followed by a discussion of language assessment for school-age children, especially bilingual children, with a focus placed on various challenges in carrying out assessment in a culturally and linguistically unbiased manner (Section 2.4). The chapter then provides a critical review of past studies on the nature of English (Section 2.5) and Japanese vocabulary knowledge (Section 2.7) in L1 and L2 children. Evidence from L2 children will be discussed further with reference to the theories of bilingual development (Cummins, 1984) and multicompetence (Cook, 1991, 2003), each of which conceptualises the dynamic nature of L1-L2 relationships in bilingual children (Section 2.6). The reader is reminded that the current study focuses on the children's knowledge of lexical meanings as demonstrated through receptive and expressive tests per language, thus only providing a snapshot of current multi-faceted vocabulary knowledge in children. Therefore, no claims are to be made about the full extent of their vocabulary knowledge or the rate of, and/or the direction of change in vocabulary development. The review places emphasis on examining the characteristic of knowledge of lexical meanings in each group of bilingual and monolingual children in their own right within the framework of multicompetence, a common thread throughout the thesis.

The literature review moves onto another component of word knowledge in focus, namely, morphological awareness of inflections and derivations (Section 2.8) and its relationship with vocabulary knowledge (Section 2.9) in school-age monolingual and bilingual children. The nature of morphological awareness in the latter group of children will be further discussed from a cross-linguistic perspective by examining past research on various pairs of languages (Section 2.10). Due to the paucity of relevant evidence on transfer in Japanese-English bilingual children, hypothesised results will be discussed, based on the existing evidence from children learning languages with different scripts and also on the description of Japanese morphology (Section 2.11). Challenges associated with measuring morphological awareness using the Japanese scripts are also discussed (Section 2.11.3). As is the case with vocabulary knowledge, morphological awareness, too, is a multi-faceted, complex concept, intimately integrated with key aspects of linguistic and metalinguistic competence (e.g., syntax and phonological awareness) which children develop constantly and significantly during the school years (Barac & Bialystok, 2011; Menyuk & Brisk, 2005). It should be therefore acknowledged and emphasised that the review presented below is necessarily limited in scope. It is not aimed at capturing a comprehensive picture of the development of morphological awareness in children but rather at examining some of its specific aspects, especially, snapshots of the ability to recognise and produce inflectional and derivational morphemes in English and Japanese and also the extent to which the ability demonstrated in one language may differ to that in the other language. Nevertheless, the approach taken in the current study is unique in that it makes the first attempt to systematically examine morphological awareness in relation to vocabulary knowledge within and across two typologically distant languages with different scripts – English and Japanese, while examining the distinctive characteristics of these two types of knowledge in each group of children, which can only be achieved by including them all within a single design.

2.2 Introduction

One of the first things to note when surveying the literature on child second language acquisition (SLA) research is the importance of defining bilinguals, in particular, addressing the distinction between (simultaneous) bilinguals and child L2 learners/L2 children. This is an important distinction to address, particularly as considerable variability in a course of acquisition and a proficiency level achieved in each language can be observed within bilingual populations. Whether the terms *bilinguals* and *child L2 learners* are used interchangeably or distinctively depends on how researchers define them, and also on where to set the boundary of the outset of child SLA, which has been argued to range from 2 to 7 years of age (see Philp, Mackey & Oliver, 2008 for a review). In the current study, these terms are used to denote different populations. Bilingual children are defined as those who have been exposed to two languages since birth (i.e., simultaneous bilinguals) or have been learning the L2 before the rudiments of the L1 (e.g., vocabulary, phonology and syntax with which to be able to comprehend and produce the language at the sentence level) are established. Simultaneous bilinguals involved in the current study are those who have been exposed to both English and Japanese since birth in England, UK. To these children, English is the dominant language being the language of instruction in school, whereas Japanese, an ethnolinguistically minority language in the UK, has been learnt mainly through parental input at home, being the first language of the mother. Children who are exposed to an ethnolinguistically minority language in the family since childhood can be classified broadly as heritage language learners (Montrul, 2008; 2010). In line with this definition, the Japanese-English simultaneous bilinguals in the current study are termed as learners of Japanese as a Heritage Language (JHL). Child L2 learners are those who have an established L1 before they begin to learn another and typically speak their L1 at home and L2 at school (Genesee & Nicoladis, 2007; Montrul, 2008; Paradis 2007). Japanese children learning English as a second language in the UK context are among this type of learners and hence are termed as ESL children henceforth. The terms *L2 children* and *child L2 learners* will be used interchangeably to denote those learning an L2 in the L2-speaking context and are thus particularly relevant to Japanese ESL children in the current context. The terms *bilingual children* and *bilingual groups* will be used when surveying the literature on bilingualism and also to collectively refer to the ESL and JHL children in this study for convenience sake.

2.3 Definitions and dimensions of bilingualism and bilinguality

There are numerous definitions and typologies of the concept *Bilingualism* which vary depending on how broadly it is defined, ranging from a native-like competence in two languages (Bloomfield, 1933) to a minimal competence in at least one of the domains in the L2 (e.g., speaking and reading) (Diebold, 1964; Macnamara, 1967). One early (and strict) definition, put forward by Bloomfield (1933), regards a learner with age-appropriate and native-like control of all aspects of two languages as a bilingual. Much broader definitions have since been proposed, which resulted in incorporating different forms of bilingualism as follows (Diebold, 1964; Tabors & Snow, 2003): a) incipient bilingualism for those who are at the beginning of acquiring some aspects of another language; b) emergent bilingualism for those with a range of (developing) abilities in the two languages; c) balanced bilingualism for whose with equal competence in the two languages; d) at-risk bilingualism for those who have become dominant in the L2, accompanied by the loss of (especially productive) abilities in the L1. Allowing degrees in defining bilingualism thus reflects the notion that most bilinguals typically use two languages to different degrees and at different frequencies, depending on the context (school and home) and domain (speaking and writing), thus leading them to have varying degrees of proficiency in two languages (García, 2009, Meisel, 2004).

2.3.1 Dimensions of bilinguality and linguistics skills in focus

Hamers and Blanc (2000) highlight multi-faceted aspects of bilinguality, referring to it as the psychological state of an individual who has access to more than one language as a means of social communication. Hamers and Blanc (2000) classify these aspects in terms of psychological and sociological dimensions, reproduced as Table 1 (Hamers & Blanc, 2000, p. 26; see also García, 2009 for a review of different models of bilingualism).

It should be noted that the purpose of this section is not to thoroughly review or debate all the existing aspects of bilinguality, but rather to acknowledge its multidimensional and complex nature and also to position the current study within its complexity. In the current study, Dimensions 1 and 3 in Table 1 are of particular relevance in the following respects: a) the current study involves children of different school ages in differing language learning contexts and b) the bilingual groups concerned are tested in two languages, which could in turn shed some light on their relative competence in each language.

Another essential aspect of bilinguals' linguistic development is a distinction between receptive and productive abilities. Bilinguals with (only) receptive bilingual abilities may understand, read or interpret signs in more than one language, but are able to speak, write or produce signs only in one of the languages. Bilinguals with (only) productive bilingual abilities possess these productive skills in more than one language but the receptive skills only in one language (García, 2009; Tabors & Snow, 2003). In some cases, moreover, bilinguals possess oracy abilities (i.e., listening and speaking) in one of the languages and literacy abilities (reading and writing) in the other, or in different combinations, partly related to varying levels of their proficiency across languages. Such a varying nature of linguistic skills in bilingual children is also a consequence of social and political constraints (e.g., language practice, power, communicative needs) which exist in communities and societies (García, 2009).

Table 1. *List of dimensions of bilinguality (Hamers & Blanc, 2000)*

Dimension	Type of bilinguality	Comments/possible outcomes
1. relative competence in both languages	(a) balanced bilinguality (b) dominant bilinguality	LA/1 competence = LB/2 competence LA/1 competence > or < LB/2 competence
2. cognitive organisation	(a) compound bilinguality (b) coordinate bilinguality	LA/1 unit equivalent to LB/2 unit = one conceptual unit LA/1 unit = one conceptual unit 1 LB/2 equivalent = one conceptual unit 2
3. age of acquisition	(a) childhood bilinguality (i) simultaneous (ii) consecutive (b) adolescent bilinguality (c) adult bilinguality	LB/2 acquired before age of 10 LA and LB = mother tongues L1 = mother tongue; L2 acquired before 10 L2 = acquired between 11 and 17 L2 = acquired after 17
4. presence of L2 community in environment	(a) endogenous bilinguality (b) exogenous bilinguality	presence of L2 community absence of L2 community
5. social cultural status of the two languages	(a) additive bilinguality (b) subtractive bilinguality	LA/1 and LB/2 socially valorised → cognitive advantage L2 valorised at the expense of L1 → cognitive disadvantage
6. group membership and cultural identity	(a) bicultural bilinguality (b) L1monocultural bilinguality (c) L2 acculturated bilinguality (d) deculturated bilinguality	Double membership and bicultural identity LA/1 membership and cultural identity LB/2 membership and cultural identity ambiguous membership and anomic identity

The current study focuses primarily on the receptive and productive aspects of the children's linguistic skills as demonstrated through morphological and vocabulary tasks in English and Japanese. In doing so, the other relevant dimensions such as age of acquisition, language use at home and presence/absence of L1 support are incorporated as part of background statistics for the children and also to help to contextualise the findings obtained.

2.3.2 Variability within bilingual populations

Judging by the various definitions and classifications of bilinguals presented above, child L2 acquisition could indeed be considered as one form of bilingualism. In addition, what we call monolingual children (or adults) could technically be bilinguals (or multilinguals) if they know a few words in another language, with reference to the minimalist definition of bilingualism (i.e., being able to produce/understand a few words or sentences in a language other than an L1). This minimalist definition, however, does not help us to better understand the course and outcome of language development which is unique to each type of bilinguals, since it neither differentiates simultaneous from consecutive bilinguals nor these bilinguals from their monolingual peers (or, in the minimalist's term, bilinguals with knowledge of a few words in another language). In order to address this issue, in the current study, children who are learning the L1 in the L1 context (e.g., Japanese children receiving education entirely in Japanese in Japan) are termed monolinguals even though they may know a few words/phrases in (an)other language(s). These children are distinguished from bilingual children, who are further classified into two distinctive groups in terms of age of acquisition in the current study, as shown in Table 1: simultaneous and consecutive bilinguals (or child L2 learners), corresponding to JHL and ESL children respectively.

The importance of this classification lies in that it hypothesises substantial differences which may exist in a course of acquisition (e.g., linguistic environment at home or outside) and an ultimate attainment achieved in both languages between these types of bilinguals, and yet evidence of these matters from linguistic research involving different types of bilinguals is scarce (Meisel, 2004). An additional factor that contributes to better understanding this issue could be a comparison of linguistic performance in each language not only across different types of bilinguals (e.g., simultaneous bilinguals and child L2 learners) but also between these types of bilinguals and their monolingual peers within the same age range. This is not to advocate the view that monolingual acquisition should be the norm for bilingual development. Monolingual data will be used in an attempt to illuminate the relative status of bilinguals' competence in each language (e.g., balanced or less balanced) and the nature of vocabulary/morphological knowledge which is unique to each group (Hamers & Blanc, 2000).

2.4 Language assessment for bilingual children

Before commencing a review of empirical evidence of vocabulary knowledge or morphological awareness, it is worth discussing issues surrounding language assessment for children, especially the complexity and difficulty of assessing bilingual children with diverse linguistic and cultural backgrounds. The issues addressed below are intended to cover domain-general as well as domain-specific (i.e., vocabulary and morphological knowledge) issues. Issues specific to Japanese, especially the Japanese scripts, will be revisited and discussed further in the latter part of the chapter (Section 2.11.4).

2.4.1 Challenges of language assessment for school-age children

One of the greatest challenges faced by researchers (and practitioners) is to devise a 'one-size-fits-all' norm-referenced standardised measure which is appropriate for (all majority and minority) populations within an ethnically diverse country like the UK (Cheng, 1997; Sánchez, 2006; Stockman, 2000; De Lamo White & Jin, 2011). As highlighted in the notion of multicompetence (Cook, 1991; 2003) and also in the complexity of bilingualism (see Section 2.3), there is extensive heterogeneity in language knowledge and use within each type of learner, whether bilingual or monolingual, owing to the interaction of a variety of factors, including linguistic, socio-linguistic and socio-cultural factors. The complexity of the interplay between a child's developing language skills and his/her social and cultural environment is depicted in Bronfenbrenner's (1979) model of the ecology of human development, a theoretical framework commonly used in ethnographic studies on child language development (e.g., Cheng, 1997; Martin, 2009), as reproduced in Figure 1. Evaluating this model in detail is beyond the scope of the current study. However, a glimpse of this model, which places the child at the centre of multiple social subsystems, informs us of the interactive and complex ways in which both the direct (e.g., family and school) and indirect (e.g., educational and political systems) effects of each social subsystem shape the child's experience and language development. This model also implies that using standardised, knowledge-based assessment tools alone may lead to a limited understanding of children's developing language knowledge.

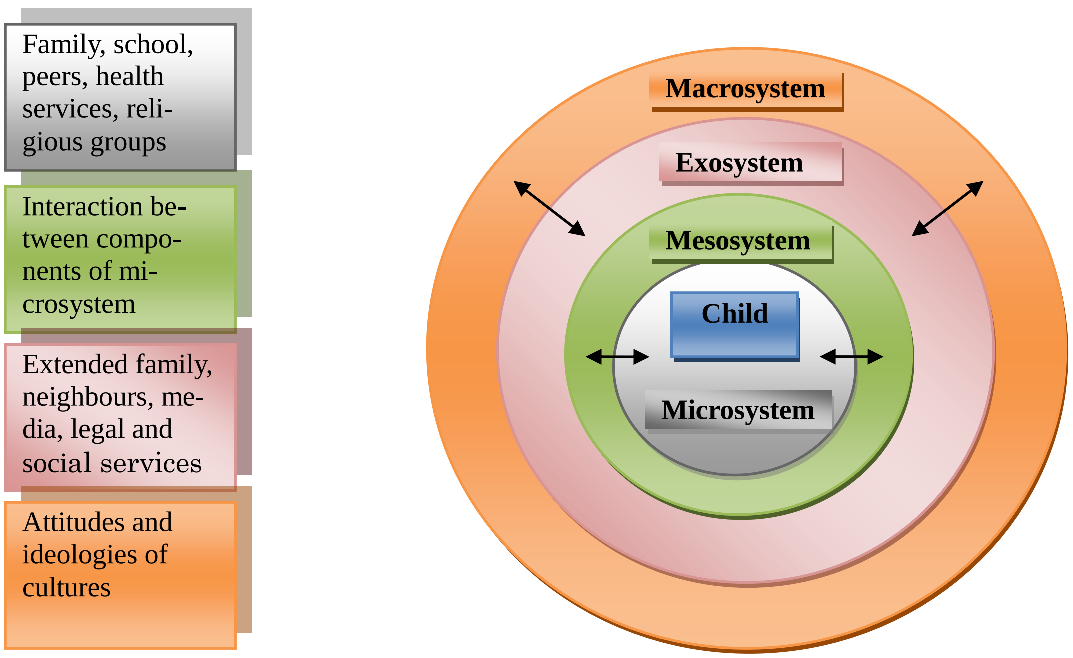

Figure 1. *Bronfenbrenner's ecology of human development*
(Bronfenbrenner, 1979; reproduced from Anderson & Van der Gaag, 2005; p. 91).

Assessing language knowledge in children is complicated also by the constantly developing nature of their linguistic and metalinguistic knowledge as they progress with formal, extensive literacy instruction through the school years. Therefore, a genuine picture of the nature of linguistic knowledge should be obtained via the use of a valid assessment tool which not only reduces the influence of external factors on performance but also captures the rate of, and/or the direction of change in language development. Faced with these challenges, researchers have begun to employ dynamic, process-oriented measures as alternative methods to, or in addition to static ones as exemplified by traditional knowledge-based standardised tests. Dynamic assessment attempts to measure children's potential for learning by focussing on the interaction between the assessor and the child and its influence on the performance and responsiveness of the child (Burton & Watkins, 2006; Hasson & Joffe, 2007; Peña, 2000). The theoretical grounding for this type of assessment is the notion of the zone of proximal development as defined by Vygotsky (1978, p.86) as follows:

'the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers.'

Incorporating into assessment adult-supported learning in the form of mediation or scaffolding, together with a heightened focus on the learning process, is considered to be less biased than knowledge-based standardised measures since the former minimises the role of the child's previous knowledge and experience with language (Campbell, Dollaghan, Needleman, Janosky, 1997; Peña, 2000). Other processing-dependent measures, including non-word repetition and fast-mapping tasks, are also designed to reduce such linguistic bias by tapping into degrees of efficiency with which children learn or access lexical items (Carey & Barlett, 1978; Kohnert & Kan, 2007). While they have their merits, dynamic, process-oriented assessment tools also have limitations. One issue is time constraints. Dynamic assessment is a time-consuming method, requiring the assessor to have intensive contact with the child, especially during the mediation learning phase – a phase during which the assessor or the more experienced collaborator teaches the principles of problem-solving strategies which underlie successful task completion (Peña, Iglesias & Lidz, 2001; De Lamo White & Jin, 2011). A second issue is the lack of established reliability and validity of the assessment procedures since assessors are free to modify their procedures according to the child (Hasson & Joffee, 2007). Although dynamic assessment, similar to other processing-dependent measures, helps to reduce linguistic basis by not relying solely on the child's previous experience with language, it may not perhaps be entirely free from such bias. Children with a higher language ability, including both monolinguals and bilinguals, appear to benefit significantly more from the mediation learning experience within a dynamic assessment framework than do those with a lower language ability (Peña, et al., 2001). A third issue is specific to the current research context, namely, the researcher's lack of qualifications as a clinician. Dynamic assessment is a tool commonly used by speech-language pathologists to serve as an aid in the accurate identification and initial diagnosis of language impairments and language learning difficulties in children. Extensive professional training would have been required if the researcher was to carry out this tool to a high standard, which was not feasible during the time scale of her doctorate.

2.4.2 Challenges of assessing bilingual children

Assessing language knowledge, including vocabulary and morphological knowledge, is a highly complex task, involving the use of multiple techniques appropriate for the target sample, together with a consideration of the interaction of wide-ranging factors which may exert a significant influence on the performance of children. An assessment procedure could become even more complex for bilingual children, especially when the cultural and linguistic diversity of these children needs to be taken into account. Adding to this complexity is the fact that there are no established standardised assessment tools or procedures to date which are appropriate and also unbiased for all ethnic groups of bilingual children in multicultural and multilingual communities, such as the UK (Peña, et al., 2001; Stockman, 2000).

One overarching challenge in language assessment for bilingual children is to remove assessment bias, specifically, psychometric and cultural bias (Carter, Lees, Murira, Gona, Neville & Newton, 2005; Peña, 2000; Teoh, Brebner & McCormack, 2012). Psychometric bias occurs when the assessment instrument lacks adequate representation of the target sample in the standardisation/norming sample and thus limits its predictive validity (Peña, 2000). The vast majority of available formal assessment tools are developed and standardised on a sample of English-speaking monolingual children (Teoh et al., 2012; Thordardottir, Rothenberg, Rivard & Naves, 2006). There is likely to be extensive variation in cultural and linguistic experiences exposed to a standardisation sample of monolingual children, in comparison to those exposed to bilingual children, such as EL1 children in comparison to EAL/ESL children in the UK context. In this regard, the use of monolingual-normed standardised measures for bilingual children could result in a less accurate interpretation of the results obtained and hence a less genuine profile of competence in the domain concerned. This issue has yet to be resolved satisfactorily by researchers, due to a lack of assessment tools which directly address the unique characteristics of linguistic knowledge in each type of bilingual child without reference to monolingual norms. One factor contributing to this persistent challenge is extensive heterogeneity within bilingual populations, which makes it difficult to recruit a relatively homogenous bilingual group, as required for the standardisation or validation of an assessment instrument (De Lamo White & Jin, 2011). Given the available assessment measures, recommended procedures for assessing bilingual children, although perhaps not ideal, remain to be the following: to test bilingual children in both their languages using tests developed originally for the respective monolingual samples and compare their performances to those of their monolingual peers of the same age and of comparable background (Thordardottir,, et al., 2006). An additional justification for these procedures is the converging evidence in the literature suggesting that bilingual children resemble monolingual children in terms of the order of acquisition of linguistic structures (e.g., grammatical morphemes) (e.g., Dulay & Burt, 1974; Jia & Fuse, 2007; Paradis, 2005) while also showing unique characteristics including code-switching and language transfer (e.g., Lindholm & Padilla, 1978; Genesee, 1989).

An additional area of bias worthy of discussion is cultural bias. One example of cultural bias is the use of stimuli which are unfamiliar to the bilingual sample and hence result in lowering their performance. Teoh et al. (2012), for instance, found that the performances of their bilingual sample in Singapore were somewhat lowered by the presence of culturally-biased pictorial stimuli from a UK-normed standardised measure (e.g., a mismatch between a target picture of a fireman with a yellow uniform and a yellow hat on and firemen in Singapore dressed in blue uniforms with red hats on). Cultural bias occurs also when the nature of the task is unfamiliar to the children. For instance, Peña and Quinn (1997) showed that Puerto Rican and African American children found it difficult to name pictures in the way required by the test, owing to their previous language experiences which made them better prepared to describe *functions* of objects, rather than name their labels using only one word. It is also possible that not all word meanings, especially meanings attached to a polysemous word, are consistent across linguistic communities. The meaning of words, such as *foot* (of person, of bed, of mountain) and *run* (person does, water does, colour does), could vary for people from different linguistic communities due to their community-specific cultural experiences (Stockman, 2000; Yule, 2006). Standardised tests which do not tap into degrees of knowledge and hence are unable to reflect culturally different ways of word learning, could, therefore, result in underestimating lexical knowledge in bilingual children.

Another important aspect of language assessment for bilingual children is a consideration of factors beyond linguistic factors, such as psychological (e.g., religion, cultural identity) and sociological factors (e.g., language input at home, language practice in the community, parents' socioeconomic status) (see Table 1 and also Section 2.3.1). These factors overlap, to some extent, with those identified as important factors for children in general, as discussed in Section 2.4.1. However, it is reasonable to assume that the nature of language assessment is more complex with bilingual children, especially when they embrace cultural and linguistic backgrounds which are different to those represented in the monolingnual population on which assessment tools are standardised.

2.4.3 Domain-specific issues with language assessment for children

2.4.3.1 Vocabulary knowledge

What specific issues should researchers take into account when attempting to obtain a comprehensive picture of the nature of vocabulary knowledge through assessment, on the basis of the discussion developed thus far? In the absence of all-encompassing measures of word learning ability (e.g., Stockman, 2000; De Lamo White & Jin, 2011), it is perhaps recommended that researchers employ multiple techniques, such as the use of static, knowledge-based standardised measures including the British Picture Vocabulary Scale (BPVS) and Peabody Picture Vocabulary Test (PPVT), in conjunction with more dynamic, processing-dependent measures. Longitudinal investigations, especially within an ethnographic design which takes account of multiple socio-cultural factors (Cheng, 1997; see also Figure 1), would not only add more detail to our understanding of children's developing vocabulary knowledge but also help to enhance the reliability and validity of the data collected. In doing so, heterogeneity within a sample needs to be reduced as much as possible by matching them, for instance, in terms of age, background characteristics (e.g., schools within the same catch-ment area and language input at home) and also socio-economic status (SES) (Thordardottir, et al., 2006).

When it comes to assessing vocabulary knowledge in bilingual children, extra care needs to be taken in ensuring that their performance will not be compromised by any assessment (especially linguistic and cultural) bias, as discussed above (Section 2.4.2). This is important particularly when these bilingual children are exposed to cultural (e.g., the presence of L1 community outside school) and linguistic experiences (e.g., language spoken at home) which are qualitatively different to the (monolingual) population on which the assessment tool was originally standardised. Another point of note is that even if the assessment tool comes with bilingual norms (as well as monolingual norms), it is not always the case that they are representative of all subgroups within the bilingual population. To take, as an example, the British Picture Vocabulary Scale (BPVS), it has been validated on an EAL population, however, Japanese ESL children in the UK constitute a minority L1 group, in comparison to South Asian language speaker groups (e.g., Punjabi, Urdu), and hence are still under-represented in this EAL normed sample. In this regard, it was necessary for all English and Japanese vocabulary tests used in the current study, including standardised measures with bilingual norms, to be pilot-tested on each group (ESL and JHL) of bilingual children (see Section 3.4 and 3.6 in Chapter 3 for a detailed description of each test and of the pilot phase, respectively).

2.4.3.2 Morphological awareness

The issues to be taken into account in assessing morphological awareness overlap, to some extent, with those with assessing vocabulary knowledge as discussed above. In the field of morphological research also, there persists a void of standardised morphological measures which are appropriate for both monolingual and all groups of bilingual children within a community. One way to overcome this would be to employ multiple techniques of data collection. Morphological awareness concerns the ability to identify morphemes and also includes the ability to appropriately use word-formation rules to construct inflectional and derivational items (Kuo & Anderson, 2006). As mentioned in Section 1.1.2 and discussed further in the latter part of the chapter, morphological awareness taps into explicit knowledge of morphological rules and is hence distinct from children's developing skills at using morphologically complex items in natural speech. Convincing evidence should, therefore, be obtained via a combined examination of morphological awareness and the acquisition of morphology (i.e., the development of morphological ability in natural settings), perhaps ideally within a longitudinal design.

Morphological awareness is, just like vocabulary knowledge, a multi-faceted concept and it involves an understanding of relational, syntactic and distributional aspects of morphemes in inflectional/derivational forms (Tyler & Nagy, 1989). Moreover, morphological awareness is intimately related to aspects of metalinguistic awareness, such as orthographic awareness, syntactic awareness and phonological awareness (Carlisle, 1995; Kuo & Anderson, 2006). Such close interrelations enhance difficulty in obtaining a pure measure of morphological awareness (Kuo & Anderson, 2006). One solution would be to administer multiple measures of metalinguistic awareness, separate from morphological awareness measures, in order to eliminate effects of these major confounding factors as much as possible.

An additional issue to be considered is specific to bilingual children, especially those who are learning an L2 which is typologically distant from the L1 and also differs in scripts and morphological systems (Japanese-English in the current context). As reviewed in detail in Section 2.10, an emerging body of evidence suggests that morphological awareness may be more strongly related to linguistic development (e.g., vocabulary and word reading) among morpheme-based L1 speakers (e.g., Chinese), in comparison to phonology-based L1 speakers (e.g., Korean). It is as yet unknown the extent to which this evidence holds for different groups of Japanese-speaking children. The two (out of three) Japanese scripts concerned in the current study each represent a different unit: morphemes in the former and moras (similar to syllable) in the latter. One consequence of this is that transparency of morphological clues inherent in a word can vary significantly, depending on how the word is presented:

a. *hiragana*-only items (opaque): consisting entirely of characters representing moras, e.g., くわし+ かっ + た /kuwashi + kat + ta/ “was detailed);

b. *kanji* + *hiragana* in combination (less opaque): morphological boundary becomes clearer due to the presence of kanji, a morpheme-based or semantic-oriented script, as in 考え + る /kangae + ru/ “to think”;

c. *kanji*-only items (transparent): Consisting entirely of morpheme-based or semantic-oriented characters, as in 不 + 親切 /fu + shinsetsu/ “ unkind”.

An additional challenge in measuring morphological awareness in the Japanese writing system is the absence of Japanese measures of morphological awareness of inflections and derivations developed for research purposes. As presented in Section 2.11, the existing body of work on Japanese morphology has been predominantly descriptive or theoretical (e.g., describing the mechanism of it) (e.g., Iwasaki, 2002; Shibatani, 1990, Tsujimura, 2007). Hence, it was obligatory for the researcher to develop new Japanese morphological measures for the current study, based predominantly on the existing theories of Japanese morphology and much less on directly relevant empirical evidence. The issues specific to the Japanese scripts are revisited and discussed further in Section 2.11.4, preceded by a description of Japanese morphology.

2.4.4 Summary

Drawing on the discussions developed thus far, one might reasonably argue that the approach taken to investigating vocabulary knowledge and morphological awareness in monolingual and bilingual children in the current study is far from comprehensive in the following regards.

The current study incorporates static (standardised tests and other experimental measures) assessment procedures only, rather than a combination of both static and dynamic assessment tools. In addition, bilingual children's cultural and linguistic backgrounds and their potential influence on performance are not systematically investigated (e.g., via a comprehensive background questionnaire or interview, or incorporating background factors as variables). Furthermore, a limited number of control variables (e.g., age and nonverbal IQ) were used. Therefore, potential effects of confounding (linguistic or non-linguistic) factors were not entirely eliminated and consequently the purity of the morphological measures used could not be claimed with confidence.

Despite these limitations, the current study has, as one of its key strengths, the ability to identify, within a framework of multicompetence, specific aspects of vocabulary knowledge and morphological awareness which may be unique to each group of bilingual (ESL and JHL groups) and monolingual (ELM and JLM groups) children and also to each language (English and Japanese). Such issues can only be illuminated by including multiple groups of children within a single study and also testing bilingual children in both languages in comparison to their monolingual peers of similar age and comparable background in terms of schooling (e.g., school type and areas in England). It should be noted that JLM children are significantly different to all the other three groups (ESL/JHL/ELM) in terms of educational backgrounds, as they follow the national curriculum specific to Japan. Therefore, no direct between-group comparisons are to be made in Japanese but their performances are analysed in order to examine any group-specific patterns therein. Furthermore, no claims are to be made about the full extent of the nature of vocabulary or morphological knowledge or any developmental patterns associated with it, due to the sole use of knowledge-based tests per language within a non-longitudinal design (see also Sections 1.1.1 – 1.1.2 and Chapter 3). The reader is, therefore, reminded that any results obtained in the current study will not be generalised as an absolute achievement in vocabulary and/or morphological acquisition, but as one piece of information about receptive and expressive knowledge of lexical meanings and the ability to recognise and produce morphologically complex items demonstrated by the participating children at the time of testing.

It is also to be reiterated that the current study is not aimed at providing the exact estimate of the number of words that a child knows (see Anglin, 1993 and Biemiller, 2005 for examples of vocabulary estimation studies) but on describing the nature of receptive and expressive vocabulary knowledge of lexical meanings amongst different groups of school-age children, together with the relationship between these aspects of vocabulary knowledge and morphological awareness. In order to reflect the focus sharply, the term *vocabulary knowledge* or *English/Japanese vocabulary* will be used throughout instead of *vocabulary size*, except when reviewing vocabulary estimation studies as given below.

2.5 Receptive and expressive vocabulary knowledge in school-age children

As stated at the beginning of Chapter 1, increasingly children around the world are receiving education entirely in an L2 while at the same time learning and developing their L1 outside L2 schooling. It is commonly observed at an early stage of schooling that the receptive and expressive aspects of vocabulary (i.e., word meanings) in child L2 learners typically differ substantially from their monolingual peers (Goulden, Nation, & Read, 1990). This initial difference is likely to be critical for child L2 learners and can make their subsequent L2 learning challenging. This is an important issue particularly as they not only need to develop L2 linguistic skills but also need to handle their school work in the L2, which involves learning in subject-matter areas, such as mathematics, science and social studies. Learning at school, furthermore, requires these children to fully develop both their receptive and productive linguistic skills, such as reading, writing, listening and speaking. In developing vocabulary, they also acquire words with their multiple dimensions, such as their phonological and orthographic representations, syntactic and morphological properties, which characterises their vocabulary learning as ‘a gargantuan task’ (Snow & Kim, 2007). For these academic purposes, child L2 learners will be compared academically against a ‘moving target’ represented by their monolingual peers who are also constantly developing their vocabulary knowledge (Cummins, 2000; Menyuk & Brisk, 2005).

An important question here is whether different aspects of vocabulary knowledge have equal weightings in these significant challenges in L2 vocabulary development. More specifically, do challenges associated with L2 vocabulary acquisition differ between aspects of vocabulary, such as receptive and expressive vocabulary? Questions of this sort have received a considerable amount of attention from researchers to date. Researchers have consistently identified asymmetric trajectories of vocabulary development between receptive and expressive vocabulary in L2 children in favour of the former, an issue reviewed in detail below. Another issue to be raised is that evidence from child learners of two typologically distant languages is still scarce, particularly in comparison to the wealth of evidence available from adult L2 learners (e.g., Hayashi & Murphy, 2011; Webb, 2008). It was hoped that the current study would contribute to making progress with this issue by investigating the nature of English and Japanese vocabulary knowledge amongst different groups of school-age monolingual and bilingual children.

2.5.1 Past vocabulary studies in school-age children

A large body of research consistently suggests that child L2 learners often lag behind their monolingual peers when tested on L2 vocabulary, while also lacking age-appropriate mastery (Bialystok, Luk, Peets and Yang, 2010; Camilleri & Law, 2007; Jean & Geva, 2009; Mahon & Crutchley, 2006; Vermeer, 2001). This pattern has been observed both in receptive and expressive vocabulary. Mahon and Crutchley (2006), for instance, investigated receptive vocabulary in children with English as an additional language (EAL) and their monolingual peers aged 4-9 years, using the British Picture Vocabulary Scale-II (Dunn, Dunn, Whetton, & Burley, 1997). The results indicated that monolingual children outperformed the EAL group in all age bands, although the older EAL subsample (7-9 years old) narrowed the gap significantly more than the younger one (4-6 years old), thus suggesting that age was playing a part in this catching-up process. This prevailing notion (i.e., monolinguals know more words than their bilingual peers) was recently corroborated by a study by Bialystok et al. (2010), which investigated receptive vocabulary in a much larger sample (1,738 children).

It appears that the lag in vocabulary growth may be more pronounced in expressive than receptive vocabulary in L2 children, and that reaching an age-appropriate level may be a slower process for the former than the latter, thus highlighting a special difficulty in L2 expressive vocabulary learning (e.g., Benedict, 1979, Golberg, Paradis, & Crago, 2008; Lugo-Neris, Jackson & Goldstein, 2010; Magiste, 1979). An early study by Mägiste (1979), for instance, found that the Swedish-German bilingual children's comprehension in the L2 (Swedish) developed faster than production, in comparison to their Swedish monolingual peers. This result was, however, based on reaction time, not accuracy in their performance. More recently, a longitudinal study by Golberg et al. (2008) showed that receptive vocabulary in the ESL children nearly reached the monolingual norm within three years of exposure. Golberg et al. also showed that, when compared to a monolingual sample from a different study (Watkins, Kelly, Harbers & Hollis, 1995) matched on the length (months) of exposure to English, the ESL group demonstrated greater lexical diversity in oral production at the average age of 7 years and 4 moths (just under three years from the start of the study). However, due to the lack of available monolingual normative data, it remained unclear whether or not the expressive vocabulary growth observed was at the age-appropriate level, as pointed out by

Golberg et al. An intervention study by Lugo-Neris et al. (2010) demonstrated that, while gains in receptive tasks were, overall, more robust than those in expressive tasks, providing L1 (Spanish) support through reading activities yielded higher scores in the L2 (English) expressive word-definition task than providing L2 instruction did. In addition, the participating children with a higher level of L1 proficiency demonstrated greater improvement in L2 vocabulary. This finding led Lugo-Neris et al. to suggest that the presence of rich L1 support environments in the L2 context may serve as a vehicle for L2 vocabulary expansion.

2.6 The dynamic relationship between L1 and L2 knowledge

2.6.1 The role of L1 in L2 knowledge

Theoretical issues embodied in the aforementioned vocabulary studies include the positive role of L1 knowledge in L2 development. This is consistent with the theoretical assumptions underlying bilingual development and education, especially the theory of Common Underlying Proficiency (CUP) (Cummins, 1984). The CUP theory hypothesises an interdependent relationship between the development of L1 and L2 verbal academic proficiency including vocabulary, such that conceptual understanding of L1 lexical items provides a facilitative knowledge basis for L2 lexical learning.

Another relevant theory proposed by Kroll and Stewart (1994) in their Revised Model of Bilingual Memory Representations incorporates both the *word association* (i.e., lexical associations between L1 and L2 words and access to concepts for L2 words through the L1) and *concept mediation* models (i.e., direct access to concepts both from L1 and L2). Kroll and Stewart's revised model takes into account asymmetric strengths of both lexical and conceptual links, depending on the level of L2 proficiency. In other words, the more proficient L2 learners become in the L2, the stronger the direct conceptual links from the L2 may become while the lexical link is still active between the L1 and L2. L2 learners at early stages of L2 learning typically rely more on lexical associations from the L2 to L1 where the conceptual link is stronger for the L1 than for the L2. The Kroll and Stewart model was based on the data from adult bilinguals (Dutch L1 and English L2). Hence, while, as in Cummins (1984), it highlights the important role of shared conceptual knowledge in L2 vocabulary development, the extent to which it applies to bilingual children has yet to be confirmed.

More recently, a similar view was put forward by Guglielmi (2008) who depicted the relationship between L1 proficiency and L2 reading ability in a longitudinal investigation of 899 limited-English-profile 8th graders in the US context, using confirmatory factor analysis and latent growth modelling. The results indicated that L1 proficiency predicted both initial L2 reading ability and gains in L2 reading skills (Grades 8-12), a finding which lends support to the notion of L1-L2 interdependent relationships, as proposed by Cummins (1984).

A point of note in Guglielmi's model is that the positive role of L1 proficiency both in concurrent and longitudinal reading development was only identified in the Hispanic subsample of the entire sample, whereas the relationship did not hold for the (Far East) Asian sub-sample. Thus, one could assume that the positive role of L1 proficiency in L2 acquisition may be language specific. Guglielmi attributed the lack of L1 influence in the Asian group in part to the lack of shared writing systems between English and their L1 (e.g., Chinese, Korean and Japanese). This explanation is questionable, however, since Guglielmi used a self-rating questionnaire as a single measure of L1 proficiency. Further investigation is necessary to confirm the role of L1 knowledge by testing participants both on their L1 and L2 using more objective and comprehensive measures of the linguistic area concerned.

2.6.2 The role of L2 in L1 knowledge

The role of L1 in L2 knowledge also leads to the question of the relationship in reverse, namely, the role of L2 in L1 knowledge (i.e., L2→L1). Research on L2→L1 effects is rooted in the notion of multicompetence (Cook, 1991, 2003), which encompasses different degrees (i.e., separation to integration) of both L1 and L2 knowledge in one mind, as reproduced in Figure 2. This notion suggests that bilinguals (and multilinguals) possess a distinctive nature of language use, knowledge in each language and minds, in comparison to their monolingual peers (Cook, 2003). The integration continuum in Figure 2 does not imply any directionality of L1-L2 influence. Nor does it apply specifically to a certain domain of language knowledge (e.g., syntax, phonology and vocabulary). It allows for varying degrees of integration across domains, hypothesising that a learner's lexicon, for instance, is highly integrated whereas phonology is separated between languages (Cook, 2003). The degree of integration varies, depending also on various other factors, such as motivation, preference, and levels of tiredness at the time of testing.

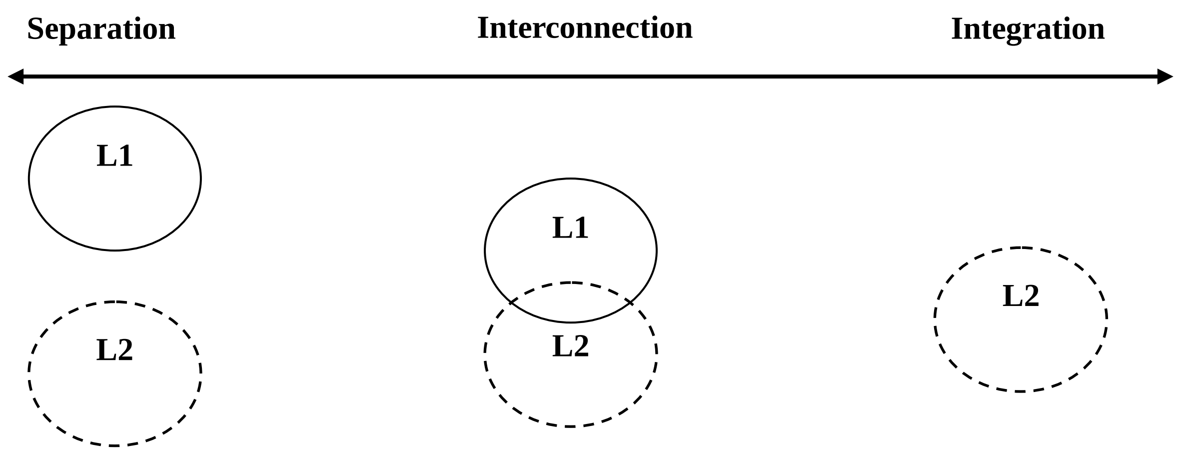

Figure 2. *The integration continuum of possible relationships in multicompetence.*
(Cook, 2003, p. 9)

The notion of multicompetence has motivated research on the effects of the L2 on the first (i.e., L2 →L1), which is relatively scarce to research on the other way around (L1→L2), consequently leading researchers to investigate these effects in terms of positive, negative or neutral effects (see Cook, 2003 for a review). In the context of bilingual children, the nature of L2 influence (e.g., advantageous or disadvantageous) on performance on L1 tasks may be manifested differently, depending on the type of tasks concerned (Biaystok, 2001b; Gathercole, Thomas, Jones, Guash, Young & Hughes, 2010). Bialystok (2001b) discusses this matter in terms of two cognitive processes —analysis and control (abbreviated as A/C henceforth). Bialystok puts forward the view that a bilingual advantage is confined to tasks which require high demands on controlling attention to specific aspects of a stimulus or mental representation. According to this view, tasks which require the analysis of representational structure via more formal or explicit knowledge are not necessarily solved better either by monolinguals or bilinguals. Studies which drew from the A/C model include one by Murphy and Pine (2003). Murphy and Pine investigated the influence of L2 knowledge on the representation of L1 knowledge in school-age bilingual children (L1 English and European languages as their L2). Murphy and Pine supported the A/C model by demonstrating that the bilingual group was similar to the monolinguals in terms of analysis (i.e., the level of explicitness in linguistic knowledge): the bilingual and monolingual groups performed comparably on a task which involved choosing the correct non-word inflectional (past tense) form in a short sentence. Bilingual advantages were identified, in contrast, in a lexical decision task, which involved focusing on the visually presented word while ignoring distracting clues (i.e., the aurally presented word and the drawing which did not correspond to the visual word). The bilinguals' performance on this task was comparable to the statistically older monolingual group, which Murphy and Pine attributed to their superior levels of attentional control.

What remains unclear as to the A/C model, at least explicitly, is the extent to which it takes into account potential variability in the nature of linguistic and cognitive abilities within bilingual populations. A question of particular interest is whether similar patterns of bilingual advantages would be identified between child L2 learners and simultaneous bilinguals. A study by Gathercole et al., (2010) is, to the researcher's knowledge, among the very few studies which investigated this issue in detail, in the context of Welsh-English bilingual English-

L1 monolingual children. The bilinguals were classified into three groups according to their language use at home: Welsh-only, English-only and Welsh-English. Gathercole et al. demonstrated that bilingual advantages differed across two executive function tasks (a Stroop task and a tapping task) and were also confined to a certain condition of the tasks. The Welsh-English group exerted an advantage over the other bilingual and monolingual groups in the hardest condition of the Stroop task, where the child was asked to name a font colour (e.g., *red*) used in the colour word presented as a stimulus (e.g., *green*). In addition, this bilingual advantage demonstrated by the Welsh-English group correlated with (English and Welsh) vocabulary knowledge, general cognitive abilities and their parents' socio economic status levels. Thus, the Gathercole study showed the nature of bilingual advantages which varied not only by task type but also as a function of different forms of bilingualism (e.g., balanced, or less balanced) together with other socio-economic, cognitive and linguistic factors. Such bilingual advantages as a function of balanced bilingualism could in turn be linked to the finding by Lugo-Neris et al. (2010) which showed a positive role of the better supported L1 on the development of L2 academic skills (see Section 2.4.1). Examining variation within bilingual populations by testing them in both languages could thus potentially illuminate the extent to which the relationship between L1 and L2 knowledge is reciprocal or independent in each type of bilinguals.

Accepting or refuting the models reviewed thus far (e.g., CUP, A/C model) is beyond the focus of the current study.[1] The theoretical assumptions of these models are still relevant and useful for offering a basis for better understanding the nature of the relationship between L1 and L2 knowledge in the bilingual mind and also the nature of linguistic knowledge mani-

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[1] Other relevant theories of L1 and L2 development in bilinguals include, for instance, the Unitary Language System Hypothesis (Volterra & Taeschner, 1978) and Separate System Hypothesis (Genesee, 1989), both of which have been the centre of debates primarily in early bilingual studies (e.g., infants and preschoolers). Other theories, which are in line with Cummins's CUP in particular, include the linguistic relativity hypothesis (different processes between languages) and common underlying rule system hypothesis, which have been investigated primarily in the context of narrative writing in bilingual children (e.g., Minami 2005).

fested differently across tasks, and also between different types of bilinguals and their monolingual peers. With respect to the multicompetence model, in particular, one would expect that the nature of Japanese/English vocabulary knowledge in ESL and JHL children would differ from that identified in Japanese/English monolinguals. Moreover, while L1 and L2 knowledge may be related, as embodied in Cummins's CUP, there is conflicting evidence to suggest that the lack of shared writing systems could prevent interdependent relationships from being established between languages, as observed in the Guglielmi study (2008). This potentially language-specific nature of L1-L2 relationships will be revisited and discussed further in Section 2.9.

The above review of vocabulary studies identifies the wealth of evidence of the nature of L2 vocabulary (English) relative to L1 vocabulary knowledge in school-age children, especially those learning two typologically similar languages (e.g., English-Spanish). More evidence is needed to extend our knowledge of this matter to the context of children learning two typologically distant languages which do not share writing systems. The current study set out to address this issue by involving children learning Japanese as an L1/HL(L2), as well as English as an L1/L2. To this end, a brief description of Japanese vocabulary and a review of relevant empirical studies are given below.

2.7 The nature of Japanese vocabulary knowledge in school-age children

2.7.1 Japanese vocabulary

Japanese vocabulary consists of the following four categories (Taylor & Taylor, 1995; Akamatsu, 2006): words of Japanese origin called *wago* (e.g., 川/kawa/ "river"); words of Chinese or Sino-Japanese words called *kango* (e.g.,学校/gakkō/ "school"); foreign words (mostly European with some Chinese words borrowed in modern times) called *gairaigo* (e.g., ホッチキス/hocchikisu/ "stapler"; マージャン/mājan/ "mah-jong"); and hybrid words called *konshu-*

go (e.g., 愛する /aisuru/ "to love" (kango + a verb and its ending of Japanese origin). The estimates produced by the National Institute for Japanese Language and Linguistics (NINJAL, 1962-64) show that, using word type as a criterion, *kango* constitutes the largest proportion of Japanese vocabulary (47.5 %), followed by *wago* (36.7%), *gairaigo* (9.8%), and *konshugo* (6.0%). The status of *kango* in Japanese is similar to that of Latin to English and *kango* are typically used to express abstract concepts often found in the literary language or academic vocabulary. There is a tendency, however, that foreign loan words have been increasing at the expense of *wago* and *kango*. In fact, by the 1980s, new words were comprised largely of *gairaigo* (57.6%), of which English words were dominant (Nomura, 1988). Once these words have been borrowed into Japanese, they become 'Japanised' with change in phonology (e.g., *strike* → /sutoraiku/), meaning (e.g., *stick* /sutekki/ → "(only used to mean) a walking stick") and word formation (e.g., *to copy* → kopii-suru) (Shibatani, 1990; Taylor & Taylor, 1995). Thus, despite the increasing proportion of English vocabulary absorbed into Japanese vocabulary, these two types of vocabulary show little resemblance to one another in terms of form, sound and meaning.

2.7.2 The writing system

The Japanese writing system consists of three different scripts: modified Chinese characters called *kanji* and two mora-based scripts called *hiragana* and *katakana*.[2] The two types of *kana* are parallel in the sense that in each type, there are a total of 71 *kana* characters consisting of 46 basic *kana* characters (5 vowels, 40 vowel-consonant combinations and one nasal sound /n/) and 25 *kana* characters with diacritics (i.e., voiced and semi-voiced vowel-consonant combinations). Each *kana* character represents one mora, namely, sub-syllabic rhythmic units

[2] There is another type of script called *romaji* written using the Roman alphabet. Romaji are used to a much lesser degree than the other scripts and are used especially for abbreviations such as *CD* and *NATO* (Iwasaki, 2002).

of approximately equal duration in speech. These units are also referred to as 'syllables' by researchers for convenience sake but they are, strictly speaking, different, as in けんか/kenka/ "row; quarrel" which can be decomposed into two syllables *ken-ka* and three morae *ke-n-ka* (see Akita & Hatano, 1999 for more examples; Morton & Sasanuma, 1992). Most children begin to name *kana* characters as early as four (Amano, 1986) and learn to read more than 60 out of the 71 *kana* characters before entering a primary school at the age of 6 (89 % of children in Shimamura & Mikami, 1994; 83 % in Sakamoto & Makita, 1973).

Although *kanji* originate from Chinese characters, Japanese and Chinese share very few linguistic features. One distinctive feature lies in phonology. During the course of adapting Chinese characters, the Japanese ignored Chinese phonology, which represents the tone features that play a role as allophones, and created their own phonological representations called on-reading and kun-reading (Akamatsu, 2006).[3] This resulted in the Japanese language accommodating a great number of homonyms. Contemporary usage of the scripts is characterised by the use of *hiragana* and *kanji* in combination in running text, whereas *katakana* are used primarily to write non-Chinese loan words. The respective use of mora-based *kana* writing (i.e., *hiragana* and *katakana*) and morpheme-based writing *kanji* is specified as follows (Coulmas, 1989): the former are used for function words, grammatical endings and particles, whereas the latter are for lexical stems. The primary school curriculum is designed to gradually introduce *kanji* after teaching *kana* writing. Under the current curriculum guidelines (MEXT, 2008), the children acquire 80 *kanji* by the end of the first school year and 1,006 *kanji* by the end of primary school education (i.e., Year 6). The children continue learning *kanji* in secondary (Years 7-9) and high schools (Years 10-12) and are expected to be literate in 2,136 *Jōyōkanji*, a set of *kanji* for common use specified by Ministry of Education, Japan

[3] These are two types of phonological representations that a majority of *kanji* possess: on-reading (i.e.,'sound' reading) derives from the original Chinese pronunciation (e.g., 車/sha/), whereas kun-reading ('meaning' reading) is based on the Japanese translation of the semantic component of the original Chinese character (e.g., 車 /kuruma/) (Akamatsu, 2006; Iwasaki, 2002).

(2010), by the end of secondary school education (i.e., the end of compulsory education in Japan). The development of *kanji* knowledge involves the continuous practice of reading and writing *kanji* both individually (e.g., drilling in a notebook) and in text, and thus plays a central role in vocabulary development during the school years (Akamatsu, 2006).

2.7.3 Japanese vocabulary knowledge in monolingual children

As is well documented in the context of English-speaking children as reviewed above, vocabulary development is a significant predictor of academic success also for Japanese-speaking children, correlated with a wide range of linguistic and cognitive skills (Takahashi, 1996; 2001). In addition, in vocabulary research with preschoolers and children in early primary school years (Years 1-2) in particular, the level of acquisition of *kana* characters before school entry is considered as an important predictor of subsequent vocabulary and literacy development (Akita, Muto, Fujioka & Yasumi, 1995; Takahashi, 1996). Takahashi (1996), for instance, carried out a longitudinal study with 69 (Japanese monolinguals) children who were tested twice during the preschool year and twice additionally during the first year of primary school. Takahashi demonstrated, through path analyses, that, at each round of testing, these children's vocabulary knowledge was associated with working memory capacity and was also a significant predictor of listening comprehension, which in turn had a direct effect on their reading comprehension. In a larger-scale longitudinal study, Takahashi (2001) tracked reading development in Japanese monolingual children from the preschool to the fifth year in primary school, and found that while the contribution of word (*kana*) reading skills to reading comprehension diminished as the children became older, vocabulary remained a significant predictor of reading comprehension across the years. In addition, vocabulary knowledge at preschool predicted reading comprehension a year later (e.g., Year 1) which in turn predicted vocabulary knowledge a year later (e.g., Year 2). Such relationships held from preschool to Year

5, thus highlighting a reciprocal, positive relationship between vocabulary knowledge and reading comprehension across school years.

While there is converging evidence supporting the importance of vocabulary knowledge in the literature, past research typically focussed on a single aspect of vocabulary knowledge, mostly a receptive understanding of lexical meanings (i.e., a word and its definition). Therefore, much has yet to be examined about how vocabulary knowledge in Japanese-speaking children is manifested across different aspects, for instance, through expressive as well as receptive tasks. Considering the multi-faceted nature of vocabulary learning (Snow & Kim, 2007), one would expect that, as identified in research on English-speaking children, the asymmetric nature of vocabulary knowledge may also be observed in Japanese-speaking children, and that the degree of asymmetry could be more robust in children learning Japanese as an L2 (or additional/heritage language) such as JHL children in this context. In light of this, one goal of the current study was to investigate the nature of Japanese vocabulary knowledge in Japanese language monolinguals (JLMs) in Japan, together with two groups of bilingual children, namely, ESL and JHL children in the UK context. To that end, the following section provides an overview of the literature on vocabulary knowledge in Japanese-English bilingual children, especially ESL children, due to a growing body of evidence derived from these populations. It is worth noting that the evidence reviewed below is context-specific and hence may not be generalised to different contexts, such as EFL (English as a Foreign Language) and immersion contexts (see Murphy, 2010, for a review).

2.7.4 Japanese vocabulary knowledge in bilingual children

As the number of Japanese children abroad has increased (MFAJ, 2011), an increasing amount of attention has been paid by researchers to bilingual development and education in these populations over the past few decades. One of the early studies by Shiba, Ōhama and

Noguchi (1980) investigated Japanese vocabulary knowledge in 400 Japanese ESL children in Years 1-9 in Canada, U.S., Australia and Switzerland. Shiba et al. found that Japanese vocabulary, as measured by a receptive test, was negatively correlated with the length of residence abroad, and that the rate at which Japanese vocabulary departed from the age-appropriate level was relatively slow for older children (Years 5-9) who had been abroad since around the age of ten. This led Shiba et al. to suggest that the critical period for the acquisition of L1 vocabulary may end approximately by age ten, thereby making it difficult for ESL children who had lived abroad since younger ages (9 or younger) to continuously develop Japanese vocabulary in the ESL context. Similar findings were obtained in later studies by different researchers, who suggested that Japanese ESL children whose onset of exposure to English started at ten years of age or older not only made more rapid progress with academic aspects of English proficiency (including vocabulary), but also continuously developed Japanese proficiency more adequately than children with younger ages of onset of exposure to English (before the ages of 8-9) (Cummins, Swain, Nakajima, Handscombe, Green, & Tran, 1984; Ono, 1994, 1995).

More recently, Minami (2002, 2003) tested Japanese ESL children of primary school age in the US context on their vocabulary usage both in English and Japanese, using the Bilingual Verbal Ability Test (BVAT) (Muñoz-Sandoval, Cummins, Alvarado, & Ruef, 1998). These children's vocabulary scores were highly correlated between languages. This led Minami to argue that increased vocabulary knowledge in one language could accelerate progress with vocabulary knowledge in the other language, thus suggesting a reciprocal nature of vocabulary development between Japanese and English. The use of a single measure (the BVAT) to measure both Japanese and English vocabulary knowledge may, however, limit the reliability of this result. Japanese vocabulary was measured via requiring the child to provide Japanese translations for the English test items. This method raises the issue that the set of

English test items may not necessarily correspond to the set of Japanese lexical items appropriate for the target age group. In other words, Japanese vocabulary scores obtained might not have been an accurate reflection of the children's vocabulary knowledge at the time of testing. As stated earlier in relation to the Guglielmi study (2008), a deeper understanding of the nature of L1 vocabulary knowledge relative to L2 should be achieved by testing bilinguals in each language, using an objective test which covers a range of age-appropriate vocabulary items for the relevant populations.

Ono (1994, 1995) suggests that receiving (week-day) school education in a single language at least during primary school years is essential for children's cognitive abilities to develop naturally. This suggestion was based on his examination of various cases of Japanese ESL children abroad whose language of instruction changed from L1 to L2 during primary school years (especially Years 3-4). These ESL children were found to be semi-lingual after several years, lacking age-appropriate mastery of vocabulary in both languages. This does not necessarily mean, however, that older ESL starters are always at an advantage over younger starters. The ultimate attainment of L2 (English) is typically higher for the latter, due to a shift in language dominance from Japanese to English over the years of residence in the L2 context (Shiba et al., 1980; Okamura-Bichard, 1985). A more recent study by Kataoka, Koshiyama and Shibata (2005) added to this by suggesting that the language dominance of ESL children who arrived in the ESL context between 7 and 9 years of age shifted from Japanese to English within as early as two years of exposure, despite receiving support in Japanese at a Japanese complementary school during that time.

The aforementioned studies thus suggest the positive role of established L1 vocabulary knowledge in the subsequent development of both L1 and L2 vocabulary knowledge, which fits well with the CUP model by Cummins (1984). In other words, one would expect that the high (or age-appropriate) level of Japanese vocabulary demonstrated by Japanese

ESL children in the L2 context could be attributed in part to the degree of Japanese entrenchment at the start of exposure to English and also perhaps continued support in Japanese. The findings from early ESL starters, in contrast, suggest that the less positive influence of early exposure to English on Japanese vocabulary development may be identified, such that Japanese vocabulary decreases and falls below the age-appropriate level at a fast rate, relative to the older starters. This could be due in part to a shift in language dominance. In other words, less established Japanese at the outset may lead to the early onset of a shift in language dominance to English, which may in turn expedite the erosion of Japanese vocabulary knowledge during residence in the L2 context (Shiba et al., 1980).

These assumptions could also be extended to the other bilingual group concerned in the current study, namely, JHL children (Japanese-English simultaneous bilinguals). Drawing on the evidence from younger ESL starters in the L2 context, one would expect that JHL children's English vocabulary may also be developing at the expense of age-appropriate mastery of Japanese vocabulary knowledge. Although these JHL children have been exposed to both languages since birth, English is established as the L1 or the more dominant language, being the language of instruction, which in turn limits their exposure to Japanese. It is, on the other hand, reasonable to assume that the extent of departure from an age-appropriate level may vary as a function of the Japanese socio-cultural environments outside school, such as Japanese support at a Saturday school and rich learning environments provided by their parents and members of the Japanese community (Okamura-Bichard, 1985). It should be noted that the effects of the socio-cultural factors as discussed thus far will not be investigated systematically (e.g., including them as variables) in the current study. These factors will be referred to for the purposes of contextualising any group-specific findings observed, especially when discussing the potential influence of L1 knowledge on the L2 and vice versa between the ESL and JHL groups.

2.7.5 Summary of vocabulary research findings and predictions

Past research on English vocabulary development in school-age children seems to be in agreement with the view that ESL children may experience greater challenges in developing expressive vocabulary at a level comparable to their moving target (i.e., age-matched monolingual peers). Receptive vocabulary, in contrast, seems to reach the moving target comparatively more quickly. Based on this converging evidence, one would expect that receptive vocabulary may be demonstrated to higher degrees than expressive vocabulary in ESL children when tested in English, and that between-group differences in vocabulary scores may be more evident on expressive vocabulary. What remains as yet unclear, however, is the extent to which this holds in the nature of Japanese vocabulary knowledge. While the important role of vocabulary knowledge in other linguistic and cognitive abilities has been well-documented, past research mostly investigated a single aspect (receptive) of Japanese vocabulary knowledge. Thus, further work needs to be carried out to examine the nature of expressive vocabulary relative to receptive vocabulary in Japanese-speaking children.

Significant challenges in the learning of L2 (especially, expressive) vocabulary faced by ESL children may be alleviated to some extent by well-established L1 knowledge and continued L1 support in the L2 context, thus representing interdependent relationships between L1 and L2 knowledge in bilingual children. What remains less understood, however, is whether the degree of interdependency, if any, varies within bilingual populations (ESL and JHL children in this context). ESLs and JHL children are two distinctive groups, especially in terms of language learning backgrounds (e.g., language use at home in a bilingual or Japanese family, and the amount of experience in schooling in Japan). One would expect that such differences in a course of acquisition could lead to a varied nature of receptive and expressive vocabulary demonstrated in each language between groups (Meisel, 2004). One could also predict that, in addition to the facilitative role of L1 in L2 development, the relationship in reverse — the influence of extensive exposure to the L2 on L1 knowledge — might also be observed in bilingual children. This prediction stems from Cook's (2003) integration continuum in Figure 2, which depicts that different degrees of L1 and L2 knowledge can coexist in the bilingual mind. This continuum also allows for a manifestation of the L1 ← L2 as well as L1 → L2 effects, depending on the linguistic domain concerned.

Despite the growing amount of interest in Japanese-English bilingual children in the literature, it is hard, at least in the public domain, to find studies which investigated the group-specific nature of vocabulary knowledge by including different types of Japanese-English bilinguals and a group of monolinguals within a single study. To reiterate, the current study is not targeted at providing the estimates of how many words a child knows, nor is it targeted, by including monolinguals, at confirming whether or not ESL/JHL children know fewer words than do English or Japanese monolinguals. The primary goal is to enhance our understanding of the characteristics of vocabulary knowledge which may not only vary between the monolingual group and bilingual groups but also be unique to each bilingual group. The latter focus is particularly important since, as encompassed in the notion of multicompetence (Cook, 1991; 2003), examining variation within bilingual populations should help us to better understand the particular characteristics of vocabulary knowledge in each type of bilingual children in their own right. In addition, testing these bilinguals both on the L1 and L2 by using objective measures of the domain concerned should allow for the examination of the influence of the L2 on the L1 and vice versa. The issues related to cross-linguistic influence will be discussed further in the context of morphological awareness, another component of word knowledge addressed in the current study.

2.8 The nature of morphological awareness in school-age children

Morphological awareness concerns the ability to distinguish and manipulate the structure of morphemes, the smallest meaning-bearing units in language, and includes the ability to construct inflectional and derivational forms by employing appropriate word-formation rules (Kuo & Anderson, 2006). Morphological awareness thus involves the conscious recognition and manipulation of morphological rules. In this regard, the ability to comprehend and produce morphologically complex items in natural speech can be considered as a type of morphological ability disctinct from morphological awareness within the scope of the acquisition of morphology, and this ability is not featured in the current study.

There are different types of morphemes in English and one essential distinction to be made is between roots, stems and bases. The stem is a basic morpheme to which inflectional suffixes are attached, such as *teach* in *teaches* and *teaching* (Katamba, 1993). The root constitutes the irreducible core part of the word (Katamba, 1993): the word *teachers*, for example, includes the inflectional suffix -*s* to which the stem *teacher* is attached, and this stem consists of both the root *teach* and the derivational suffix -*er*. A base is a root or stem to which affixes of any kind, inflectional or derivational, can be attached (Katamba, 1993). The word *disagreement* includes the base *disagree* to which the suffix -*ment* is attached. (*Agree* is the root). In the word *disagree*, *agree* can be a base to which the prefix -*dis* is attached, as well as the root of the entire word (Aronoff & Fudeman, 2005). Bases are referred to as stems only in the context of inflectional morphology (Katamba, 1993).

Morphemes can also be divided into two categories depending on whether they can stand as a word on their own or whether they must be attached to another morpheme. The former are referred to as *free morphemes*, whereas the latter are *bound morphemes*. To take the word *unhappily* for example, the *un*- and -*ly* are bound morphemes as they cannot stand as a word by themselves, whereas the root *happy(i)* is a free morpheme since it does not require any additional morpheme in order for it to stand as a word on its own. Bound morphemes can further be divided into inflectional and derivational morphemes, a distinction of particular relevance to the current study.

2.8.1 An awareness of inflectional morphemes

Inflectional morphemes function in such a manner that they modify the form of a word within the same syntactic category, such as *cat* → *cats* and *walk* → *walked*, without changing the core lexical meaning (Katamba, 1993). The manner in which a stem is inflected is determined by its syntactic environment, and through inflection, morphosyntactic features, such as number, tense, aspect and case, are expressed (Aronoff & Fudeman, 2005).

One of the best known studies (and also perhaps the most influential in subsequent morphological research) on L1 children's use of morphemes is one by Berko (1958). In this study, 4- to 7-year-old children were presented with a nonce word (e.g., *wug),* together with drawings of bird-like creatures, and were asked to generate its plural form (e.g., *wugs).* Children in Berko's study consistently applied the English plural (and past tense) inflection onto these words, despite the fact the children would have had no way of knowing the words' plural or past tense forms by virtue of the fact they were nonce words. Berko interpreted this finding as an indication that children made a connection between the form and meaning of these nonce words, applying a rule-based procedure in generating the plural inflection.

Children, while acquiring inflectional morphemes, make developmental errors such as over-regularising or over-generalising inflections, such as, *breaked* and *broked*. Considering that children do not hear these forms in the input in general, one might argue that, at an early stage of language development, whether in L1 or L2, they apply the same rule to both regular and irregular forms, identifying both *break* and *broke* as two separate stems (Clark, 1998). This pattern of errors could also be linked to the degree of morphological transparency inherent in regular and irregular forms. The irregular form *broke*, for instance, conveys linguistic information in a morphologically covert way: the boundary between a stem and its suffix is more obscured than the regular form *walked* (the verbal stem *walk* + the past tense inflection -*ed*). Thus, it is perhaps difficult for children to combine the morphological relationship (i.e., *break* → *broke*) with the meaning that they have mapped onto the irregular form.[4] Such difficulty could also be linked to a body of evidence suggesting that children, in both L1 and L2, acquire the more core or basic (prototypical) grammatical morphemes at early stages of morphological development (Clark, 1987; Shirai, 1993; Shirai & Kurono, 1998). For instance, regular forms are acquired earlier than irregular ones in English and the past-tense inflection -*ta* for achievement verbs (e.g., *reach*) acquired earlier than -*ta* for state verbs (e.g., *see*) in Japanese (see Li & Shirai, 2000 for review).[5] The current study is not targeted at investigating the order of acquisition of grammatical morphemes. However, a glimpse of this line of research offers a useful insight that it is a prerequisite for children to engage in morphological analyses by making a connection between the form and meaning of a word, while using their (implicit) knowledge of stems and inflectional suffixes. It is reasonable to assume that these morphological analyses are similar to analysing derivational forms.

2.8.2 An awareness of derivational morphemes

English derivational morphemes include both class-maintaining and class-changing affixes (Koda, 2000). Class-changing derivational affixes form new words by altering the syntactic category (e.g., *happy-happiness)*. Class-maintaining derivational affixes, in contrast, repre-

[4] See Pinker (1999) and Daugherty and Seidenberg, (1994) for psycholinguistic accounts of the mental representation and processing of regular and irregular forms.

[5] Research on the order of acquisition of grammatical morphemes in English, for example, suggests that, consistent with L1 children, child L2 learners, regardless of L1, typically acquire non-tense related morphemes early (e.g., progressive -*ing*, simple plural -*s*), followed by tense-related morphemes (e.g., third-person -*(e)s*; regular past tense, and irregular past tense) (e.g., Brown, 1973; Dulay & Burt, 1974; Jia & Fuse, 2007; Paradis, 2005).

sent the formation of new words without changing the syntactic category (e.g., *happy-unhappy*), while changing the meaning of the base. In addition, there are other properties that add to morphological complexities in derivational forms, including phonological (e.g., stress shift) and orthographic changes (e.g., vowel change). To take the derivation *history* → *historical* for example, the former undergoes stress shift and orthographic change together with a change in its overall syntactic category. Another illustrative example is *sane* → *sanity*, a derivation which represents phonological change in the stress and orthographic change (*e* → *i*), in addition to a change in syntactic category (Menyuk & Brisk, 2005). It should be noted that these examples are not exhaustive and there are other ways of defining morphological complexities, such as the number of morphemes inherent in words (Anglin, 1993): monomorphemic (e.g., *talk*), bimorphemic (e.g., *talking*) and multimorphemic (e.g., *talkativeness*).

Past research suggests that the mastery of morphological derivations takes place later than that of morphological inflections (Berko, 1958; Clark, 1998). Children acquire morphological derivations by learning morphologically simple or transparent words to start with, followed by learning more morphologically complex, opaque words. Major gains in an awareness of morphological derivations are achieved over a long period of time, beginning in middle childhood and continuing through adolescence (Anglin, 1993; Carlisle, 1988, 2000; Carlisle & Fleming, 2003; Mahony, 1994; Mahony, Singson, & Mann, 2000; Singson, Mahony, & Mann, 2000; Tyler & Nagy, 1989). Evidence suggests that children's developing morphological awareness across school years is characterised more markedly by their ability to produce derived words than to recognise the relationship between a base and its derived word (e.g., Carlisle, 2000; Carlisle & Fleming, 2003). Moreover, it is productive use of derivations, not receptive (i.e., decomposing a word into morphemes), that was predictive of the children's ability to define morphologically complex words (Carlisle, 2000). Carlisle (2000) explained this relationship by suggesting that producing derivational forms requires knowledge of both semantic and syntactic roles of the affixes, as well as the meaning of the base morpheme. In this respect, these processes are more similar to the processes of demonstrating lexical meanings than those involved in morphological decomposition are. Duncan, Casalis and Colé (2009) argued for a special difficulty in producing morphologically complex items over recognising morphemes in terms of the production task tapping into a more explicit level of morphological awareness, thus placing greater metalinguistic demands on these children. Hence, considering both morpheme recognition and production is important in that it adds a more detailed picture to our understanding of the nature of morphological awareness in children.

The importance of morphological awareness has been well-documented also in the context of literacy development (e.g., reading and writing). Research suggests that knowledge of relational (teach → teacher, me → meter*) and syntactic properties (e.g., *-ise* (legalise) as a verb-forming suffix) of derivational forms, which develops across the school years (Grades 3-6), made an independent contribution to reading ability above and beyond vocabulary and phonological awareness (Mahony et al., 2000; Singson et al., 2000) and verbal short-term memory (Singleton et al., 2000). Moreover, degrees of morphological accuracy in the written compositions of children increased with age (Carlisle, 1996) and higher degrees of morphological accuracy demonstrated in narrative writing were associated with higher spelling and reading scores amongst school-age children (Green, McCutchen, Schwiebert, Quinlan, Eva-wood & Juelis, 2003). Thus, morphological awareness could be considered as a type of word-specific knowledge critical for academic success in school.

Developing morphological awareness is not a linear process: the idiosyncratic nature of morphological derivations, in particular, poses significant challenges not only on L1-English monolingual children but also on L2 children (Kieffer & Lesaux, 2008). These challenges may be greater particularly for those who may draw upon an L1 which represents different orthographic properties from English (e.g., Korean Hangul, as in Wang, Koi & Choi, 2009). Nevertheless, as reviewed above, the majority of the existing evidence derives from L1-English studies and much less is understood regarding the nature of morphological awareness and its relationship with vocabulary (or any other aspects of linguistic) knowledge in the context of L2 children, especially those learning two typologically distant languages (Pasquarella, Chen, Lam, Luo & Ramirez, 2011). The current study addresses this gap of understanding by carrying out both within-language and cross-linguistic investigations of English and Japanese morphological awareness (inflections and derivations), in relation to vocabulary knowledge, in different groups of bilingual and monolingual children. Issues with cross-lingusitic influence – the nature of L2 morphological awareness in relation to L1 knowledge and vice versa – will be discussed further in Section 2.10. In what follows, morphological awareness is further discussed in relation to vocabulary knowledge, an association to be addresssed in the current study.

2.9 Morphological awareness in relation to vocabulary knowledge

It is reasonable to assume that increased morphological awareness, which includes knowledge of both inflectional and derivational forms of a word, allows learners to have access to more members of a word family (consisting of a root form and its inflections and derivations) and hence coincides with vocabulary growth (Schmitt & McCarthy, 1997). A large body of evidence in the literature lends support to this assumption by demonstrating positive correlations between morphological awareness and vocabulary knowledge in English-speaking monolingual (e.g., Anglin, 1993; Bowers & Kirby, 2010; Tyler & Nagy, 1989; McBride-Chang et al., 2005b) and bilingual children (e.g., McBride-Chang et al., 2006; Wang, Cheng & Chen, 2006). Anglin (1993), for instance, found that 1st-graders' vocabulary estimates were characterised by the largest number of root words, followed by the number of inflected words. By the 5th grade, vocabulary size consisted of the largest number of derived words, thus highlighting a rapid increase in knowledge of derivational morphemes during the school years. 5th-graders' vocabulary growth was, moreover, characterised by their increased knowledge of multi-morphemic words (e.g., *talkativeness*), although bi-morphemic words (e.g., *talking*) still accounted for the largest proportion of their vocabulary size. These findings led Anglin to suggest that vocabulary knowledge develops with age during the early and middle school years, when children develop their abilities to analyse multi-morphemic words into components and discern lexical meanings.

More recently, Bowers and Kirby (2010), who conducted a 20-session intervention on morphological word structure, used a Morphological Vocabulary task to assess children's skills at identifying the root of morphologically complex items and explaining their meaning. These methods (i.e., morphological problem-solving and morphological vocabulary) are significant in that they allowed for the examination of children's ability to map meanings onto affixes as well as their root. One could, however, argue that these children's understanding of the internal structure of those items was not fully demonstrated, since only the root was required to be explicitly identified. An additional feature to be added to the task would be to explicitly elicit both a root and its affixes through morphological analysis. This feature should provide a more detailed picture of children's morphological awareness, specifically their awareness of the structure of morphologically complex items.

The role of morphological awareness in vocabulary development has been researched in various languages ranging from alphabetic (e.g., English and Spanish) to non-alphabetic scripts (e.g., Chinese characters and Korean Hangul) (Mann, 1986; McBride-Chang, Cho, Liu, Wagner, Shu, Zhou, Cheuk & Muse, 2005a; McBride-Chang, Tardif, Cho, Shu, Fletcher, Stokes, Wong & Leung, 2008). McBride-Chang et al. (2005a) provide evidence to suggest that morphological awareness may be more important for children with a morphographic L1 (e.g., Chinese) than those with a phonographic L1 (e.g., English) in recognising words. This suggests that the role of morphological awareness in vocabulary development may be language-specific. Mann (1986) identified a similar language-specific role in the context of phonological awareness in Japanese-speaking and English-speaking children in Japan and the US respectively. Mann found that an awareness of phonemes was demonstrated to higher degrees by the American children, whereas the Japanese children obtained higher scores on a mora deletion task than did the American children on the English equivalent of the task (a syllable deletion task). This led Mann to suggest that degrees of metalinguistic awareness could be dependent on the nature of children's experience of learning to read the orthography of each language. Drawing on this finding, together with the body of evidence on morphological awareness as reviewed above, one could assume that the role of morphological awareness in vocabulary knowledge could be language-specific in nature between English and Japanese due to a varied nature of reading experience across orthographies. It is, however, perhaps too hasty to predict the relative importance of morphological awareness in Japanese to English, since both language represent a morpho-phonological structure in their orthography. (*Kana* orthography in Japanese is phonology-based and represents moras, whereas *kanji* is morphology-based). One goal of the current study is to shed some light on this issue by investigating an association between morphological awareness and vocabulary knowledge via both within-language and between-languages statistical models (i.e., multiple regression models). This issue will be revisited and discussed further in Section 2.10.

2.9.1 Summary of morphological awareness studies

The body of research presented thus far has fallen short of evidence of different aspects (e.g., recognition and production) of morphological awareness and their relations to vocabulary knowledge among L1 and L2 children. As suggested by Duncan et al. (2009), completing productive tasks requires higher levels of metalinguistic demands, thus posing greater challenges on children. In addition, the ability to produce morphologically complex items could be more closely related to vocabulary knowledge, due to its processes being more analogous to demonstrating vocabulary knowledge than those involved in recognising morphemes, as argued by Carlisle (2000). Vocabulary growth could be associated with an enhanced awareness of the structure of morphemes – an aspect of morpheme recognition, as suggested by Bowers & Kirby (2010). However, an improved measure of morpheme recognition would be necessary to confirm this association so that it would require an explicit identification of all types of morphemes inherent in a word, including both affixes and their root.

The varied nature of the relationship between morphological awareness and vocabulary knowledge across recognition/comprehension and production has been identified in adult L2 studies (e.g., Hayashi & Murphy, 2011; Webb, 2005, 2008). It has yet to be determined, however, whether such a relationship, which might be relevant to adult L2 learners, is also explanatory for different groups of bilingual children (ESL and JHL children in this study) and also their monolingual peers. Adult learners, who possess greater cognitive maturity, are typically better at completing tasks that require higher degrees of metalinguistic awareness than school-age children whose cognitive maturity is still developing. By considering different aspects of each knowledge type, therefore, the current study is capable of digging deeper into the nature of the relationship between morphological awareness and vocabulary knowledge which is particularly relevant to child monolinguals and bilinguals.

2.10 Morphological awareness from a cross-linguistic perspective

In view of the notion of multicompetence, bilingual children are distinguishable from their monolingual peers in that the former possess morphological knowledge of their L1 as well as L2, perhaps with varying degrees of integration between languages and also of explicitness in each language. It is conceivable that there is also variability in the nature of linguistic knowledge within the bilingual populations of interest. One contributing aspect to such variability is that, in comparison to simultaneous bilinguals (JHL children in this context), ESL children possessed more established L1 knowledge at the outset of L2 learning, although it was probably not as entrenched as L1 knowledge in adult L2 learners (Nicholas & Lightbown, 2008; Philp et al., 2008). Such varying degrees of strength in L1 as well as L2 knowledge among bilinguals could influence the nature of morphological transfer differently across groups. The current study was designed to investigate this issue in the statistical sense, (a practice commonly exercised in educational psychology or psycholinguistic research); namely, evidence of transfer was interpreted as such when unique variance in an outcome variable in one language was explained by a between-language predictor in a regression model, over and above within-language predictors (Wang, Ko & Choi, 2009).

2.10.1 Transfer of morphological awareness

Research on children learning English as a foreign (EFL) and/or second language (ESL) reveals that the degree of shared morphological features between two languages may determine the degree of transferability of morphological awareness and not typological distance per se. In other words, the more similar morphological features are, the more positive transfer may occur (e.g., L1-Spanish and L2-English in Hancin-Bhatt & Nagy, 1994; L1-Hebrew and L2-English in Schiff & Calif, 2007) and conversely, the more different, the more limited morphological transferability may become (e.g., L1-English and L2-Arabic in Saiegh-Haddad & Geva, 2008).

Similarities/differences in morphological systems could also influence the direction of transfer, i.e., L1 → L2 or L2 → L1 (unidirectional) or L1 ⇔ L2 (bidirectional, or reciprocal). Ramirez, Chen, Geva and Kiefer (2010), for instance, investigated cross-linguistic contributions of morphological awareness in Spanish-speaking English Language Learners (ELLs) in the late primary school years, using two measures (morphological structure and production) of English and Spanish derivational morphology. The results showed that the productive measure of Spanish morphological awareness was a strong predictor of English word reading after controlling for nonverbal IQ, vocabulary, phonological awareness and English morphological awareness. However, English morphological awareness did not predict Spanish word reading, which Ramirez et al. explained by suggesting that morphological transfer tends to occur from a language with more complex morphological systems (Spanish in this case) to the other with less complex systems (English).

The unidirectional nature of transfer has also been observed in the context of Chinese-English bilingual children, two languages which share similar morphological features in compounding. Wang, Cheng and Chen (2006) demonstrated that English morphological awareness was a significant predictor of Chinese character reading and reading comprehension in Chinese ESL children in the U.S. context. Transfer in the other direction (Chinese → English) was not observed, however. Wang et al. attributed this unidirectional transfer to the enhanced degrees of the children's metalinguistic awareness in English and a shift in language dominance from Chinese to English.

More recently, Pasquarella et al. (2011) investigated morphological awareness of compounding in Chinese and English among Grades 1-4 bilingual children in the Canadian context. When the contribution of morphological awareness to vocabulary was examined via structural equation modelling, reciprocal relationships (i.e., Chinese ⇔ English) were identified between English morphological awareness and Chinese vocabulary. This result not only suggests the influence of L2 morphological awareness on L1 reading skills (English → Chinese) but also the interdependent relationships between L1 and L2 academic proficiency, as captured in the CUP by Cummins (1984). Pasquarella et al. note that these reciprocal relationships should be viewed as preliminary evidence because of the use of cross-sectional data, rather than longitudinal data. Another issue to be pointed out is that they compiled a Chinese vocabulary test by directly translating some of the English items in the Peabody Picture Vocabulary Test (PPVT, Dunn & Dunn, 1997) into Chinese. English items from the PPVT are not necessarily reflective of age-appropriate vocabulary in Chinese (or any other language). Hence, the development of a more valid L1 vocabulary measure for children should be carried out to further investigate the nature of a cross-linguistic relationship between morphological awareness and vocabulary knowledge.

One way of expanding on the aforementioned studies could be to look at different aspects of morphological awareness in bilingual children by testing them both in their L1 and L2. Research which used a wide range of measures that tap into both inflectional and derivational morphology in both languages is particularly limited to date (Deacon, Wade-Woolley & Kirby, 2007). Considering the varied nature of derivational and inflectional morphology (especially in terms of richness in number and variety), one might reasonably assume that, when both inflections and derivations were taken into account, cross-linguistic contributions of morphological awareness might qualitatively differ from those found in the aforementioned studies.

2.10.2 Influence of different scripts on morphological transfer

The non-exhaustive overview of cross-linguistic morphological research, as presented above, featured various pairs of two languages ranging from typologically similar (e.g., English - Spanish) to distant (e.g., Chinese - English; Hebrew - English). What remains as yet unclear is the potential impact of learning languages with different scripts on the nature of morphological transfer. As briefly touched upon in Section 2.8, evidence from within-language studies suggests that the role of morphological awareness in vocabulary knowledge may be L1-

orthography (or script) specific (McBride-Chang et al., 2005a). In addition, the nature of metalinguistic awareness could be dependent upon children's experience with the orthography (Mann, 1986). Extending these findings to the context of cross-linguistic transfer, one could postulate that such an L1-orthgraphy specific nature may manifest itself as non-transferrable between languages. Alternatively, there could be a threshold of the quality of experience with each writing system, above which morphological awareness becomes transferrable between languages despite the lack of shared scripts. The current study was not designed to specify such a threshold but to investigate the degree of transferability between Japanese and English morphological awareness in two different types of bilinguals who were exposed to each writing system to varying degrees. In this way, this study could expand on the within-language studies and offer insight into potential variability in the nature of morphological transfer as a function of the quality of experience with the English and Japanese writing systems. To that end, a brief overview of Japanese morphology is given below.

2.11 Japanese morphology

Japanese lacks pauses both in its written and spoken forms. Therefore, clues to identify words in a sentence are available to a much lesser degree than those in written or spoken English, as illustrated below:

花子は本を 2 冊読んだ。
Hanako read two books.

One piece of information that a speaker/writer relies on (whether implicitly or explicitly) for identifying where and what the words are in the sentence is morphological information, which involves knowing the meaningful component(s) of words. A speaker/writer, for instance, must know that は /wa/ and を /wo/ serve as particles (a type of grammatical morphemes), respectively indicating the subject of the sentence and the object towards which the relevant activity (to read) was directed. Furthermore, a speaker/writer must know that 読んだ /yonda/ denotes the act of reading which took place in the past, due to its morphological constituent, more specifically, the voiced past-tense marking suffix だ /da/. These morphological processes interact with phonology, semantics and syntax, indicating that, as in English, morphological knowledge plays a crucial part in the development of word knowledge in Japanese.

Japanese is an agglutinative language in the sense that it involves gluing morphemes together by using both prefixes and suffixes as a common word formation process (Iwasaki, 2002; Shibatani, 1990; Tsujimura, 2007).[6] In addition, as in English, inflectional and derivational affixes are the types of affixes found in Japanese morphology. Japanese morphemes can be further broken down into four categories (Tsujimura, 2007): Native (morphemes of Japanese origin), Sino-Japanese (morphemes of Chinese origin), Mimetic (e.g., /kira-kira/ (sparkling); /wan-wan/ (bow-wow)) and Foreign (morphemes of non-Chinese origin). This section focuses particularly on the first two, as they comprise major parts of Japanese vocabulary (Coulmas, 1989; Taylor & Taylor, 1995). It also provides a non-exhaustive description of a variety of inflections and derivations found in the conjugation paradigms of syntactic categories, such as nouns, verbs, adjectives, adverbs, adjectival nouns (or nominal adjectives) and verbal nouns (or nominalised verbs) (see Shibatani, 1990 and Tsujimura, 2007 for a more comprehensive overview of Japanese morphology).[7]

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[6] It is worth noting that no language can be neatly classified into a single type (e.g., isolating, agglutinative and fusional) and hence this classification only reflects the dominant characteristics that determine the way in which words are formed in Japanese (Katamba, 1993; Shibatani & Bynon, 1999). Japanese is considered agglutinative also in the sense that case particles (e.g., -ga, -wa, -o) are glued together with their accompanying nouns to denote the grammatical functions of these nouns in a sentence (i.e., Taroo-*wa* (topic marker) Jitensha-*o* motteinai /Taro does not have a bike/ (Tsujimura, 2007; Lincoln, 2004).

[7] Adjectiveal nouns and Verbal nouns, two unique syntactic categories in Japanese, are characterised by their dual behaviour both as adjectives and nouns, and as verbs and nouns respectively.

2.11.1 Japanese inflectional suffixes

As with English inflectional suffixes, Japanese inflectional suffixes represent variants of a word within its syntactic category. Inflectional morphemes are well represented in verbal and adjectival conjugations in Japanese. Verbal inflectional suffixes are classified into six termination suffixes, whereas adjectives are divided into three termination (*nonpast*, *volitional* and *past tense*) and three connective inflectional suffixes (*conditional*, *hypothetical* and *conjunctive*). Nonpast and past tense, which were featured in the morphological tasks used in the current study, are two highly productive classes among others in both verbs and adjectives, as in the examples given in Tables 2 and 3 (see Iwasaki, 2002 for more examples and Shibatani, 1990 for different theoretical models of inflectional verb morphology).

Table 2. *Japanese verb and adjective morphology*

Verbs	**VR verb**	**CR verb**	**Irregular verbs**	
Function	to eat	to drink	to do	to come
Nonpast ***-(r) u***	*tabe-ru*	*nom-u*	*su-ru*	*ku-ru*
Volitional *-(y)oo*	*tabe-yoo*	*nom-oo*	*shi-yoo*	*ko-yoo*
Imperative *-e/ro*	*tabe-ro*	*nom-e*	*shi-ro*	*ko-i*
Past ***(i)-ta***	*tabe-ta*	*non-da*	*sh-i-ta*	*k-i-ta*
Polite *(i)-mas-*	*tabe-mas-*	*nom-i-mas-*	*sh-i-mas-*	*k-i-mas*
Evidental *(i)-soo*	*tabe-soo*	*nom-i-soo*	*sh-i-so*	*k-i-soo*

* VR: verb root; CR: consonant root

Table 3. *Japanese adjective morphology*

Adjectives	**Big /ookii/**		**Expensive /takai/**	
Function	Root + IS		Root + IS	
Nonpast ***-i***	*ooki-i*	It is big	*taka-i*	It is expensive
Evidental *-soo*	*ooki-soo*	It seems big	*taka-soo*	It seems expensive
Past ***-kattta***	*ooki-katta*	It was big	*taka-katta*	It was expensive
Conditional *-kattara*	*ooki-kattara*	If it is big	*taka-kattara*	If it is expensive
Hypothetical *-kareba*	*ooki-kereba*	Provide it is big	*taka-kereba*	Provide it is expensive
Conjunctive *-te*	*ooki-(ku)-te*	big and	*taka-(ku)-te*	expensive and

* IS: Inflectional suffix

Japanese verbs are classified into three categories: verbs with a vowel-ending root (*tabe-ru* “eat”); verbs with a consonant-ending root (*nom-u* “drink”); and irregular verbs. There are only two irregular verbs (*suru* “do” and *kuru* “come”) in Japanese, both of which have various allomorphs (Iwasaki, 2002): *s*-, *su*-, *shi*- for the former; and *k*-, *ko*-, *ku*-, *ki*- for the latter. The formation of a past tense verb involves several phonological changes. The verb *nom-u* "to drink", for instance, it undergoes two changes: the ending of the root *m* changes into *n* before the past tense *ta*, which in turn becomes voiced *da*, resulting in *non-da* "drank". Several other phonological changes including the following can be observed (see Tsujimura, 2007 for more examples):

- *hai**r**-u* (to enter) → *hai**t**-**t**a* (entered);
- *yo**b**-u* (to call) → *yo**n**-**d**a* (called);
- *ka**k**-u* (to write) → *ka**i**-ta* (wrote);
- *oyo**g**-u* (to swim) → *oyo**i**-**d**a* (swam).

As illustrated in Tables 2 and 3 above, the inflectional ending -*ta* marks past tense both for verbs and adjectives, although the latter must be preceded by another inflectional suffix -*kat*, whereas the former can immediately follow the root. Some of the inflectional processes presented above lack their inflectional counterparts in English. For instance, Japanese adjectives are accompanied by inflections that are perhaps more syntax-oriented than those in English. In addition, Japanese nouns lack in the equivalent of the singular and plural distinction in English, such as -e(s) (e.g., *book* → *books*). The use of plural marking is limited to person nouns (e.g., *kodomo* "child" → *kodomo-**tachi*** "children"; *gakusei* "student" → *gakusei-**tachi*** "students"). Moreover, unlike in English (e.g., *I walk* → *she walks*), there is no inflectional marking of subject-verb agreement.

2.11.2 Japanese derivational morphemes

Derivational affixes alter the meaning and/or syntactic category of the base to which they are attached. Japanese derivational prefixes are generally attached to a noun or noun equivalent (e.g., *o-share* "dressing up") (Iwasaki, 2002). Sino-Japanese prefixes (e.g., *mu*-, *hu*- and *mi*-) are among the very small number of class-changing derivational prefixes (from noun to adjectival noun) in Japanese (Kageyama, 1982, Nomura, 1973), as presented in Table 4 (Iwasaki, 2002; see Nomura, 1973 for a more complete list of Japanese prefixes). Japanese morphology also represents derivational suffixes, which are more numerous and productive than prefixes (Iwasaki, 2002). Among others, some examples of noun- (NF), verb- (VF), adjective- (AdjF) and adverb-forming (AdvF) derivational suffixes are presented in Table 5 (Iwasaki, 2002; Shibatani, 1990)[8].

Table 4. *Japanese derivational prefixes*

Function	Base	Prefixed form
Honorific prefixes : o-	*kome* (rice)	*o-kome*
go-	*fujin* (lady)	*go-fujin*
Size/degree prefixes: oo- (big)	*arashi* (storm)	*oo-arashi* (heavy storm)
ko- (small)	*ishi* (stone)	*ko-ishi* (pebbles)
Negative prefixes (S-J): mu-*	*shinkei* (nerve)	*mu-shinkei* (insensitive)
hu-*	*tyuui* (attention)	*fu-tyuui* (careless)
hi-*	*joushiki* (common sense)	*hi-joushiki* (senseless)
mi-*	*happyou* (public)	*mi-happyou* (non-public)

Table 5. *Japanese derivational suffixes*

Function	Base (syntactic category)	Suffixed form
NF suffixes: *-sa,*	*atataka-i* (Adj.) (warm)	*atataka-sa* (warmth)
-mi	*yowai-i* (Adj.) (weak)	*yowa-mi* (weakness)
VF suffixes: -garu	*samu-i* (Adj.) (cold)	*samu-garu* (become cold)
-meku	*kira* (N) (shine)	*kira-meku* (shine)
AdjF suffixes: -ta-	*tabe-ru* (V) (eat)	*tabe-ta-i* (want to eat)
-i-ta-	*kak-u* (V) (write)	*kak-i-ta-i* (want to write)
***AdvF suffixes*:** -ku	*ooki-i* (big)	*ooki-ku*
	too-i (far)	*too-ku*

2.11.3 Issues in measuring morphological awareness in Japanese scripts

The above description of Japanese morphology presents some issues with measuring Japanese morphological awareness using the Japanese writing system (not in the Roman alphabet). As briefly discussed earlier in Section 2.4.3.2, degrees of morphological transparency inherent in a word can differ significantly, depending on the scripts in which the word is presented.

[8] Iwasaki (2002) further examines Japanese morphemes by presenting the way they behave to form a more extended word, within which a series of derivational and inflectional suffixes are glued together following the root. These extended forms could serve as a nearly full sentence and hence tap into syntactic awareness more than morphological awareness. For this reason, this type of affixation is not featured in this study.

Kana writing in particular causes a major problem with morphological segmentation (Shibatani, 1990). To take the verb 読む /yomu/ "to read" as an example, it is segmented as *yom-u* through the use of the alphabet. However, in *kana* writing, the syllable む /mu/ cannot be broken down into any smaller units (×*mu* → *m* + *u*) and hence the root and its inflectional suffix are not discernible in the same way that they are using the alphabet. Moreover, the segmentation 読 + む is more consistent with how the inflectional system is traditionally taught (Coulmas, 1989) and hence should not be interpreted as incorrect. Two additional issues should be addressed. One is concerned with a potential bias towards 'graphical' segmentations, especially when morphologically less complex items are presented using the combination of *hiragana* and *kanji*, such as 読む (Coulmas, 1989). This problem stems from the fact that the representational unit of *kanji* is a morpheme or semantically oriented and the difference across three scripts is graphically easily identifiable. Another problem lies in that Japanese morphemes are typically multi-syllabic. Even a mono-morphemic word such as はな /ha-na/ (flower) consists of two syllables or moras. In this respect, presenting items in phonology-based *hiragana* alone could potentially lead to syllabic segmentation, especially if the item is morphologically simple. In order to keep these possibilities to a minimum, it is essential to ensure that target items presented in *kana* writing and *kana* and *kanji* combined represented a range of internal complexities from less complex (e.g., 食べる /taberu/ "to eat") to more complex items (e.g., 詳しかった /kuwashikatta/ "was detailed").

Another major issue is the absence of Japanese morphological awareness measures developed for research purposes. To the best of the researcher's knowledge, only one relevant study was found in cross-searching educational and linguistic data bases, and it investigated morphological awareness of limited aspects of inflectional morphology in Japanese monolingual children and adults (Fujiwara, 1999) as reviewed below. Hence, it was obligatory that the researcher newly develop, for the current study, measures of Japanese morphological awareness which are designed to overcome the issues with the Japanese scripts as presented above and also tap into knowledge of a range of both inflectional and derivational forms appropriate for school-age children (see Chapter 3 for details of these Japanese tasks developed).

2.11.4 Empirical evidence on Japanese morphological awareness in children

The current study makes one of the first attempts to systematically investigate different aspects of Japanese morphological awareness of both inflections and derivations in different types of bilingual children (JHLs and ESLs), together with Japanese monolinguals. Although research on Japanese morphological awareness is not non-existent, it typically focuses on either inflections (in children by Fujiwara, 1999) or derivations (in adults by Hagiwara, Sugioka, Ito & Kawamura, 1999) and even so, the range of morphemes included was rather limited (see Clancy, 1985 for a comprehensive overview of Japanese grammatical morphemes). Fujiwara (1999), for instance, compared an awareness of Japanese inflectional adjectival suffixes (past tense forms, -*katta* and -*da/data*) between two groups of children (4- and 5-year old groups) and a group of adults (all monolinguals). Fujiwara suggests that 5 years of age could be a transitional period where Japanese children begin to separate the stem from its inflectional suffixes, although adults are more efficient in using such morphological information. Hagiwara et al. (1999) provide neurological evidence to suggest that the level of productivity influences the processing of noun-forming derivational suffixes (-*sa* and -*mi*) for both brain-damaged aphasic patients and normal adults. Hagiwara et al. found that these two suffixation processes involved two different neurological systems, whereby the suffix -*sa* was processed on a rule-like basis and the -*mi*, a much less productive suffix than the -*sa*, was processed via access to associative memory. Investigating the mental mechanism underlying morphological processing is beyond the scope of the current study. Nevertheless, this line of research offers useful insight into the role of psycholinguistic factors, such as productivity, in processing Japanese morphemes, an issue extensively discussed also in the context of morphological processing in English (e.g., Marslen-Wilson, 2007; Murphy, 2004).

A significant feature of Fujiwara's study is that Japanese monolingual children possess the ability to distinguish inflectional suffixes from their stem as early as 5 years of age. One way of expanding on this finding is to examine the extent to which children's Japanese morphological awareness is demonstrable when tested on a wider range of both inflectional and derivational affixes. In order for target morphemes to be representative of Japanese morphology, it is essential to include both verbal and adjectival inflectional suffixes, two representative types of Japanese inflectional suffixes, together with the more numerous and idiosyncratic nature of derivational prefixes and suffixes (Iwasaki, 2002). Further progress should be made with this matter by examining the nature of morphological awareness in different groups of children with varying Japanese proficiency levels, such as ESL, JHL and JLM children in the current study, so that we could enhance our understanding of the nature of the ability to recognise and produce morphemes in Japanese which may be unique to each group.

2.11.5 Summary of cross-linguistic influence

Despite the considerable amount of attention morphological transfer has received to date, there is a paucity of research carried out in the context of children learning Japanese and English. Thus, no direct hypothesising or postulating can be done at this stage. As suggested in Section 2.9.1, slightly less direct evidence is available from transfer studies on Chinese-English bilingual children (e.g., Wang et al., 2006; Pasquarella et al., 2011), which suggests that if two languages share similar morphological systems (e.g., compounding in Chinese and English), morphological awareness in one language could serve as a facilitative basis for the development of morphological awareness in the other language. The direction of transfer seems to vary, depending on the complexity inherent in each morphological system, such that language with the more complex morphological system typically influences the development of morphological awareness in the other language (Ramirez, et al., 2010). Drawing on this, since Japanese is a richly inflected language, one could argue that children's attentiveness to morphemes included in Japanese words could be positively transferred to their morphological analysis of English words. However, this type of transfer perhaps presupposes that bilingual children are dominant or sufficiently proficient in Japanese. Otherwise, in line with Wang et al. (2006), transfer from English to Japanese could be more robust than the other way around, due to a shift in language dominance from Japanese to English.

With reference to the within-language study by Mann (1986), as reviewed in Section 2.9, it is reasonable to assume that the nature of morphological awareness could be language-specific particularly as Japanese and English require using different scripts/orthographies, which in turn could act to limit the occurrence of transfer across languages. Based on this assumption, one could postulate that morphological awareness in both languages may be developing independently of one another in bilingual children. However, one could at the same time assume that the fact that both languages represent morphological properties in their respective orthography could serve as a transferrable knowledge basis, supposing that the child has had enough exposure to both writing systems in developing literacy. It is to be reiterated that the current study is not designed to investigate the transfer of certain morphological classes between languages but to investigate the contribution of morphological awareness in one language to predicting morphological awareness in the other language in statistical (regression) models. When morphological awareness in one language explains a significant amount of unique variance in morphological awareness in the other language, it will be interpreted as evidence of morphological transfer. It should also be emphasised that using such techniques allows no claim to be made about the causality of transfer but could suggest the potential influence of one language on the other.

2.12 Summary of the Chapter

The review presented thus far centred around the issues surrounding the nature of vocabulary knowledge and morphological awareness in children learning English and Japanese as an L1/L2, together with cross-linguistic influence on the nature of morphological awareness in bilingual children. Past vocabulary research on ESL children consistently demonstrated that receptive and expressive vocabulary knowledge were demonstrable to different degrees in favour of the former, and that the former typically caught up with monolingual peers more quickly than the latter. There is, on the other hand, evidence to suggest that L2 expressive vocabulary knowledge may accelerate, aided by high L1 proficiency at the start of schooling in the L2 and continued L1 support (Lugo-Neris et al., 2010), a finding consistent with the notion of CUP (Cummins, 1984). However, this converging evidence was not present, at least explicitly, when the literature on Japanese vocabulary knowledge in school-age children was surveyed. Since the existing evidence derives predominantly from (both L1 and L2) studies which looked at a single aspect (receptive) of Japanese vocabulary, much has yet to be learnt about expressive vocabulary knowledge and its nature relative to receptive vocabulary in Japanese-speaking children. In order to advance our knowledge further, evidence is needed of the extent to which a manifestation of these aspects differs between different groups of Japanese-speaking children. The groups of Japanese-speaking children involved in the current study are ESL and JHL children in the UK context and Japanese Language Monolinguals (JLMs) in Japan.

What the review of vocabulary research has also highlighted is the need to examine potential variability within bilingual populations (ESL and JHL children in this context), a focus motivated particularly by the notion of multicompetence (Cook, 1991, 2003). A bilingual (and multilingual) possesses different degrees of L1 and L2 knowledge in one mind, and their language use and knowledge in each language are distinct from those in their monolingual peers and hence warrant examination in their own right. Moreover, different levels of integration of two languages can be captured in the bilingual mind, depending on the domain concerned. This theoretical underpinning thus accommodates the occurrence of cross-linguistic influence in both directions (L1 → L2 and/or L1 ← L2). The current study was designed to examine potential cross-linguistic influence in the context of morphological awareness between two different types of bilinguals – ESL and JHL children.

The importance of morphological awareness is well documented, associated with the development of vocabulary knowledge and other literacy-related skills both in L1 and L2 studies. Emerging evidence, although still scarce, suggests that this positive association could be restricted to a certain aspect of morphological awareness, due to varying levels of cognitive demands required for the completion of morpheme recognition and production tasks (Duncan et al., 2009), and also due to the degree of similarity in the processes involved between recognising/producing morphemes and demonstrating lexical meanings (Carlisle, 2000). The current study offers further evidence of this matter by examining whether morpheme recognition and production are differently associated with vocabulary knowledge both in Japanese and English.

An additional approach taken to investigating morphological awareness is an examination of its transferability between Japanese and English, a pair of typologically distant languages which have received little attention in the field of morphological transfer to date. A few postulations can be made based on past research on different language pairs, as follows. The degree of commonality in morphological features, together with that of complexity within the morphological systems may determine the nature of morphological transfer between languages. Japanese morphology, the predominant typology of which is agglutinative, accommodates a rich inventory of various kinds of inflections and derivations and hence could be considered the more morphologically complex than English (Tsujimura, 2007). In this respect, one could predict that an awareness of Japanese morphemes may result in positive transfer to English morphological awareness. Additional detail needs to be added to this prediction, namely, a role of language dominance. Such positive transfer could be more relevant to Japanese L1 (or Japanese-dominant) children and its transferability may be limited in children who have experienced a shift in dominance to English. For these children, transfer in the other direction (L2 → L1) could be observed (Wang et al., 2006). It is rather difficult to settle on certain predictions at this stage due to the lack of direct evidence available. Furthermore, it is difficult to hypothesise results in terms of the impact of different scripts on the nature of transfer, due to some conflicting evidence in the literature. As identified in Gulgliel, the lack of shared writing systems may inhibit L1 knowledge from transferring to L2 academic skills, whereas the presence of morphological structure in both orthographies could be susceptible to transfer depending on the quality of the child's literacy skills in these orthographies. In these respects, it is to be emphasised that an examination of morphological transfer in the current study is exploratory in nature. It is hoped that, by offering preliminary evidence, the current study can provide a useful stepping stone for future research.

In the current study which follows, the issues covered thus far were investigated with four groups of school-age children: Japanese children learning English as an L2 (ESLs); English-L1 children learning Japanese as a heritage language (JHLs); English Language Monolinguals (ELMs) (all three recruited in England); and Japanese Language Monolinguals (JLMs). To reiterate, these monolinguals groups are not included to represent the norm against which the ESL/JHL children are measured, but to describe the nature of vocabulary knowledge and morphological awareness which may be unique to each group of children with each differing language learning backgrounds.

Chapter 3

METHODOLOGY

3.1 The current study

The current study is a predominantly quantitative study, adhering to a quasi-experimental design, in the sense that no participating children were randomly assigned to the groups, whereas this study bears some characteristics of an experimental design in terms of variables of interest being compared across groups (Bryman, 2008). The variables concerned include two related-samples variables, Vocabulary Knowledge (receptive and expressive), Morphological Awareness (morpheme recognition and production) and one independent-samples variable, Group (ESLs, JHLs, JLMs and ELMs). The groups involved are as follows: Japanese children learning English as an L2 (ESL); L1 English children learning Japanese as a Heritage Language (JHL); Japanese Language Monolingual children (JLM); and English Language Monolingual children (ELM). This study addresses the following questions.

1. What is the nature of receptive and expressive knowledge of lexical meanings in a) English and b) Japanese speakers, and to what extent does it differ a) between ESL, JHL and ELM children and b) between ESL, JHL and JLM children?

2. What is the nature of the ability to recognise and produce inflectional and derivational morphemes in a) English and b) Japanese speakers, and to what extent does it differ a) between ESL, JHL and ELM children and b) between ESL, JHL and JLM children?

3. What is the nature of the relationship between morphological awareness and vocabulary knowledge in English speakers and to what extent does it differ between ESL, JHL and ELM children? Similarly, how does the relationship in Japanese speakers differ between ESL, JHL and JLM children?

4. Does morphological awareness in one language act as a significant predictor of morphological awareness in the other language among ESL and JHL children?
   4a) If it does, is the nature of transfer different between groups?

Vocabulary knowledge in this study refers to children's knowledge of the connection between a word and its meaning and hence is concerned with vocabulary size. The focus of the study is not on providing an exact estimate of how many words a child knows but on describing the nature of receptive and expressive knowledge of lexical meanings demonstrated by each group of children. In order to reflect this focus sharply, the terms *vocabulary knowledge* or *vocabulary* will be used throughout instead of *vocabulary size*.

The subcomponents of Questions 1 and 2 corresponding to the a)s above comprise Sub-study 1 and involve the comparisons of performances on English tests/tasks within and between groups. The subcomponent b) questions are concerned with the comparisons of performances in Japanese, thus comprising Sub-study 2. The rationale behind this division is two-fold. Firstly, the ESL/JHL/ELM groups all attended a local state school in England (except for three JHLs who attended an independent school), an English learning environment comparable between groups. Additionally, the monolingual groups were each receiving education on the national curriculum specific to each country (England and Japan), and hence it was unreasonable to directly compare these two monolingual groups within a single study. It should be noted that the bilingual groups (i.e., ESLs/JHLs) were receiving Japanese tuition in the UK, an environment significantly different from one where the JLMs were being educated in Japan. In this respect, direct comparisons were not made across these three groups in Japanese. The JLM data are presented in Sub-study 2 for the purpose of better understanding the nature of vocabulary/morphological knowledge in each group of Japanese-speaking children. Sub-study 1 findings are reported in Chapter 4, whereas Sub-study 2 findings in Chapter 5. Research questions 3 and 4 are concerned with within- and cross-language investigations of morphological awareness in relation to vocabulary knowledge, respectively and are reported in Chapter 6. An overview of the research design is given in Figure 3.

Figure 3. *An overview of the design of the study*

The current study

Chapter 4

Sub-study 1				
Language tested in	English			
Groups	ESL, JHL & ELM			
Variables	VK		MA	
Tests/tasks	RV (BPVS)	EV (TOWK)	MR (WS)	MP (WA)

Chapter 5

Sub-study 2				
Language tested in	Japanese			
Groups	ESL, JHL & JLM			
Variables	VK		MA	
Tests/tasks	RV (TJLA)	EV (TJEV)	MR (WS)	MP (WA)

Chapter 6

VK and MA	Within-language (a) and cross-language relationships (b)			
Language concerned	Japanese (J) and English (E)			
Groups	(a) ESL, JHL & ELM (E) ESL, JHL & JLM (J)			
	(b) ESL & JHL			
Variables	VK		MA	
Tests/tasks	RV (J & E)	EV (J & E)	MR (J &E)	MP (J & E)

Note. VK: Vocabulary Knowledge; MA: Morphological Awareness; RV: Receptive Vocabulary; EV: Expressive Vocabulary; TJLA: Test of Japanese Language Abilities; TJEV: Test of Japanese Expressive Vocabulary; BPVS: British Picture Vocabulary Scale; TOWK: Test of Word Knowledge; WS: Word Segmentation; WA: Word Analogy; MR: Morpheme Recognition; MP: Morpheme Production.

3.2 Participants

The following four different groups of children were involved:

1. 29 Japanese children learning English as a second language (ESL);
2. 21 Simultaneous bilingual children learning Japanese as a heritage language (JHL);
3. 26 English-L1 monolingual children (ELM);
4. 27 Japanese-L1 monolingual children (JLM).

The first three groups were recruited in England, whereas the JLM group was recruited in Japan. The description of each group is given below. The ESL and JHL groups denote two different Japanese-English bilingual populations in the UK: the former represents a population of Japanese children learning English as an L2, having acquired Japanese as an L1 in Japan (i.e., consecutive bilinguals), whereas the latter represents a population of children from a bilingual family where they have been exposed to both English and Japanese since birth (simultaneous bilinguals). The monolingual groups reflect a population of children learning English/Japanese as an L1 and speaking the L1 only at home in the UK/Japan, respectively.

3.2.1 ESL group

The ESLs were those who had acquired the core aspects (e.g., phonology, grammar and vocabulary) of Japanese as an L1 in Japan before they came to England and started learning English as an L2 at an early age (mean Age On Arrival (AOA) = 4;8, SD = 3.74 (in months)). Their parents were both Japanese and all of them came to the UK due to their parent's (mostly father's) job. The ESLs attended a local state school during the week (average school year = Year 5) and 18 out of 29 ESLs went to Japanese (complementary) School on Saturdays. The data from five of these ESLs were removed from the subsequent analyses. Three of those excluded ESLs went to a full-time Japanese school in England, where English was taught as a modern foreign language (more accurately, the language of the larger community), which meant that these three participants were in a language learning/ educational environment significantly different from the environment surrounding the rest of the ESLs. Two other ESLs were excluded for the following reasons: one child was too young (6 years old) to complete all the measures, whereas the other was thought by his teachers and parents to have some form of dyslexia. As a result, the data from a total of 24 ESLs were used for data analysis.

3.2.2 JHL group

Each of the JHLs was from a Japanese-English bilingual family, where the mother was Japanese and the father was British. These children had been exposed to both languages since birth, but according to their teachers and parents, Japanese was the less dominant language being learnt as a heritage language (mother's L1). Just like the ESLs, the JHLs attended a local state school in England during the week (average school year = Year 5), except for 3 JHLs who attended an independent school. The JHLs all attended a Japanese school on Saturdays. Three JHLs were born in Japan and moved to the UK within about 18 months (mean AOA = 1;05, SD = 2.65 (in months)). Effectively then, the educational background of these two groups (ESL/JHL) is very similar but their home language environments are quite different, as is the extent to which they are dominant in English (JHL being dominant in English whereas the ESL being still dominant in Japanese or shifting towards English dominant to some extent).

3.2.3 ELM and JLM groups

As for the monolingual groups, the JLMs went to a local public primary school (equivalent to a state school in England) in Saga, Japan and were in Years 3-6 (all in the same school) at the time of testing. The ELM group consisted of 26 Years 3-6 children at state schools in Oxfordshire (n = 14) and Essex (n = 12), UK, who were recruited via convenience sampling procedures. All JLMs and ELMs had lived in Japan and England respectively since birth. They spoke no language other than the L1 at home. One ELM child was absent from school due to illness during the testing and hence was unable to complete the tasks. Therefore, data from a total of 25 ELMs were used in the subsequent analyses. Table 6 summarises background statistics for all four groups of children. The school teachers in England informed the researcher that no participating children were receiving free school meals, one indication of parents' socio-economic status. No equivalent information was available in Japan. It should be noted that a consideration of a wider range of aspects of home literacy (e.g., the amount of reading, writing and watching TV in Japanese) and other shared environmental factors (e.g., parents' education levels) was beyond the scope of the study and hence is not included in Table 6.

Table 6. *Participating children's background information*

	ESL (n = 24)	JHL (n = 21)	ELM (n = 25)	JLM (n = 27)
	Mean (SD)			
Age	10;2 (1.82)	10;2 (2.17)	8;6 (1.11)	9;10 (1.16)
Year 3 (No. of children)	5	3	7	7
Year 4	2	7	7	6
Year 5	7	1	6	7
Year 6	4	2	5	7
Year 7	4	4	0	0
Year 8	1	3	0	0
Year 9	1	1	0	0
LOR in the UK (months)	64.75 (5.59)	110.62 (3.42)	103.68(1.11)	NA
Length of Japanese tuition received in England*	18.13 (4.04)	47.24 (5.27)	NA	NA
Language at home	JO = 14 EO = 2 Both = 8	JO = 0 EO = 6 Both = 15	English	Japanese

Note. JO: Japanese only; EO: English only; LOR: Length of Residence. *Japanese tuition comes in different forms, including attending a Japanese Saturday school and home learning with a private tutor or through distant learning at home.

3.3 Sampling issues

It proved very difficult to recruit ESL/JHL children through local state schools in England, due to the schools' tight schedules. Therefore, they were recruited through multiple sources including Saturday schools, Japan-related organisations, local societies, and word-of-mouth. All the existing 11 Japanese Saturday schools in England were contacted and two schools agreed to accommodate the study. Two organisations based in London advertised the study to a few hundred Japanese parents registered with them and also on their mailing list. During this process, the researcher was referred to the members of Japanese communities in London and Nottingham respectively and attended some of their regular gatherings to advertise the study. These activities led to working with a few interested families across England to start with, followed by more families recruited through word-of-mouth, that is, via the families who had already taken part in the study introducing their friends to the researcher (i.e., a snowball sampling method). The researcher also recruited participants from the Japanese Saturday schools by distributing the parental consent form via the schools (see Appendix 1). As a result, nineteen children took part in the testing from these schools (13 JHLs & 6 ESLs). Recruiting children from each of these sources was slow to progress, constrained by the tight schedule of the schools, organisations and parents. For example, the children of the interested families were normally only available for participation during a half-term break and hence data collection often came to a halt outside half term. In addition, not many parents were keen on their children staying beyond the regular class hours, having driven a long way to collect them.

These practical issues resulted in the researcher having to loosen her sampling criteria, consequently working with a group of ESL/JHLs with a wide age range (from 7 to 14 years). It was necessary, therefore, to use age as a control variable in any subsequent data analysis so that its influence on performances could be removed as much as possible. An additional issue was that three JHLs were attending an independent school at the time of testing (two in Oxford and one in Cambridge). Thus, the schooling environment is not entirely homogenous within the JHL group, which in turn adds variability across English-speaking groups (ESLs, JHLs and ELMs). The downside to this is that their performance could well be explained by instructional differences (e.g., curricula of state and independent schools), rather than their vocabulary and/or morphological knowledge per se. Moreover, regional variation in instruction within state schools and Japanese Saturday schools respectively could potentially confound the results, as these children were recruited in various parts of England (e.g., Oxford, Cambridge, Nottingham, London and Manchester). On a more positive note, however, results from a more diverse sample of children in terms of age and geography could potentially allow us to obtain a slightly broader and more representative picture of different aspects of vocabulary and morphological knowledge in the ESL and JHL populations.

3.4 Measures

3.4.1 Interviews for background information

Brief interviews, which were modelled on the interview questions developed by Mahon and Crutchley (2006), were conducted with the ESL/JHL children with their mother present, before the first task was administered. These interviews were designed to obtain information about the following: language spoken at home, age on arrival (i.e., age of onset of L2 exposure), length of residence in the UK and Japan, experiences in schooling in Japan or other English-speaking countries (see Appendix 2 for the entire set of questions).

3.4.2 Nonverbal ability task

Raven's Standard Progressive Matrices Plus (SPM+) (Raven, Rust & Squire, 2008). SPM+ was administered to assess children's nonverbal ability, to ensure that all participating children fell within the typical range for cognitive capacity. SPM+ is designed to be relatively culture-free and thus suitable for children from various linguistic backgrounds (Jean & Geva, 2009). Children were shown an incomplete illustration of a matrix and asked to complete the matrix by choosing one pattern among an array of five or six patterns. While the administrator's manual for the SPM+ does not suggest administering the test within a time limit, some researchers suggest that using the SPM as a timed test across a wide range of populations can be both reliable and valid (e.g., Grant, 2006; Rushton, Čvirivić & Bons, 2007). Therefore, due to practical issues surrounding the schools' and parents' schedules, the SPM+ was administered with a 20-minute time limit.

3.4.3 Vocabulary tests

The British Picture Vocabulary Scale II (BPVS) (Dunn, Dunn, Whetton & Burley, 1997). The BPVS was used as a measure of receptive vocabulary in English. The BPVS involved looking at four pictures on each page and pointing to, or saying the number of the picture that matches the meaning of the word that s/he hears. The BPVS is a standardised assessment instrument which has been widely used in the contexts of EAL/ESL children as well as English monolingual children for educational, clinical and research purposes (e.g., Beech & Keys, 1997; Mahon & Crutchley, 2006; Muter & Diethelm, 2001; Hick, Botting & Conti-Ramsden, 2005).

Several limitations of the BPVS should be noted first. One is that its (forced) word-picture matching design could potentially overestimate children's lexical knowledge since correct decisions can be made without fully demonstrating knowledge of the target meaning, such as defining it verbally or recognising its meaning in text. Another related issue is that the BPVS does not tap into degrees (e.g., none, partial and full) of knowledge of lexical meanings, nor does it incorporate other essential aspects of vocabulary knowledge, such as word associations, multiple meanings and use in sentential contexts. The BPVS is a standardised measure of receptive (hearing) vocabulary which comprises just one aspect of multi-faceted vocabulary knowledge and the other complex linguistic and cognitive domains. Therefore, as also cautioned by the developers of the Test (Dunn et al., 1997), the scores of the BPVS should not be over-generalised but be viewed as an approximation of the level of present functioning of a person. As such, a follow-up study or a larger test battery would be necessary to gain a more comprehensive picture of the nature of vocabulary knowledge.

Despite these limitations, the BPVS was judged to be appropriate for the current sample since the test is the only valid instrument designed specifically to measure vocabulary knowledge with available norms not only on the British English-L1 monolingual population but also on the EAL population in the UK. The BPVS was developed with the standardisation sample of 2,751 pupils in 152 schools in England and Wales and a high degree of reliability was achieved, as measured by the values of Cronbach Alpha (0.93) and split-half reliability (0.86) (Dunn et al., 1997). The BPVS was also validated on a sample of EAL children (410 children) of preschool to Year 3 ages from 77 schools in the UK. Clear evidence of validity was provided. Their performance increased with age, as was observed in the performance of the corresponding standardisation (monolingual) sample. In addition, the performance of the standardisation sample was superior to that of the corresponding EAL sample across age groups, the difference being equal to approximately one standard deviation (differences in age equivalents ranging from 10 months to 2 years). Moreover, the BPVS has established a variety of strands of research evidence which support its construct and concurrent validity, correlated with other measures of language development in EAL and English monolingual children, such as intelligence (Wechsler, 1974), listening comprehension (McKendry & Murphy, 2011) and reading skills (e.g., Elliot, 1983; Muter, Hulme, Snowling & Stevenson, 2004). Thus, the BPVS can also serve as an indication of children's general proficiency or verbal ability in English, when English is the primary language of instruction at school.

Expressive Vocabulary (EV), the Test of Word Knowledge (TOWK) (Wiig & Secord, 1992) (abbreviated as TOWK-EV henceforth). Expressive Vocabulary is a subtest of the TOWK, a standardised in-depth vocabulary test. The TOWK-EV was designed to orally name pictures of activities and objects using a single most descriptive word per picture and was used to measure English expressive vocabulary knowledge.

A few issues were raised when it came to using the TOWK-EV for the current sample. One is that the TOWK was standardised on a US population and therefore, unlike the BPVS, it does not come with norms on UK monolingual or EAL children. When examining a total of 32 target items in the TOWK-EV, there was an item 'janitor', the British English equivalent of which is ‘caretaker’. Thus, not all items listed as correct answers were entirely reflective of vocabulary items which British school-age children are likely to use for expressive purposes. In addition, although its format is similar to the BPVS in the sense that it also consists of several age bands, the classification of age is relatively coarse with only five levels (5, 6-9, 10-11, 12-14 and 15-17 years), in comparison to fourteen levels in the BPVS. This raises the possibility that the TOWK-EV may lack sensitivity to the maturity of expressive vocabulary knowledge in children.

Despite these limitations, the TOWK-EV was chosen as an appropriate test for the current sample for the following five reasons. One primary reason is that the TOWK is, to the best of the researcher’s knowledge, almost the only assessment kit which is both designed specifically for measuring wide-ranging aspects of word knowledge including vocabulary and has been used widely both with British monolingual children (e.g., Ricketts, Nation & Bishop, 2007; Ricketts, Bishop & Nation, 2008) and with EAL/ESL children for educational and research purposes (e.g., Hutchinson, Whiteley, Smith, & Connors, 2003; McKendry, in progress; Whiteley, Smith, & Connors, 2007). An additional reason is that clear evidence is provided for the validity of the TOWK. Its construct validity was established by significant intercorrelations between a total of eight subtests and also the results of factor analysis which identified two factors each consisting of receptive and expressive subtests respectively. Its concurrent validity was established as it was correlated significantly with CELF-R (Clinical Evaluation of Language Fundamentals-Revised (Semel, Wiig & Secord, 1987)) total scores, a comprehensive test on language skills. Three additional reasons for choosing the TOWK-EV are as follows: a) it specifically addresses word knowledge, whereas other standardised tests including the CELF-R and WIAT (Wechsler Individual Achievement Test, Wechsler, 2005) focus primarily on wide-ranging higher-level (reading and writing) language skills; b) its format was similar to the BPVS in the sense that both were oral tests, involving picture presentations; and lastly c) it was designed to be quick to administer (Wiig & Secord, 1992). The reason c) was not the primary criterion but was still an important one for choosing tests for the study, in order to keep to a minimum any disruption that administering a range of measures could cause to participating schools.

The Test of Japanese Language Abilities (TJLA) (Ono, Shigemasu, Hayashibe, Okazaki, Ichikawa, Kinoshita & Makino, 1989), 日本語能力テスト in Japanese, was used as a measure of Japanese receptive vocabulary knowledge. The TJLA, a written test, involved circling the number that corresponds to the meaning of the target item. The TJLA was standardised against approximately 20,000 Japanese students across Japan, who ranged from 6 to 15 years in age. The TJLA for primary school children is divided into three versions according to school year: a) Years 1-2 (age 6-8 years); b) Years 3-4 (age 8-10 years); and c) Years 5-6 (age 10-12 years). The appropriate version was administered, according to the child's school year (e.g., Version b for a Year 3 child).

Using the TJLA comes with a few limitations. One is its dissimilar format to the English equivalent of a receptive vocabulary test, namely, the BPVS. While the latter is a measure of *hearing* vocabulary, requiring the child to match the aural input to the picture presented, the former involves distinguishing the correct item from the distractor item meanings presented in writing. Although direct comparisons between vocabulary scores were to be made only within languages, and *not* between languages, this difference in format could be associated with unequal cognitive demands within the receptive vocabulary measures. This in turn raises the possibility of the TJLA underestimating vocabulary knowledge in the Japanese-speaking groups, relative to English vocabulary knowledge in the English-speaking groups estimated by the BPVS. An additional issue is consistent with the issue raised with the BPVS: the TJLA does not tap into degrees of vocabulary knowledge, either. In other words, it does not allow for the researcher to examine whether the child possessed partial knowledge or no knowledge at all of the items marked as incorrect. Furthermore, the TJLA is rather old and has not been re-standardised since its 1989 edition. One could claim, therefore, that the range of Japanese items included therein may not necessarily be the equally close representation of items exposed to school-age children in the present day, especially in light of numerous updates and changes made to the national curriculum since then.

The use of the TJLA is, nevertheless, justified in the following regards. To the best of the researcher's knowledge, it is the only available comprehensive standardised test on Japanese language proficiency which has not only been widely used for educational, diagnostic and research purposes but also comes with (both monolingual and) bilingual norms (as described below). Moreover, the TJLA has consistently been found to be a reliable and valid assessment tool for school-age monolingual and bilingual populations including both ESL and JHL samples in recent (Kataoka et al., 2005) as well as old studies (e.g., Ono, 1988; 1994). This is in turn indicative of the items included in the TJLA remaining representative of Japanese vocabulary appropriate for school-age Japanese-speaking children, thus acting as a defence against the aforementioned issue with the less current edition of the TJLA.

TJLA originally came in eight sub-sections: vocabulary, particles, *kanji*, syntax, writing skills, reference, presupposition and connotation. The results of factor analysis indicated that Factor 1 Word Knowledge, which consisted of two subcomponents of the test (vocabulary and *kanji*), explained the largest proportion of total variance in Japanese proficiency. In addition, the contribution of Factor 1 was significantly larger than that of the other factors. More specifically, the second largest contribution by Factor 2 Grammatical Awareness (syntax and reference) was one-tenth of the contribution of Factor 1. Ono et al. (1989) interpreted this as meaning that the scores from the vocabulary section could be the strongest predictor of general proficiency in Japanese. Furthermore, the fact that the vocabulary and *kanji* sections were clustered together onto the same factor supports the measurement (or construct) validity of the test. In other words, the vocabulary section reflected the concepts (i.e., knowledge of a word and its meaning) that it was designed to measure.

The TJLA was validated on a large sample of Japanese bilingual children in the UK (approximately 2,000 children) who were schooled in English while attending Japanese complementary (Saturday) school at weekends, a context which matches the ESL and JHL groups in the current study. The bilingual (validation) sample's performance was consistently lower than their corresponding Japanese monolingual standardisation sample and these differences tended to widen as the children progressed through school years, especially from mid school years (Years 3-4) onwards. In addition, children with a younger AOA in the UK (approximately 8-9 years or younger) departed from the age-appropriate level of Japanese vocabulary knowledge more quickly than those with an older AOA (10 years or older). Similar patterns were obtained in a more recent study by Kataoka, et al (2005), which involved a sample of 1700 Japanese-English bilingual (a mix of ESL and JHL children) in the US, thus supporting the reliability of the TJLA. Its concurrent validity was established, as it is correlated with other linguistic measures, such as syntactic awareness and knowledge of kanji in the bilingual sample, as was the case with the monolingual standardisation sample (Kataoka, et al., 2005).

The TJEV (The Test of Japanese Expressive Vocabulary) was used as a written measure of Japanese expressive vocabulary. To the best of the researcher's knowledge, no tests on Japanese expressive vocabulary appropriate for the current sample had been developed or used in Japanese L1 or L2 studies, or at least had been available in the public domain. As pointed out in Section 2.7.3, past research on Japanese vocabulary knowledge in children predominantly focussed on a single aspect of vocabulary knowledge, namely, receptive knowledge of a connection between a lexical item and its meaning, as measured by a single test. Therefore, the TJEV was developed by the researcher for the current study. It initially came in two formats: Test A involved naming a picture which appeared next to a short sentence provided as a cue; and Test B involved providing word completions in a short sentence. The TJEV was designed to be as comparable with the TJLA as possible by making it a written test and also having age bands, particularly as these two tests were to be directly compared in the subsequent analyses (in Sub-study 2). Tests A and B each had two age (school year) bands: one for children in the mid school years (Years 3-4 or younger) and the other for those in the later school years (Years 5-6 or older). Both tests (A and B) and their age bands were piloted prior to the main study. As a result, it was decided that Test B would be used in the main study (see Appendix 3). This decision-making process is described in detail in Section 3.6 below. It should be noted that, due to practical issues with data collection, the validation of the TJEV with a large sample was not feasible and hence its (face and content) validity was judged by the researcher and her colleagues with expertise in Japanese linguistics, together with the performance of, and feedback received by the children who took part in the pilot phase.

To reiterate, no claims are to be made about the full extent of the children's vocabulary knowledge in either language on the basis of the scores of the standardised or experimental tests as described above. Vocabulary knowledge is a multi-faceted construct and measuring it comprehensively would necessitate the use of a much wider range of both knowledge-based and processing-dependent tests which tap into the integration of various subcomponents including associations, grammatical functions, collocations and register traits. Moreover, longitudinal data would provide information about the rate of, and/or the direction of change in vocabulary development, thus adding further detail to the nature of vocabulary knowledge in children. In this respect, the approach taken to measuring the children's receptive and expressive vocabulary in the current study is far from comprehensive. Results obtained in the current study should, therefore, be interpreted as a snapshot of the children's *current* knowledge of lexical meanings demonstrable for comprehension (i.e., word-definition pairings) and expression (i.e., picture-naming and providing word completions). The focus of this approach is on identifying the group-specific characteristics of these snapshots in each language, together with their relations with morphological awareness.

With reference to the manual for examiners (Dunn, et al., 1997; Ono, et al., 1989), receptive vocabulary scores – BPVS and TJLA scores – were each used as a proxy for general proficiency in each language as well as receptive vocabulary. This was for the purpose of taking into account potentially varying levels of general proficiency when investigating the children's morphological awareness through statistical analyses.

3.4.4 Morphological tasks

Two morphological tasks were developed for this research: a Word Segmentation (WS) task and a Word Analogy (WA) task. These two tasks were designed to measure different aspects of morphological awareness. The WS task was designed to measure the ability to recognise the morphological structure of words and identify the morphemes included therein by putting (a) slash(es) (e.g., *wonder/ing*). The WA task was, on the other hand, designed to tap into relational, syntactic and semantic aspects of morphemes in a more productive manner by requiring the children to produce a morphologically related item through analogy on their own. In this respect, the WS task was referred to as a measure of morpheme recognition, whereas the WA task as a measure of morpheme production henceforth.

Using these two morphological awareness tasks is important for the following reason. The sole use of the WS task might yield a biased picture of *relational* knowledge (e.g., ✓*create* - *creator*; × *me* - *meter*), one of the three essential aspects of morphology (Kuo & Anderson, 2006; Tyler & Nagy, 1989). The WS task taps into an awareness of the *structure* of morphemes in the children without fully reflecting their understanding of the relationship between the root and its affixed form. The WA task, on the other hand, involves the children recognising the semantic and syntactic relationships between a root and its affixed forms when attempting to produce an appropriate inflectional or derivational item. The WA task thus taps into all three aspects of morphological knowledge: relational; syntactic (e.g., recognising *-ise/-tion* as a verb-forming/noun-forming suffix); and distributional (✓*announcement*; × *responsement*). In short, the WS and WA tasks act to measure different aspects of morphological awareness in a complementary manner.

The Word Segmentation (WS) task. The WS task was modelled on a base identification task (Bowers, 2006; Bowers & Kirby, 2009) and a WS task (Hayashi & Murphy, 2011). The English WS task was administered to the ESLs, JHLs and ELM children, whereas the Japanese WS task was administered to the ESL, JHL and JLM children. The children were asked to segment target items into morphological components using (a) slash(es) (e.g., *wonder/ing*), a method modified from the original base identification task developed by Bowers (2006). The original base identification task required children to identify the base morpheme of each item. One limitation of this method is that it measures *partial* knowledge of the morphological structure of an item (e.g., *shortened*), since an identification of affixes (e.g., *-en* and *-ed*) is not required. The WS task used in the current study made it obligatory for the children to identify both the root and affixes of each target item by putting a slash or slashes where each morphological boundary lies. In this way, a more detailed picture of the children's understanding of the structure of morphologically complex items should be obtained.

The Japanese version of the WS task was developed by the researcher as no such measures had been developed for children for research purposes before, to the best of the researcher's knowledge. Its format was the same as the English WS task. To take, as an example, the past tense verb 読んだ /yohnda/ "*read*" in the past tense, the children were asked to provide its morphological constituents (i.e., the stem 読ん and its inflectional suffix だ). It was ensured that the *kanji* (with reading aids called *furigana* placed above them) included in the task were age-appropriate. This was achieved by consulting the NINJAL data (2009) on Japanese vocabulary for educational purposes, which provides the school-year equivalent of each vocabulary item listed therein, and also by presenting the tasks to the school teachers who co-operated for the study. All participating children were also asked to circle any unknown item, to ensure that the target items represented a range of age-appropriate vocabulary. Morphological complexities inherent in the Japanese target items differed from those in the English items, an issue explained further in Section 3.5 below (see Appendix 4 for the complete lists of English and Japanese WS items). In addition, the total number of target morphemes to be segmented in the WS task differed from the number of target items (30) since the former reflected the internal morphological complexity of a word, which varies across words, such as *unkind* (two morphemes), *irregularly* (three morphemes), きらめく /kira + meku/ "to shine" (two morphemes), さむかった /samu + kat + ta/ "was cold" (three morphemes). The breakdown of the target items by morpheme type is given in Section 3.5.

The Word Analogy (WA) task. The WA task was modelled on word analogy tasks used in studies by Nunes, Bryant and Bindman (1997, 2006) and Roman, Kirby, Parrila, Wade-Woolley and Deacon (2009), respectively. The WA task involved producing the missing item in a target pair, on the basis of the morphological relationship between two items in the immediately preceding pair and thus was used as a measure of morpheme production. The English WA task was administered to the ESL, JHL and ELM children (e.g., anger: angry:: strength: ______ (strong)), whereas the Japanese WA task was administered to the ESLs, JHLs and JLMs.

There were three issues raised with the original word analogy tasks. One was that Nunes et al. used only eight items to measure morphological awareness of both inflections and derivations. The use of such few items might not have acted as a representative range of morphologically complex items, particularly in view of the idiosyncratic nature of derivations.

Another issue is concerned with the sampling of test items. The eight items used in the Nunes et al. studies, which were administered to school-age British children, had been matched om frequency with reference to a single American adult corpus (Carroll, Davis & Richman, 1971). Items used in the analogy task developed by Ronan et al. were sampled from teaching materials specific to the Canadian context. How this item-sampling issue was addressed in the current study is described in detail in Section 3.5. An additional limitation is that the analogy task used in the Ronan et al. study contained target items which could potentially be answered correctly via phonological knowledge, (e.g., *long*: *longer* :: *tall*: _________ (*taller), teach: teacher:: work*: ______ (*worker*)), which casts doubt about the validity of the task as a morphological task. These items were, therefore, replaced with more opaque items, in order for the children not to be able to figure out the target items correctly by simply using phonological knowledge (e.g., *jump: jumped:: hold:_______ (held)*). In addition, in order to further reduce phonological bias, it was ensured that morphemes included in the test items differed from syllables included therein (see Appendix 7 for the list of syllabic and morphological constituents of the target items).

The Japanese WA task was of the same format as the English task. It was developed by the researcher for the current study, due to the absence of available Japanese word analogy tasks in the public domain. Examples include the following (see Appendix 5 for the complete sets of target items in the English and Japanese WA tasks):

- 合格/goukaku/ “pass”: 不合格/fugoukaku/ “fail” ::
  意味(いみ) /imi/ “meaning”: (無意味(むいみ) /muimi/“meaningless”)
- 食(た)べる /taberu/ “eat”: 食(た)べた /tabeta/ “ate”::
  読(よ)む /yomu/ “read” : (読(よ)んだ/yonda/ “read in the past tense”)

It should be noted that the same consideration as given for the English WA task, regarding phonological properties of the test items, could not be applied to the Japanese WA task. This is due to the fact that Japanese verbs and adjectives in particular, always end with the same sound in the present tense and also in the past tense (*-ta* or *-da* for both verbs and adjectives). It was ensured that the items in the target pair and those in the immediately preceding pair were phonologically different except for the item-final sound but were morphologically related to one another, such as 休む/yasumu/: 休んだ/yasunda/:: 動く/ugoku/:動いた/ugoita/. As illustrated above, *furigana*, a Japanese reading aid, were placed above the line of *kanji* so that this task would not bias towards the size of *kanji* vocabulary in the children. This practice (i.e., placing *furigana* above *kanji*) is commonly observed also in school textbooks (see, for instance, textbooks by Tokyo Shoseki (2011) for children to learn how to read new (or target) *kanji* as well as its meaning. The morphological tasks were all completed in writing.

The reader is warned that, similar to the limitations of the approach taken to measuring vocabulary knowledge, the use of two morphological measures per language is not intended to give a comprehensive understanding of the nature of morphological awareness in children. As stated in Sections 1.1.2 and 2.8, respectively, morphological awareness taps into the more explicit representation and manipulation of morphological rules (implicitly) acquired by children. A more comprehensive understanding of the nature of morphological knowledge in children would perhaps be obtained through an additional examination of the development of their ability to understand and produce morphologically complex items in natural speech (Kuo & Anderson, 2006). In addition, a wider range of control measures would be necessary to factor out potential effects of other metalinguistic factors (e.g., phonological and orthographical awareness), so that the purity of the measures as morphological ones could be claimed with confidence. Further, no developmental aspects of morphological awareness are to be inferred from the current study, due to its non-longitudinal design and also the absence of systematic investigations into underlying socio-cultural factors, which play an important part in shaping children's developing language skills (see Section 2.4). To reiterate, the current study limits its approach to providing information about the children's *present* ability to identify morphemes and produce morphologically complex items demonstrated at a single point in time. In doing so, emphasis is placed on examining any group-specific characteristics of morpheme recognition and production demonstrated in English and Japanese, respectively, together with the extent to which the morphological ability demonstrated in each language differs to that in the other language between the bilingual groups (ESL and JHL groups), namely, transfer of morphological awareness.

All the morphological tasks, including both the English and Japanese ones, were to be pilot-tested prior to the main study. Ideally, the current study would have a separate, instrument validation phase, during which any newly-developed measures are validated on a large sample of children from the population of interest. This was not feasible due to the great difficulty in recruiting the bilingual children through schools. In order to minimise any detrimental effects of this limitation on the validity of the measures, it was ensured that individual performances on each measure and feedback from each one of the children were analysed in great detail during the pilot phase, as described in Section 3.6.

3.5 **Sampling test items**

3.5.1 English morphological tasks

The English WS and WA tasks were modelled on the experimental measures used in previous studies (e.g., Bowers, 2006; Nunes *et al.*, 1997, 2006), where test items were compiled with reference to frequency data on American English (Carroll, Davis & Richman, 1971) or based on the teacher's lesson plans in the Canadian context (Bowers, 2006). In order to adapt these tasks to the current research context, three existing sources of frequency data (for triangulation) based on British and American English were consulted:

a. Brown corpus (American English) (Hofland & Johansson, 1982);
b. Lancaster-Oslo/Bergen (LOB) Corpus (British English) (Johansson & Hofland, 1989);
c. British National Corpus (BNC) (Leech, Rayson & Wilson, 2001).

It should be noted that these sources are compiled, based predominantly on adult, formal, British or American English and hence are not entirely satisfactorily suited for selecting test items appropriate for children (Nation, 2007). Due to the lack of availability of corpora based on child British English, the above corpora were used as an alternative, as commonly seen in previous studies (Nunes *et al*., 1997, 2006). In doing so, it was ensured that the items were used in present-day British English, and that most of them appeared consistently as high-frequency items across sources. Some low-frequency items used in the original tasks (those with frequency scores below 20 per million) were retained as long as they were used in British English, so as to have a range of frequencies (frequent and less frequent) in the test items. An overall frequency of 20 per million words was used as a cut-off point between high-frequency and low-frequency items, as used in the compilation of the BNC spoken and written corpora (Leech et al., 2001). The number of high-frequency (HF) and low-frequency (LF) words in each morphological task is 20 (HF) and 10 (LF) in the WS task and 18 (HF) and 12 (LF) in the WA task (see Appendix 6 for the frequency counts of each item per corpus). It should be noted that investigating frequency effects was beyond the scope of this study.

3.5.2 Japanese vocabulary tests and morphological tasks

Two versions of the TJEV and each of the Japanese morphological tasks were developed for this research: one for children in Years 3-4 (or younger) and the other for those in Years 5-6 (or older). The format of each task remained the same across two groups, the difference being the test items included therein, due to the consideration of age-appropriate vocabulary.

Japanese test items were prepared with reference to a book entitled *Basic Research on the Fundamental Vocabulary used for Education Purposes* (revised and expanded edition) (NINJAL, 2009). This book contains data from seven different sources of Japanese vocabulary for educational purposes (for the nine years of compulsory education) that have been compiled since after World War II. It also presents a complete list of 27,234 words considered as basic educational vocabulary, while also comparing and contrasting these words across sources. Among these seven sources, the following three were chosen for sampling test items:

a. New Basic Japanese Vocabulary for Educational Purposes (Shin Sakamoto Kyōikukihon Goishū) (Sakamoto, 1984)
b. Basic Japanese Vocabulary for Educational Purposes (Tanaka Kyōiku Kihon Goi) (Tanaka, 1956)
c. Basic Japanese Vocabulary for Educational Purposes (Gakushū Kihon Goi) (Chu-O Institute for Educational Research, 1984)

The above three sources were chosen primarily as a) they focus explicitly on Japanese educational vocabulary for primary school children and b) they give an indication of age-appropriateness of all selected vocabulary items by sorting them by school year (NINJAL, 2009). As a first step, all the vocabulary items included in the NINJAL data base (i.e., 27,234 words) were reduced to 2,107 words which appeared consistently across three sources.

The Test of Japanese Expressive Vocabulary (TJEV). Due to the nature of the TJEV (i.e., naming pictures (Test A) or providing word completions in a short sentence (Test B)), only verbs and nouns were selected for test items, a format consistent with the Expressive Vocabulary test from the TOWK (Wiig & Secord, 1992). In addition, nouns and verbs are considered to be the most common parts of speech found in natural text (Webb, 2009). As a result, 2,107 words were reduced to 1,382 words: 957 words appropriate for Years 3-4 children and 425 words for Years 5-6 children. These pools of words were decreased further to 176 words per group (Years 3-4 & Years 5-6) by selecting 4 words from each of the 44 sets indexed by the first *kana* (sound) of each word. (There are 44 basic syllable sounds in total, excluding the vowel-consonant combination を/wo/ and the nasal sound ん/n/.) Two nouns and two verbs chosen from each *kana* all start with the same sound, e.g.,と/to/ (or ど/do/) as in とじる/tojiru/ "to close", どなる/donaru/ "to shout", どろぼう /dorobou/ "a thief" and とちゅう /tochū/ "half way through". 30 target items were then selected to be used in each version of the test (one for Years 3-4 and the other for Years 5-6 children). The same items appear in Tests A and B.

The Japanese WS and WA tasks. The 2,107 words were divided into two parts: one consisted of 1,133 items considered appropriate for Years 3-4 (or younger) children whereas the other consisted of 850 items considered appropriate for Years 5-6 (or older) children. These pools of words were reduced to those of 122 and 123 words respectively, having excluded words which fell under the following categories:

a) loan words;
b) mono-morphemic words (e.g., 花/hana/ “flower”);
c) bi-morphemic words consisting solely of *kanji* (e.g., 読書), as the child could simply put a slash in the middle regardless of his/her morphological knowledge.
d) pronouns かれ/kare/ “he”, conjunction markers (そして/soshite/ “and, then”) and other syntactic categories that do not represent the target morphological processes – inflections and derivations.

30 of the remaining words were selected for each morphological task (WS and WA), consisting of 13/10 inflectional suffixes (5/5 verbal and 8/5 adjectival suffixes) and 20 derivational affixes (8 prefixes and 12 suffixes) in the WS/WA tasks respectively, as shown in Table 7. More derivational suffixes than derivational prefixes were chosen as the former are more numerous and productive in Japanese morphology (Iwasaki, 2002). With respect to derivational suffixes, an equal number of items were prepared from each syntactic category (3 verbs, 3 nouns, 3 adjectives and 3 adverbs). The Japanese target items could be segmented into two or three morphological components, as more complex words were not listed in any of the three sources above and hence were judged as unsuitable for the current sample.

Table 7. *Number of target inflectional and derivational morphemes*

	Inflectional	Derivational	
Task	suffixes	Prefixes	suffixes
English WS	10	8	22
English WA	12	5	13
Japanese WS	13	8	12
Japanese WA	10	8	12

3.6 Pilot study

Prior to the main study, a small-scale pilot study was carried out to judge whether the vocabulary tests and morphological tasks in both languages were appropriate for JHL and ESL children. A total of 8 children consisting of 4 ESLs and 4 JHLs in England took part, none of whom were involved in the main study. They ranged from 7 to 14 years of age (Mean = 10, SD = 2.93). All the children were recruited through Japan-related organisations, societies and snowballing sampling procedures. Their parents preferred to have all the measures administered in a single session at their home. Each child was briefly interviewed by the researcher first regarding their background and was then administered SPM+ either individually or together with their sibling. In cases where two siblings were both eligible for the study, both attended the session together. After appropriate instruction and practice trials, children were administered two vocabulary tests and two additional morphological tasks per language. Instructions were given in English for the English tasks and in Japanese for the Japanese ones. The BPVS and TOWK were administered individually. An average duration of the entire session was two hours, which was split into two to three parts in order to allow the children to have breaks (approximately 15-30 minutes). Half of the children engaged in the tasks in English first, whereas the other half completed the tasks in Japanese first.

The children's performances on the following six tasks were analysed descriptively: the WS and WA tasks in English and Japanese; the TJLA; and the TJEV. As for the TJEV, half of the participating children completed Test A with pictures, whereas the other half completed Test B with short sentences. For both groups, no one was either at floor or ceiling on the morphological/vocabulary tasks in both languages. All four children (2 ESLs and 2 JHLs) scored much less highly on Test A of the TJEV (with pictures) than the others did on Test B with sentences. In addition, two of the children (1 ESL and 1 JHL) who had taken Test A took Test B afterwards and their scores increased from 12 to 25 and 12 to 18 respectively. They both reported that they found Test B much more straightforward and less confusing than Test A, where they struggled to produce an item which matched both the picture and the sentential context in which it occurred. Based on this feedback and the performances across tests, Test B was judged to be more suitable for the current sample.

When administering the Japanese WA task, all the children struggled to understand the following pairs of practice items: 色 (/iro/, colour): 無色 (/mu-shoku/, colourless):: 親切 (/shinsetsu/, kind): 不親切(/fu-shinsetsu/, unkind). Therefore, these pairs were replaced with the following pairs, which were all listed in the Japanese data (NINJAL, 2009): 関係 (/kankei/, relationship): 無関係 (/mukankei/, no relationships):: 自由 (/jiyū/, freedom): 不自由(/fujiyū/, restricted, or disabled in a physical sense). No modification was made to the target items.

Based on these results of the pilot study, the following tests/tasks were to be used in the main study:

a) Nonverbal ability: Raven's SPM +;
b) English: BPVS, TOWK-EV (Expressive Vocabulary), the WS and WA tasks;
c) Japanese: TJLA, TJEV, the Japanese version of the WS and WA tasks.

3.7 Procedures

Great difficulty in recruiting ESL/JHLs from Japanese schools or local state schools in England resulted in the researcher visiting 17 ESLs and 11 JHLs at their home and administering all the measures in a single session, as requested by their parents. On other occasions, the testing was carried out on 6 ESLs and 6 JHLs in a quiet room at Japanese Saturday Schools over two sessions (the second session held two weeks later) and on 1 ESL and 4 JHLs at the Department of Education, University of Oxford. The picture below shows what a testing session at home looked like.

The bilingual children's age does not necessarily correspond to the same school year in England and Japan, due to the difference in the starting age of compulsory schooling which is five in England and six in Japan. Therefore, the version of each Japanese task (A or B) which corresponded to one year minus their English school year was administered to the bilingual groups. Prior to the testing, the researcher presented the Japanese tasks to the school teachers and parents for feedback, to ensure that the test items were appropriate for the bilingual children. Concerns were raised for four JHL children in Years 6-9 by their school teachers and parents and the researcher was advised to administer Version A of the morphological tasks (designed for children in Years 3-4 or younger), instead of Version B, so that it would not damage the children's confidence in Japanese.

Picture. *A testing session with the bilingual children*

A brief interview was held at the beginning of the first session, to obtain information about the language learning background of the bilingual children (e.g., language spoken at home, AOA, LOR in the UK). After the interview, the SPM+ was administered either individually or in a small group. No children fell below the normal range and hence their scores were all included in the subsequent analyses. After appropriate instruction and practice trials, the ESLs and JHLs were administered two vocabulary tests and two additional morphological tasks per language. The JLM/ELMs were tested in Japanese/English only and two testing sessions, each of which lasted approximately half an hour, took place in a quiet room at their school. All the measures were administered over two school visits per school. The ESL/JHLs attended the testing session either individually or in a small group, depending on where it was held (e.g., at their home or school) and on the arrangements made by the parents or school teachers. It was ensured that all children (ESLs, JHLs and ELMs) were administered the oral tests (BPVS and TOWK) individually. The ELMs were divided into two groups to engage in the SPM+ and English morphological tasks: one consisted of Years 3-4 children, whereas the other consisted of Years 5-6 children. The JLMs attended both sessions in a group consisting of their peers from the same school year, since all of their measures were written tests/tasks. The average duration of the testing session was two hours for the ESL/JHLs (with breaks) and approximately an hour for the JLM/ELMs. In order to avoid any potential effect of order of test/task administration, counter-balancing was achieved by half of the children in each bilingual group completed the Japanese set first and the other half English first.

3.8 Ethical approval

This study was, prior to data collection, reviewed by and received ethical clearance from the University of Oxford Central University Ethics Committee (see Appendix 24 for the ethical approval letter and CUREC form 1). The schools and their parents were all informed that their personal information would be strictly confidential and anonymous, and that the data would only be accessed by the researcher and her supervisor at the University of Oxford. The researcher received clearance from the Criminal Record Bureau. It was ensured that the schools and parents were informed, prior to the start of data collection, of the number of sessions and the length of time required for the completion of tasks. It was also ensured that the researcher asked the child if s/he was happy to continue at the beginning of each task, and, especially when the child was to complete all the tasks in a single session, s/he was allowed to have a break in between sessions so that their performance would not be compromised by their fatigue too much.

Chapter 4

RESULTS Part I – Sub-study 1 –

This chapter reports on the findings of Sub-study 1, which focussed on the participating children's performance on the vocabulary and morphological tests/tasks in English, thus involving the following three groups: the ESL, JHL and ELM groups. The results will be analysed statistically by carrying out a series of Analysis of Covariance (ANCOVA) and multiple regression analyses and also by descriptively analysing errors in individual responses to the Word Segmentation (WS) and Word Analogy (WA) task. The findings reported in this chapter will be revisited for further discussions in Chapter 7. The research questions (RQs) addressed in Sub-study 1 are as follows:

1. What is the nature of receptive and expressive knowledge of lexical meanings in English speakers and to what extent does it differ between ESL, JHL and ELM children?
2. What is the nature of the ability to recognise and produce inflectional and derivational morphemes in English speakers, and to what extent does it differ between ESL, JHL and ELM children?

As stated in Chapter 3, unless otherwise stated, the terms *vocabulary knowledge* or *vocabulary* refer to the children's knowledge of lexical meanings in the language concerned (English in this study and Japanese in Sub-study 2).

4.1 Scoring systems

The children's responses to the Word Segmentation (WS) task and Word Analogy (WA) task were each coded by the researcher. Two scoring systems – crude and sensitive – were applied to the WS task (Webb, 2008; Hayashi & Murphy, 2011). In the crude scoring system, responses were marked as correct if they matched the segmentations given by two Native

Speaker (NS) judges and etymological segmentations given in an English language dictionary (Konishi & Minamide, 2007). If they did not match either source, zero points were awarded. In the sensitive system, a total score is a sum of points awarded to each morpheme (e.g., stems/roots, affixes) identified through segmentation, such as *shorten* + <u>*ed*</u> (one point), *short* + *en* + *ed* (three points), <u>*ir*</u> + *regularly* (one point) and *ir* + *regular* + *ly* (three points).

Employing these two scoring systems is important for the following two reasons. One is to allow for the task to capture different degrees (i.e., explicit and less explicit) of the children's knowledge of the structure of morphologically complex items. Another reason is that using only the strict scoring system, which is reflective of how adults may segment the items, together with etymological segmentations given in the dictionary, might not necessarily accurately represent the way school-age children segment these items. In addition, depending on the item and its morphological complexity, it can be difficult to reach 'the segmentation': there may well be different ways of segmenting an item, none of which can be dismissed as 'incorrect' altogether and awarded zero points accordingly. To take the word *irregularly* as an example, using the crude scoring system only would completely ignore such segmentations as *irregular* + *ly* or *ir* + *regularly*, due to these being different from the judges' segmentation *ir* + *regular* + *ly*. All accepted segmentations are presented in Appendix 8.

Component scores of the overall sensitive scores – scores awarded on each morpheme type – were used when investigating effects of morpheme type on children's performance on the WS task (RQ2). The WS task is designed to measure the children's ability to recognise the morphological structure of each target item by identifying each morpheme included therein using slashes. Therefore, scores were awarded on each morpheme type: root (i.e., an irreducible core unit of word), inflectional and derivational. Crude and sensitive overall scores were both used when examining patterns in overall performance across morphological tasks, and also their relationship with vocabulary knowledge (Chapter 6).

Only the crude scoring system was applied to the WA task. The overall crude scores were divided into two sets of sub-scores – those on the inflectional and derivational morphemes, when effects of morpheme type on the children's performance were examined. Root morphemes were not included in the WA analysis since the task involved producing an item which correctly represented the inflectional or derivational relationship between items in the target pair, as in *angry*: *anger*:: *strong*: __________ (*strength*). One correct answer was assigned to every target item except for Item 3 (*teacher: taught* :: *writer:* _____) and Item 11 (*healthy: unhealthy* :: *similar:* _____). Two answers were assigned to these items: *wrote/written* for Item 3; and *dissimilar/unsimilar* for Item 11. In the former example, the item *taught* in the preceding pair can be considered either as past simple or past participle and hence both *wrote* and *written* were marked as correct. The item *unsimilar* was uncommonly used, however it was marked as correct since it is listed in the English language dictionary (Konishi & Minamide, 2007). In addition, since the WA task was not designed to measure spelling skills, the children were not penalised for any spelling errors as long as they reflected a correct response phonologically. Two common spelling errors were 'inventer (for *inventor*)' and 'inpossible (for *impossible*)' and both were marked as correct.

The standardised tests such as the BPVS and TOWK were marked with reference to their respective manuals for examiners. The response was scored one point if it was correct, and zero points if it was incorrect or 'NR (no response)' was given as an answer, whereby the child gave no response or responded with 'I don't know', or a similar response.

Due to the small sample size, p-values greater than .05 and below .08 (i.e., 05 $\leq p \leq$ .07) were too close to the value of .05, a significance threshold commonly used in social science research, to ignore completely (Daniel, 1998; Larson-Hall, 2010). Hence, these values are reported as nearing significance in the following statistical analyses, a practice also employed in relevant studies (e.g., Deacon et al., 2007; Proctor, Uccelli, Dalton & Snow, 2009). Unless otherwise stated, any result accompanied by '$p > .05$' indicates that its non-significance value was greater than the nearing significance level.

Age and nonverbal IQ are used as control variables in the statistical analyses reported below. Controlling for age was important, due to the use of age-related measures, which means that any results obtained could well be explained by age rather than vocabulary or morphological knowledge per se. The scores of the vocabulary tests (BPVS and TOWK-EV), for instance, did not come from the items completed by all participating children: the children completed a different set of test items, according to their chronological age, as specified in the respective manuals. Another similar issue is that while the target items in the morphological tasks remained the same across groups, they were completed by the children of different ages. Whilst using age as a control variable alone does not eliminate all potential age effects from the analysis, it acted to keep these effects to a minimum. Controlling for nonverbal IQ was to ensure that any significant association was not a product of the influence of their cognitive ability but came from the linguistic variables of interest.

4.2 Exploring data – checking the assumption of normality

The extent of normality in the distribution of the data points, the most important of the assumptions of parametric data, was checked first. The data on each variable from each group was eyeballed using a histogram. This was followed by quantifying the shape of the distribution using the z-scores of skewness (S) and kurtosis (K) values, which were calculated by dividing the S/K by standard error of S/K respectively (Field, 2005). This conversion was necessary also to standardise measures on different scales. Due to the small sample size, the criterion of an absolute value 1.96 (significant at $p < .05$) was increased to an upper threshold of $\pm$ 2.58 (significant at $p < .01$) (Field, 2005). In other words, an absolute value greater than the increased threshold indicates that the data were significantly deviant from normality. All the

English measures administered for this sub-study fell below this threshold, thus indicating that normal distribution was an appropriate model for the data set.

4.3 Vocabulary test results

The reliability of the TOWK Expressive Vocabulary (TOWK-EV) was checked, since it was originally standardised on a US population and does not have UK norms. The TOWK-EV, just like the BPVS, consists of several age bands and not all children completed the same sets of items. For instance, some children started on Item 5 in Set 2 (6 - 9 years) and finished on Item 21 (having made five consecutive errors), whereas others started on Item 13 in Set 3 (12 - 14 years) and finished at the end (Item 32). Hence, the internal consistency of the TOEK-EV could not be checked using all the items. As an alternative, Item 9 - Item 21 were used since these were completed by the majority of the participating children (80 %). A high degree of internal consistency was obtained, Cronbach's α = .83, thus indicating that the TOWK-EV is a reliable measure of expressive vocabulary for the current UK sample. Table 8 presents means and Standard Deviations (SD) for the nonverbal task SPM+ and vocabulary tests.

Table 8. *Mean and standard deviations for SPM+ and English vocabulary tests*

	ESL (n = 24)	JHL (n = 21)	ELM (n = 25)
Nonverbal & Vocabulary tests		Mean (SD)	
SPM+ raw scores (max. 60)	32.65 (5.47)	33.19 (4.01)	27.29 (4.63)
SPM+ standard scores	106.74 (13.78)	108.81 (10.24)	98.75 (14.16)
BPVS			
Raw scores (max. 168)	86.35 (25.46)	108.48 (14.06)	99.33 (13.73)
Standard scores	87.00 (16.70)	107.81 (7.81)	107.42 (10.43)
Age-equivalent	8; 6 (3.37)	11;4 (2.15)	9;9 (1.94)
TOWK-EV			
Raw scores (max. 32)	15.57 (6.10)	22.52 (4.15)	23.17 (2.75)
Standard scores	7.70 (3.72)	12.67 (2.92)	15.17 (1.76)

In order to investigate performance on the vocabulary tests, a repeated-measures Analysis of Covariance (ANCOVA) was carried out, with one related-samples variable English Vocabulary Knowledge (EVK) tested at two levels (receptive and expressive) and one independent-samples variable, Group (ESLs, JHLs and ELMs). Age and nonverbal IQ were used as covariates. Z-scores of each test were used for this analysis, since both tests were on different scales.

A main effect was identified for EVK, $F(1, 65) = 5.47$, $p = .02$, $\eta_p^2 = .08$ and also for Group, $F(2, 65) = 43.76$, $p < .001$, $\eta_p^2 = .57$. A significant EVK × Group interaction, $F(2, 65) = 6.43$, $p = .003$, $\eta_p^2 = .17$ was also identified, suggesting that patterns in the performances on the receptive (BPVS) and expressive measures (TOWK-EV) were different across groups. These effects are illustrated in Figure 4. Planned contrasts revealed that the ELMs and JHLs yielded comparable scores on the BPVS, $p > .05$, whereas their scores were each significantly higher than the ESL scores, $t(44) = 6.61$, $p < .001$, $d = 2.3$ (ELMs – ESLs) and $t(40) = 5.68$, $p < .001$, $d = 1.8$ (JHLs – ESLs). The smallest difference in the expressive vocabulary scores, which lay between the ELM and JHL groups, was statistically significant, $t(41) = 3.08$, $p = .002$, $d = .01$. Hence, the ELM group yielded the highest expressive scores while the JHL group yielded higher scores than did the ESL group. As regards within-group differences, the receptive scores were significantly higher than the expressive scores for the ESL group, $t(23) = 2.45$, $p = .02$, $d = .36$, whereas it was the other way around for the ELM group (expressive > receptive), $t(24) = 4.37$, $p < .001$, $d = .62$. In contrast, receptive and expressive vocabulary scores were comparable for the JHL group, $p > .05$. Thus, these findings have revealed three group-specific patterns in the nature of receptive and expressive vocabulary in English.

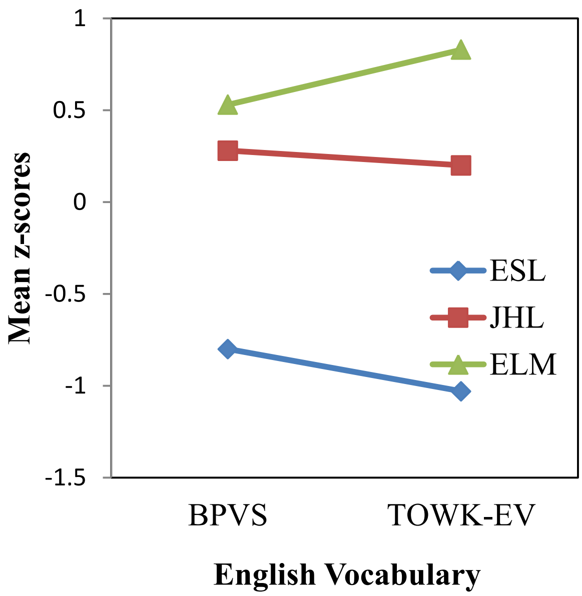


Figure 4. *Mean scores on the BPVS and TOWK-EV*

4.3.1 Relationship between receptive and productive vocabulary knowledge

Partial correlations, controlling for age and nonverbal IQ, were performed to examine the relationship between receptive and expressive vocabulary in each group. Consistent with all groups, an increase in receptive (BPVS) scores was associated with an increase in expressive (TOWK-EV) scores, r = .78, p < .001 (both ESLs and JHLs), r = .56, p = .006 (ELMs), thus representing a positive relationship between receptive and expressive vocabulary in English.

In summary, as also shown in Table 9, the nature of English receptive and expressive vocabulary was unique to each group. Receptive vocabulary scores were higher than expressive vocabulary scores for the ESL group, whereas these two sets of scores did not significantly differ for the JHL group. In contrast, the ELM group's expressive vocabulary scores were higher than receptive vocabulary scores. Group differences were evident on the expressive vocabulary test: each group's performance was significantly different from one another. The JHL and ELM groups demonstrated receptive vocabulary knowledge in a comparable manner, outperforming the ESL group.

Table 9. *Summary of English vocabulary results*

Within-group difference		
ESL	JHL	ELM
RV > EV	RV ≈ EV	RV < EV

Between-group difference	
RV	EV
ESL < JHL ≈ ELM	ESL < JHL < ELM

Note. RV: Receptive Vocabulary; EV: Expressive Vocabulary

4.4 English morphological task results

The reliability of the English WS and WA tasks was measured by a Cronbach Alpha coefficient. A high degree of internal consistency was observed for both WS (.82) and WA (.87) tasks. Means and standard deviations for overall scores are presented in Table 10. .

Table 10. *Mean and standard deviations for English morphological tasks*

	ESL (n = 24)	JHL (n = 21)	ELM (n = 25)
Measures	Mean (SD)		
English morphological tasks			
WS task (crude) (max. 30)	17.44 (4.7)	16.23 (5.42)	15.25 (4.58)
WS task (sensitive) (max. 100)	61.12 (14.21)	60 (12.04)	62.16 (14.05)
WA task (max. 30)	18.82 (6.4)	17.85 (5.81)	15.86 (4.13)

4.4.1 English morphological awareness results - overall performance

Overall performance on the WS task did not differ across groups, $p > .05$. On the WA task, in contrast, the ESL group yielded higher scores than did the ELM group, $t(45) = 2.16$, $p = .03$, $d = .64$. Overall WA scores were comparable between the ESL and JHL groups on the one hand and the JHL and ELM groups on the other. Paired-samples t-tests indicated that the JHL group performed significantly better on the WA task than the WS task, $t(20) = 3.32$, $p = .003$, $d = .51$. Both ESL and ELM groups each yielded comparable overall scores across tasks (see Appendix 20 for a more detailed version of the analysis).

4.4.2 English WS task results - effects of morpheme type

In relation to Research Question 2, component (morpheme-type) scores of WS sensitive scores were used to investigate the children's performance by morpheme type. To this end, a repeated-measures ANCOVA was carried out with a related-samples variable, Morpheme Type tested at three levels (root, inflectional and derivational), together with Group (ESL, JHL and ELM) as an independent-samples variable. Each set of raw component scores (max. 30 for root, 10 for inflectional and 30 for derivational morphemes) was converted into percentages for comparisons to be made across morpheme types.

The vocabulary results reported above showed that the ESL group yielded lower receptive scores than did the other groups. One could infer from this difference that the level of the ESL group's proficiency in English was lower than the other two groups. This difference was taken into account by using proficiency (BPVS scores) as a covariate, together with the other non-linguistic covariates, age and nonverbal IQ.

Due to the violation of the assumption of sphericity, ($\chi^2(2) = 26.53$, $p < .001$), degrees of freedom were corrected using Greenhouse-Geisser estimates of sphericity ($\varepsilon = .74$) (Field, 2005). The WS analysis identified a main effect for Morpheme Type, $F(1.49, 95.26) = 10.28$, $p < .001$, $\eta_p^2 = .14$, as illustrated in Figure 5. Neither a Morpheme Type $\times$ Group interaction nor Group effects were significant, $F < 1$. Paired-samples t-tests were carried out to examine performances across morpheme types within each group. As for the ESL group, the smallest within-group difference, which lay between their scores on the root and derivational morphemes, reached statistical significance, $t(23) = 7.0$, $p < .001$, $d = 1.0$. The bigger differences were also significant, suggesting that the ESLs performed most highly on the inflectional morphemes. In addition, their awareness of root morphemes was demonstrated to higher degrees than that of derivational morphemes. The same pattern was identified in the other two groups: both groups scored more highly on the root morphemes than derivational morphemes (the smallest difference), $t(20) = 2.13$, $p = .046$, $d = .33$. (JHLs) and $t(24) = 3.47$, $p = .002$, $d = .49$ (ELMs). Both JHL and ELM groups thus performed most highly on the inflectional morphemes and least highly on the derivational morphemes.

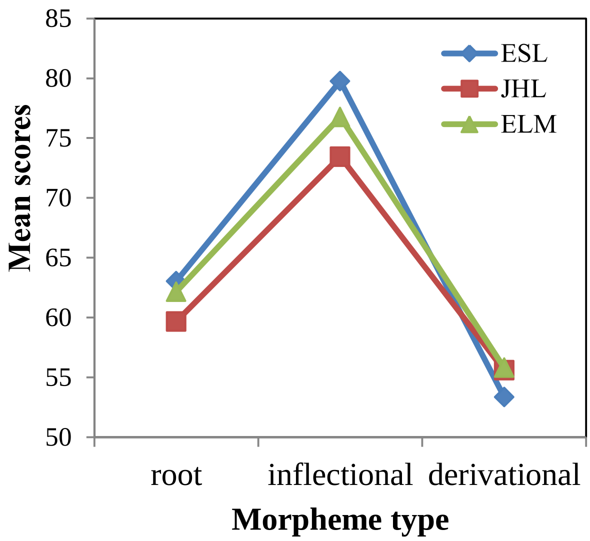


Figure 5. *Mean scores on morpheme types in the English WS task*

4.4.3 English WA task results - effects of morpheme type

An additional repeated-measures ANCOVA was carried out in order to examine the effects of morpheme type (inflectional and derivational) on the children's performance on the WA task. Age, nonverbal IQ and English proficiency were used as covariates.

The WA analysis yielded a main effect for Morpheme Type, $F(1, 63) = 7.72$, $p = .007$, $\eta_p^2 = .11$, indicating that all groups typically performed better on the inflectional than derivational morphemes. This effect is illustrated in Figure 6. Neither significant Group effects nor a significant Morpheme Type $\times$ Group interaction was found, $p > .05$. Planned contrast indicated that while all groups yielded similar scores on the inflectional morphemes, the ESL and JHL groups each scored more highly on the derivational morphemes than did the ELM group, $t(44) = 2.04$, $p = .046$, $d = .71$ (ESL – ELM), $t(41) = 2.5$, $p = .015$, $d = .78$ (JHL – ELM). The ESL and JHL groups did not differ significantly on the derivational morphemes, $p > .05$.

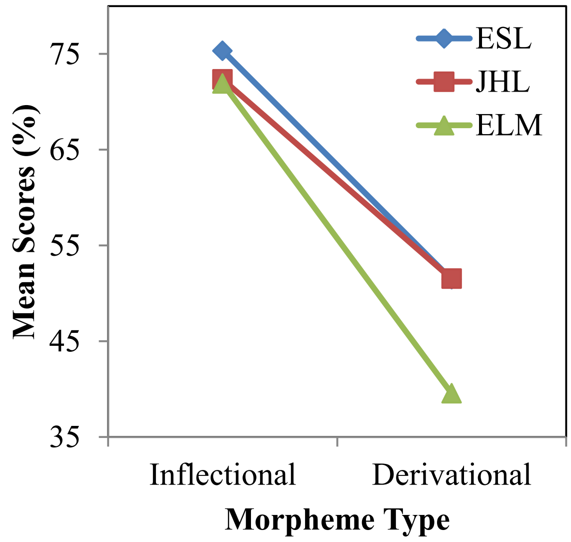


Figure 6. *Mean scores across morphemes in the English WA task*

4.4.4 Relationship between morpheme recognition and production

Partial correlations were carried out, controlling for age, nonverbal IQ and English proficiency in order to examine the relationship between morpheme recognition and production, as measured by the WS task and WA task respectively. Two sets of scores – crude and sensitive scores from the WS task – were entered as two separate variables to examine whether or not each level of sensitivity in morpheme recognition was differently associated with the measure of morpheme production. The only significant relationship identified was between each set of WS scores and the WA task scores among the ESL group, r = .55, p = .009 (WS crude scores - WA scores) and r = .60, p = .004 (WS sensitive scores - WA scores). That is, as their ability to identify morphemes through segmentation increases at both levels of sensitivity, so too does the ability to produce inflectional and derivational forms through analogy increase, thus representing a positive relationship between morpheme recognition and production in English. These aspects of morphological awareness were, in contrast, not significantly related with one another in the other two groups, both of whom were English-L1 (or English dominant) children.

4.4.5 Summary of the English morphological awareness results

As summarised in Table 11, in the WS task, all groups scored most highly on the inflectional morphemes and least highly on the derivational morphemes. No significant group differences were identified either in overall scores or performance on each morpheme type. Group differences were more evident in the WA task: while the ESL group yielded higher overall scores than the ELM group, both ESL and JHL groups scored more highly than did the ELM group on the derivational items. The nature of the association between morpheme recognition and production differed between groups, with it being more reciprocal for the ESL group and perhaps being independent of one another for the other two groups.

Table 11. *Summary of English morphological awareness results*

Overall performance

Within-group difference		
ESL	JHL	ELM
WS ≈ WA	WS < WA	WS ≈ WA

Between-group difference	
WS task	WA task
ESL ≈ JHL ≈ ELM	ESL > ELM; JHL ≈ ELM; ESL ≈ JHL

Morpheme type effects

Within-group difference					
WS task			WA task		
ESL	JHL	ELM	ESL	JHL	ELM
inflectional > root > derivational			inflectional > derivational		

Between-group difference				
WS task			WA task	
Root	Inflectional	Derivational	Inflectional	Derivational
ESL ≈ JHL ≈ ELM			ESL ≈ JHL ≈ ELM	ESL ≈ JHL > ELM

4.5 A descriptive analysis of morphological errors

The ANCOVAs carried out above indicated that the groups did not differ either in overall scores or scores on each morpheme type in the WS task. Further information about the nature of morphological awareness in these children should be gleaned by looking at their individual responses, especially errors, and examining whether or not there may be some morphological factors (i.e., semantic transparency and morphemic complexity) underlying these erroneous responses. It is conceivable that some degrees of morphological awareness can be captured in errors, namely, children's answers which did not match either the responses given by the NS judges or those by the English language dictionary (for the WS task). More specifically, analysing errors could elucidate processes that children might have used when completing each morphological task and also allow for the observation of patterns in the errors which are common across groups or unique to a certain group (Jarmulowicz & Hay, 2009).

A close examination of individual responses to the morphological tasks identified the following three overall patterns to begin with: items accompanied by a) the consistent nature (80% or higher percentage) of correct responses; b) lesser degrees (51-79%) of consistency in correct responses and a few examples of incorrect responses; and c) a wide variety of incorrect responses with few correct ones provided by less than half of the children in each group. Based on this observation, the researcher categorised the target items into three levels of response variability for each group of children (i.e., low/no variability = Grade 1, medium = Grade 2, high = Grade 3) (see Appendices 9 (WS) & 11 (WA) for the complete lists of items classified into Grades 1-3 and morphological factors, respectively). To take the item *arrival* from the WS task for example, it was classified as a Grade 1 item for both the JHL and ELM groups as more than 80 % of the children segmented it as *arriv* + *al*. It was regarded as a Grade 2 item for the ESL group since 51-79 % of the children provided the *arriv* + *al* as an answer. The item *information* was classified as a Grade 3 item for all groups as less than half of the children in each group segmented it as *in/form* + *ation*, while the remaining children provided wide-ranging segmentations judged as incorrect for the ANCOVAs (see Appendices 8 (WS) and 10 (WA) for the complete lists of individual responses).

Errors in Grade 2 and 3 items will be the focus throughout the error analysis reported below. The Grade 1 category, which consists of a large proportion (more than 80%) of correct responses provided, will not be featured explicitly, except when the relationship between the morphological factors and levels of response variability is examined statistically.

Investigating these morphological factors was motivated by the existing evidence both from psycholinguistic and linguistic research suggesting that the way lexical items are accessed for morphological segmentation could be influenced by semantic transparency (e.g., Hayashi & Murphy, 2011, Marslen-Wilson, 2007), and that vocabulary development during the late school years is characterised by improved skills at analysing multi-morphemic items (consisting of three or more morphemes), as well as bi-morphemic items (consisting two morphemes) (Anglin, 1993; Bowers, 2006; Bowers & Kirby, 2010). Semantic transparency concerns the degree to which the meaning of a morphologically complex item is derivable from the relationship between the root and its affix(es) (e.g., transparent: *departure* (*depart* + *ure*); opaque: *department* (*depart* + *ment*)) (Marslen-Wilson, Tyler, Waksler & Older, 1994). An element of phonological transparency was incorporated into semantic transparency, due to the following observations made during data collection: a) the vast majority of the participating children (JHL and ELM children in particular) attempted to identify morphemes by 'sounding out' the target items; and b) phonological opacity between the root and its affixes adversely affected some children in recognising the semantically transparent relationship between items (e.g., *definition* → *define* - *definition*; *competition* → *compete* - *competition*). Therefore, the item was judged as semantically transparent if the meaning of the entire form could be derived from the relationship between a root and its affixes in spoken form as well as written form (e.g., transparent: *creative*; opaque: *definition*).

It should be noted that the error analysis reported below acts as supplementary analysis for the ANCOVAs presented above so that a detailed picture of the nature of morphological awareness can be obtained in addressing Research Question 2. A brief overview of the analysis conducted will be given below, starting with the relationship between morphological factors and response variability, followed by a description of patterns in errors from each task. The reader is referred to Appendix 21 for a more detailed version of the error analysis.

4.5.1 Relationship between morphological factors and response variability

4.5.1.1 English WS task

Cross-tabulation analysis was performed to examine the relationship between degrees of semantic transparency (transparent - opaque) and levels of response variability (Grades 1-3) on the one hand, and degrees of morpheme complexity (bi-morphemic - multi-morphemic) and levels of response variability on the other. Fisher's exact test was used as a method for computing the exact probability of the chi-square statistic, since the expected frequencies were low (more than 20% below 5), which means that the sample size was too small and the sampling distribution could be deviant from a perfect chi-square distribution (Field, 2005). Consistent with all groups, increased degrees of semantic opacity and morphemic complexity were each significantly associated with the most highly varied nature of responses, as shown in Tables 12 (ESLs), 13 (JHLs) and 14 (ELMs). That is, the children's segmentations became increasingly varied (i.e., errors increased significantly) (Grade 1 → 3) as the item increased in semantic opacity and also in internal complexity (bimorphemic → multimorphemic).

Table 12. *The relationship between response variability and semantic transparency/ morphemic complexity (ESLs)*

Variability	Transparent	Opaque	Bi-morphemic	Multi-morphemic
	Fisher's exact test: p = .02, φ (phi) = .55 (a medium effect size)		Fisher's exact test p = .007, φ = .61	
Low (Grade 1)	9	0	9	0
High (Grade 3)	6	6	5	7

Table 13. *The relationship between response variability and semantic transparency/ morphemic complexity (JHLs)*

Variability	Transparent	Opaque	Bi-morphemic	Multi-morphemic
	Fisher's exact test: p = .04, φ = .54			
Low (Grade 1)	7	0	7	0
High (Grade 3)	6	7	6	7

Table 14. *The relationship between response variability and semantic transparency/ morphemic complexity (ELMs)*

Variability	Transparent	Opaque	Bi-morphemic	Multi-morphemic
	Fisher's exact test: p = .04, φ = .46		Fisher's exact test: p = .02, φ = .57	
Low (Grade 1)	8	0	8	0
High (Grade 3)	8	6	6	8

4.5.1.2 English WA task

A similar analysis was carried out on the individual responses to the English WA task, except that only one morphological factor, morphemic complexity, was taken into account at two levels (monomorphemic versus bi-morphemic) as no multi-morphemic items were targeted for production. Semantic transparency is not examined, since each target item was preceded by another item which was semantically related, such as *angry: anger:: strong:* _______ (*strength*). A series of cross-tabulation analyses identified no significant relationships between the two levels of morphemic complexity and three levels of response variability (Grades 1-3): Fisher's exact test (FET) = 1.30, p = 1.0 (ESLs); FET = .92, p = 1.0 (JHLs); FET = .89, p = 1.0 (ELMs) (see Appendix 21 for a detailed version of the analysis).

4.5.2 Descriptive patterns in morphological errors

4.5.2.1 English WS task

4.5.2.1.1 Coarse segmentation

One overarching pattern identified in all groups was so-called *coarse segmentation*. The participating children typically identified a base morpheme as the smallest unit, instead of a root (i.e., an irreducible core unit of a word), such as 'differen + ce' (for *differ* + *rence*), and 'in + formation' (for *in/form + ation*). This tendency was particularly robust in multi-morphemic items such as 'un + comfortable' (5 ESLs, 9 JHLs, 11 ELMs), 'victorious + ly' (11 ESLs, 6 JHLs, 9 ELMs), 'in + significance / in + significan + ce' (11 ESLs, 9 JHLs, 13 ELMs) and 'responsibiliti + es / respons + iblities' (9 ESLs, 5 JHLs, 8 ELMs) (see Appendices 8 for the complete list of individual responses).

4.5.2.1.2 Identification of a non-morphemic unit

An identification of non-morphemic units was characteristic of errors produced by the JHL and ELM groups – English dominant/L1 groups. Both groups, upon encountering non-easily-segmentable items, typically sounded them out in search of their morphological constituents. Failing that, they attempted to find an alternative component, irrespective of its semantic relationships with the target item (e.g., 'def' (*deaf*) as in 'def + inition' (5 JHLs, 4 ELMs), 'am' in 'ambitious' (7 JHLs, 11 ELMs) or 'fur' in 'fur + niture' (3 JHLs, 9 ELMs)).

4.5.2.1.3 'furniture' and 'ambitious'

All groups of children struggled with the items, *furniture* and *ambitious*. The participating children typically sounded these items out many times while also reporting to the researcher that they could not find any smaller units included in these words or any other words with a similar form (i.e., morphologically related words, such as *furnish* and *ambition*). These items were perhaps available for access to, and retrieval from the mental lexicon only as whole-word forms and hence resulted in the children treating them as monomorphemic items and/or segmenting them non-morphologically (e.g., resorting to phonological segmentation).

4.5.2.2 English WA task

4.5.2.2.1 Overgeneralised inflectional forms

One pattern of errors commonly identified across groups was the production of overgeneralised inflectional forms. Examples include the following: ‘shaked’ (17 ESLs, 15 JHLs, 12 ELMs), ‘mices’ (2 ESLs, 2 JHLs, 3 ELMs), ‘holded’ (6 ESLs, 4 JHLs, 4 ELMs) and ‘losed’(9 ESLs, 4 ESLs, 1 ELM). While these errors indicate that the relationship between the correct irregular form and its stem was not recognised, they could also be interpreted as a manifestation of an awareness of the regular inflectional ending *-ed* and *-(e)s* in the children (see Appendix 10 for the complete list of individual responses).

4.5.2.2.2 Production of non-naturally occurring derivational forms

The production of non-naturally occurring derivational items was a pattern prominent especially in the ESL and ELM groups. Examples include the following (answers and the number of children given in brackets): ‘insimilar (for *dissimilar*)’ (1 ESL), ‘necessaricy (for *necessity*)’ (1 ESL), ‘responsement (for *respond*)’ (2 ESLs, 1 ELM), ‘effection (for *effective*)’ (1 ESL, 3 ELMs) and ‘enthusiation (for *enthusiastic*)’ (2 ELMs). These examples, although erroneous, suggest that the children applied their knowledge of affixes (e.g., *in-*, *-cy*, *-ment*, *-tion*) to produce a morphologically complex item on their own. These errors, at the same time, underscore a special difficulty in mastering the idiosyncratic nature of derivational suffixes, which involves multiple aspects of knowledge (Tyler & Nagy, 1989): relational (e.g., ✓*create* - *creator*; × *me* - *meter*); syntactic (e.g., recognising *-ise/-tion* as a verb-forming/noun-forming suffix); and distributional (✓*announcement*; × *responsement*).

4.5.2.2.3 Morphologically related items given in an incorrect syntactic category

Some of the answers given by the JHL and ELM groups in particular were morphologically related to the other item in the target pair but did not fully represent the syntactic relationship between the items in the immediately preceding pair. Examples include the following: ‘anger: angry:: strength: <u>strengthened </u>(for *strong*)’ (1 JHL, 1 ELM); ‘private: privacy:: necessary: <u>necessarily </u>(for *necessity*)’ (7 JHLs, 8 ELMs); and ‘treatment: treat :: response : <u>responsibility/responsible </u>(for *respond*)’ (2 JHLs, 6 ELMs). Hence, although these responses were marked as incorrect, they could be interpreted as a manifestation of morphological awareness, especially, an awareness (or a partial awareness) of a word family.

4.5.2.2.4 Influence of surface features

Use of the surface features of the immediately preceding pair was observed in all groups, although somewhat more salient in the ESL group. Examples include the following: ‘happy: happiness:: high: <u>highness</u>’ (12 ESLs, 7 JHLs, 4 ELMs); ‘lucky: unlucky:: possible: <u>unpossible</u>’ (5 ESLs, 3 JHLs); and ‘mess: messy:: effect: <u>effecty</u>’ (11 ESLs).

4.5.2.2.5 ‘dissimilar’ and ‘enlarge’

Only one ESL and one JHL child provided the correct forms *dissimilar* and *enlarge* and both of them were in Year 9 (i.e., the oldest child in each group) at the time of testing. (No secondary school children were included in the ELM group.) These items were retained for analysis since this pattern provides insight into their sensitivity to the maturity of children’s vocabulary knowledge, which could be incorporated in the future improvement of the current WA task.

4.5.3 Summary of error analysis of the English morphological tasks

Amongst the morphological factors concerned, semantic transparency and morphemic complexity were found to be influential in the children's individual segmentations. As identified in all groups, as the degree of transparency decreased (transparent → opaque) and complexity increased (bi-morphemic → multi-morphemic), erroneous segmentations increased significantly (Grade 1→ 3). There were commonalities in Grades 2-3 segmentation errors between groups. One was to segment multi-morphemic items into two morphemes, where the participating children treated the base, not the root, as the smallest unit. An additional observation was that some children, especially the JHL and ELM groups, identified a unit (a free morpheme) independently of the meaning of the target item, by relying on its phonological properties.

With respect to the English WA task, the roles of morphemic complexity in the nature of individual responses remained unclear for all groups. The further descriptive analysis of Grade 2-3 errors revealed that the production of overgeneralised inflectional forms was commonly identified in all groups. The ESL and ELM groups, in particular, exhibited a tendency to produce novel derivational forms by applying incompatible affixes to the root morpheme (i.e., a cue for the target item). Some of the responses judged as incorrect were indeed morphologically related to the other item in the target pair, which could be interpreted as the children's (impartial) knowledge of a word family.

4.6 Summary of the Chapter

The analyses presented in this chapter have revealed the group-specific nature of receptive and expressive vocabulary, as measured by the BPVS and TOWK-EV (Expressive Vocabulary) scores. The receptive scores were significantly higher for the ESL group, whereas it was the other way around for the ELM group. In contrast, these two sets of scores were comparable for the JHL group. As regards the morphological tasks, both in the WS and WA tasks, inflectional morphemes were recognised/produced more accurately than derivational ones. It is worth noting that the WS task did not exhibit any significant group difference in overall scores or across morpheme types, after controlling for age, IQ and English proficiency. The investigation of individual segmentations indicated that both semantic opacity and the multi-morphemic nature of items could be influential in the large proportion of errors by all groups.

With respect to the WA task, the difference in overall performance was identified between the ESL and ELM groups only, in the favour of the former. The group difference was more evident on the derivational morphemes, where the ESL and JHL groups each yielded higher scores than did the ELM group. Thus, after controlling for age, IQ and English proficiency, the nature of morphological derivations could be more highly productive in the ESL group in written tasks, in comparison to the ELM group. One salient feature identified in the ELM group (and less saliently also in the ESL group) was a large proportion of non-naturally occurring derivational items, due to the erroneous choice of an affix to be attached to a root morpheme. Another pattern, relatively common in the JHL group, was the incorrect syntactic category in which the derivational item was given as an answer (e.g., *necessarily* for *necessity*). Hence, the error analysis not only adds more detail to the ANCOVA results by describing a range of underlying patterns but also could potentially serve as a stimulus for a further investigation into morphological processes which the children may use in recognising/producing inflectional and/or derivational items.

The next step was to investigate the extent to which the nature of vocabulary and morphological knowledge identified thus far was different or similar in Japanese, a typologically distant language from English and a language which requires using different scripts to English. To this end, an additional sub-study (Sub-study 2) was carried out, involving the same two groups of bilingual children, ESLs and JHLs, and a comparison group of Japanese

Language Monolinguals (JLMs). Sub-study 2 followed the same research design and data analysis procedures as in Sub-study 1, the primary difference being that it concerned the children's performances on Japanese tests/tasks. It should be reiterated that, since the language learning background was significantly different between the monolingual group and the bilingual groups, the monolingual data will not be presented for the purpose of treating the JLM data as the norm against which to evaluate the bilingual results. The purpose of Sub-study 2 is to illuminate potential variability in the characteristics of vocabulary knowledge and morphological awareness which may be unique to each group of Japanese-speaking children.

Chapter 5

RESULTS Part II – Sub-study 2 –

This chapter reports on the findings of the vocabulary and morphological tasks in Japanese and is hence concerned with the following three groups: ESLs, JHLs and JLMs. The implications of the findings reported below will be revisited and interpreted in detail in Chapter 7. The research questions to be addressed are as follows:

1. What is the nature of receptive and expressive knowledge of lexical meanings in Japanese speakers, and to what extent does it differ between ESL, JHL and JLM children?
2. What is the nature of the ability to recognise and produce inflectional and derivational morphemes in Japanese speakers, and to what extent does it differ between ESL, JHL and JLM children?

5.1 Scoring systems

All the responses were marked by the researcher, a native speaker of Japanese, together with another native speaker (NS) of Japanese with expertise in Japanese linguistics. Performance on the standardised test TJLA (Test of Japanese Language Abilities) was marked with reference to its scoring manual for examiners. The response was scored one point if it was correct, and zero points if it was incorrect, or left blank. The same scoring method (1 or 0 points) was applied to the TJEV (Test of Japanese Expressive Vocabulary).

As in Sub-study 1, two scoring systems were employed for the Japanese WS task: crude and sensitive. In the crude system, the children's segmentations were marked as either correct (one point) or incorrect (zero points), based on the segmentations given by two judges. Due to the lack of available etymological segmentations of Japanese words, segmentations which were consistent with the theoretical model of Japanese morphology (Iwasaki, 2002) were accepted as correct, in addition to the NS judges' segmentations (see Appendix 12 for the full list of accepted segmentations). In the sensitive system, a total score was a sum of points awarded to each morpheme (root, inflectional and derivational morphemes) identified through segmentation. To take the word きらめく/kirameku/ “to shine” for example, a child who segmented it as ‘きらめ + く/kirame+ku/’ was awarded one point in the sensitive scoring system, due to the identifications of the verb-forming suffix く/-ku/. This segmentation would, however, be awarded zero points in the crude scoring system, as the suffix *-ku* in this context forms part of the derivational verb-forming suffix *-meku* and hence めく/meku/ should be identified as one unit. The children who provided the segmentation ‘きらめ + く/kirame + ku/’ were differentiated from those who provided the correct segmention ‘きら + めく/kira + meku/’ as follows. Two points were awarded for the correct identification of a derivational suffix (e.g., *-meku* , *-tai*) as one unit within which a verbal/adjectival ending is graphically present (e.g., *-ku* and *-i*). For instance, the segmentation きら + めく was awarded a total of three points, consisting of the correct identification of the root きら/kira/ (one point) and the suffix めく/meku/ (two points). The segmentation きらめ + く was, on the other hand, awarded one point due to the identification of the inflectional ending alone.

As with the English WA task, only the crude scoring system (i.e., correct or incorrect) was applied to the WA task: the target item was preceded and cued by the presentation of another morphologically related pair. The WA overall scores were divided into two sets of scores (inflectional and derivational scores) to examine whether the children’s performance was affected by morpheme type. In keeping with the nature of the task, the children were not penalised for any errors in the written forms of *kanji* (e.g., some strokes were missing or strung together erroneously) included in their responses. A full list of individual responses marked as correct is given in Appendix 12 (Japanese WS task) and Appendix 16 (Japanese WA task).

The scores of the vocabulary (TJLA/TJEV) and morphological measures (WS/WA tasks) consisted of two age-related sets of scores, each corresponding to the two versions of each test/task: one for children in Years 3-4 (age 8-10 years) or younger; and another for those in Years 5-6 (age 10-12) or older. These two sets of scores were collapsed into a single set for statistical analysis, in line with an approach taken with standardised language tests with several age bands (Dunn, et al., 1997; Wiig & Secord, 1992). This approach, however, raises the possibility that the effects of age could confound the analysis of such scores. As stated in Section 4.1, in order to minimise age effects as much as possible, age was used as a control variable in the statistical analyses reported below. Nonverbal IQ was also used as a control variable to tease apart the influence of cognitive ability when analysing performance on the critical variables, namely, vocabulary and morphological awareness measures.

5.2 Exploring data – checking the assumption of normality

Consistent with the procedures followed in Sub-study 1, the extent of normality in the distribution of the data was checked first, by eyeballing each variable from each group using a histogram. This was followed by converting the skewness (S)/ kurtosis (K) values into z-scores and setting ± 2.58 (significant at $p < .01$) as an upper threshold. The data were also boxplotted for outliers, especially for those with S/K z-cores above or approaching the upper threshold. The following measures exhibited outliers:

a. Test of Japanese Language Abilities (TJLA);
b. Test of Japanese Expressive Vocabulary (TJEV);
c. Japanese Word Analogy (WA) task.

A robust procedure called *winsorisation* was employed in order to deal with these outliers. Winsorisation is recommended as it is not only robust but also more objective than simply deleting outliers (Larson-Hall, 2010; Maronna, Martin & Yohai, 2006). This procedure involves the transformation of the original data by changing the outliers to the value of the smallest or biggest value at a specified percentile (Larsen-Hall, 2010). For example, 10% winsorisation involves changing the raw scores (e.g., 2 and 29 out of 30) that fall below the 5^{th} percentile and above 95^{th} percentile to the score at the 5^{th} and 95^{th} percentile (e.g., 2 → 5, 29 → 28), respectively. When the 10% winsorisation did not significantly improve the non-normality of the distribution of the data, 20% winsorisation (10^{th} and 90^{th} percentiles used as lower and higher ends) were carried out. Both 10% and 20% winsorisation were carried out to examine which procedure would improve the distribution most. As a result, the above three sets of scores were each transformed into 20% winsorised TJLA/TJEV/Japanese WA scores. The improved normality of the data on each test was indicated also by the Shapiro-Wilk normality test, which showed non-significant values for each group, $p > .05$. These transformed scores will be used in the analyses reported below.

5.3 Japanese vocabulary tests

The reliability of each age band in the TJEV, as measured by the Cronbach Alpha coefficient, was high at .92 (age band A) and .94 (B). Age band A was designed for children in Years 3-4 or younger, whereas B was for those in Years 5-6 or older. Means and standard deviations (SD) for the SPM+ and these Japanese vocabulary tasks are given in Table 15.

Table 15. *Mean and standard deviations for SPM+ and Japanese vocabulary tests*

	ESL (n = 24)	JHL (n = 21)	JLM (n = 27)
Nonverbal & Vocabulary tests		Mean (SD)	
SPM+ raw scores (max. 60)	32.5 (5.41)	33.19 (4.01)	30.22 (4.53)
SPM+ standard scores	106.25 (13.69)	108.81 (10.24)	99.07 (10.83)
TJLA scores (max. 30)	14.66 (6.34)	9.08 (4.76)	18.51 (4.13)
TJLA school-year equivalent	4.8 (2.31)	2.6 (1.43)	6 (2.18)
TJEV scores (max. 30)	22.04 (4.96)	12.60 (7.21)	27.12 (1.48)

The children's performance on the Japanese vocabulary tests was analysed using a repeated-measures Analysis of Covariance (ANCOVA), with a related-samples variable, Japanese Vocabulary Knowledge (JVK) (receptive and expressive) and an independent-samples variable, Group (ESLs, JHLs and JLMs). Age and nonverbal IQ were used as covariates.

Controlling for age and nonverbal IQ, the analysis identified a main effect for JVK, $F(1, 67) = 5.14$, $p = .03$, $\eta^2 = .07$, indicating that the participants tended to score more highly on the TJEV than the TJLA. There was also a main effect for Group, $F(2, 67) = 51.29$, $p < .001$, $\eta_p^2 = .60$. No significant JVK × Group interaction was identified, $F < 1$. These results are illustrated in Figure 7. Planned contrast indicated that the smallest group difference was identified between the ESL and JLM groups on both vocabulary tests, and each reached statistical significance, $t(46) = -2.40$, $p = .02$, $d = .72$ (TJLA) and $t(46) = -3.88$, $p < .001$, $d = 1.16$ (TJEV). Hence, the other bigger differences were also significant, suggesting that the JLM group outperformed the other groups on both tests, and that the ESL group scored more highly than did the JHL group on both tests.

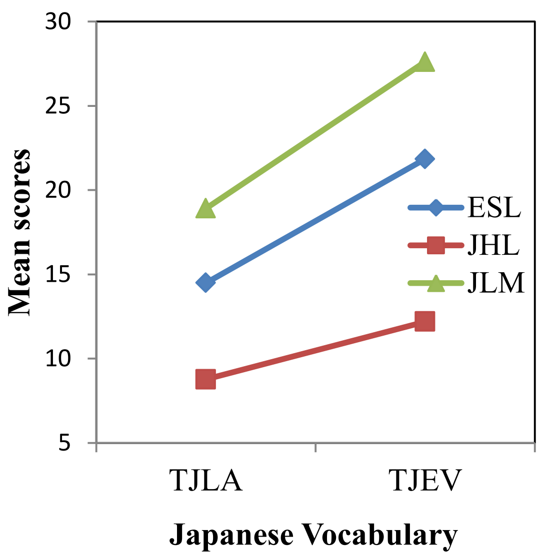


Figure 7. *Mean scores on the TJLA and TJEV*

5.3.1 Relationship between receptive and expressive vocabulary in Japanese

Partial correlations were performed controlling for age and nonverbal IQ, in order to examine the relationship between Japanese receptive and expressive vocabulary. The TJLA and TJEV scores were significantly correlated for each group, r = .78, p < .001 (ESLs), r = .48, p = .04 (JHLs), r = .58, p = .003 (JLMs). This suggests that an increase in receptive vocabulary is likely to coincide with an increase in expressive vocabulary, thus representing a positive relationship between receptive and expressive vocabulary in Japanese among all groups.

In summary, as shown in Table 16, expressive vocabulary scores were significantly higher than receptive vocabulary scores in all groups. Moreover, receptive vocabulary is likely to increase along with expressive vocabulary in all groups. It comes as no surprise that the JLM group outperformed the bilingual groups, particularly as their language of instruction at school is Japanese (English for the bilingual groups). It is worthy of note that Japanese vocabulary knowledge was significantly different between the ESL and JHL groups, both of whom were being schooled in English in the UK context, the primary difference being their language use at home. This issue will be elaborated on in Chapter 7 (Discussion).

Table 16. *Summary of Japanese vocabulary results*

Within-group difference		
ESL	JHL	JLM
RV < EV		
Between-group difference		
RV		EV
JHL < ESL < JLM		

Note. RV: Receptive Vocabulary; EV: Expressive Vocabulary

5.4 Morphological task results

A high degree of internal consistency was observed for the Word Segmentation (WS) task, Cronbach alpha = .77 (age band A), and .70 (age band B). (Recall that two versions were developed: A for Year 3- 4 or younger children and B for Year 5-6 or older). With respect to the Word Analogy (WA) tasks, both age bands were found to be reliable, version A = .86, version B = .90. Means and SDs for the WS and WA tasks are given in Table 17.

Table 17. *Mean and standard deviations for Japanese morphological tasks*

	ESL (n = 24)	JHL (n = 21)	JLM (n = 27)
Measures		Mean (SD)	
Japanese morphological tasks			
WS crude scores (max. 30)	20.69 (3.72)	19.79 (4.35)	21.29 (4.26)
WS sensitive scores (max. 100)	72.82 (13.23)	69.96 (12.96)	75.45 (12.7)
WA scores (max. 30)	24.83 (4.70)	20.50 (4.89)	26. 69 (3.63)

5.4.1 Japanese morphological awareness results - overall performance

The overall WS (crude) scores did not differ across groups, $p > .05$, whereas the WA scores by the JLM and ESL group, which did not differ significantly, were each higher than those by the JHL group, $t(43) = 3.43$, $p = .003$, $d = .97$ (JLM - JHL), $t(40) = 1.82$, $p = .02$, $d = .57$ (ESL - JHL). As regards within-group differences, the JHL group yielded comparable scores across tasks, whereas both the ESL and JLM groups scored more highly on the WA task than the WS task, , $t(23) = 4.61$, $p < .001$, $d = .67$ (ESLs) and $t(46) = 5.8$, $p < .001$, $d = .79$ (JLMs) (see Appendix 20 for a more detailed analysis).

5.4.2 Japanese WS task results – effects of morpheme type

In relation to RQ2, the WS sensitive component scores (i.e., scores awarded on each morpheme type) were used to examine the extent to which different morpheme types affected the children’s performance on the WS task. To that end, a repeated-measures ANCOVA was performed, with one related-samples variable, Morpheme Type (root, inflectional and derivational) and one independent-samples variable, Group (ESL, JHL and JLM). Age, nonverbal IQ and Japanese proficiency (TJLA scores) were used as covariates.

Mauchly's test indicated that the assumption of sphericity had been violated ($\chi^2(2)$ = 80.27, p < .001). Therefore, degrees of freedom were corrected using Greenhouse-Geisser estimates of sphericity (ε = .59). The WS analysis identified a main effect for Morpheme Type, $F(1.17, 77.23) = 7.40$, $p = .006$, $\eta_p^2 = .10$. Neither Group effects nor a Morpheme Type $\times$ Group interaction reached statistical significance, $p > .05$. These results are shown in Figure 8. Paired-samples t-tests indicated that the JHLs performed better on the inflectional morphemes than the root morphemes at the approaching significance level, $t(20) = 2.06$, $p = .05$, whereas their mean scores across the other morpheme types (inflectional versus derivational, and root versus derivational morphemes) were not significantly different. No significant difference in scores was found across morpheme types within the other two groups. In short, scores on each morpheme type did not differ across groups. Within-group performances, on the other hand, exhibited a pattern whereby the JHL group recognised the inflectional morphemes accurately, relative to the root morphemes, whereas the performances of the ESL and JLM groups were not affected by morpheme type.

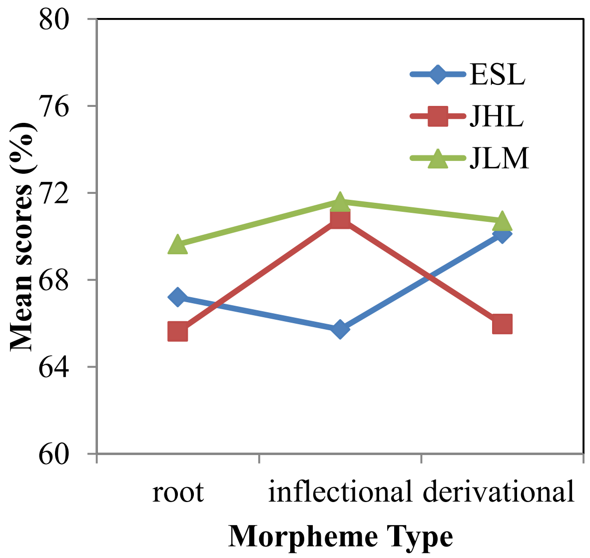


Figure 8. *Mean scores across morpheme types on the Japanese WS task*

5.4.3 Japanese WA task results– effects of morpheme type

A similar repeated-measures ANCOVA was carried out on the WA data. A related-samples variable tested at two levels (inflectional and derivational morphemes) was used, together an independent-samples variable Group (ESLs, JHLs & JLMs).

After controlling for age, nonverbal IQ and Japanese proficiency, the WA analysis yielded a main effect for Morpheme Type, $F(1, 66) = 12.45$, $p =.001$, $\eta_p^2 =.16$, indicating that the participants typically performed better on the inflectional morphemes than the derivational morphemes. There was also a main effect for Group, $F(2, 66) = 5.09$, $p = .009$, $\eta_p^2 = .13$, and no significant Morpheme Type × Group interaction was identified, $F < 1$. These results are illustrated in Figure 9. Planned contrasts indicated that the JLM group yielded higher scores than the JHL group on the inflectional morphemes ($t(42) = 2.56$, $p = .01$, $d = .79$) and derivational morphemes ($t(42) = 2.89$, $p = .005$, $d = .89$) respectively. The scores on the derivational morphemes were also significantly different between the ESL and JHL groups in favour of the former, $t(40) = 2.52$, $p = .02$, $d = .75$. No significant differences were identified between the ESL and JHL group on the inflectional morphemes on the one hand and between the ESL and JLM groups on either morpheme type on the other. In short, all groups exhibited a similar pattern whereby they scored more highly on the inflectional than derivational morphemes. The JHL group's morphological awareness was demonstrable to lesser degrees than the other groups, especially on the derivational morphemes, while both the ESL and JLM groups were comparable in scores on both morpheme types.

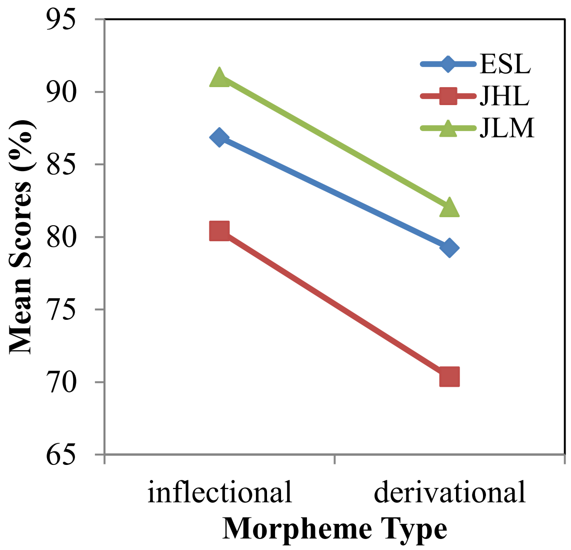


Figure 9. *Mean scores across morpheme types on the Japanese WA task*

5.4.4 Relationship between morpheme recognition and production in Japanese

Partial correlations, controlling for age, nonverbal IQ and Japanese proficiency, were carried out to examine the relationship between two levels of sensitivity in morpheme recognition, as measured by the WS crude and sensitive scores, and the measure of morpheme production. No significant relationships were identified between morpheme recognition and production in Japanese in any of the groups. The morphological abilities tapped into by the WS and WA tasks are, therefore, likely to increase independently of one another in all groups of children.

5.4.5 Summary of the Japanese morphological awareness results

As summarised in Table 18, the ESL and JLM groups each demonstrated higher degrees of morpheme production than morpheme recognition, whereas the JHL group demonstrated comparable degrees of both aspects of morphological awareness. No group differences in overall scores were identified in the WS task. In the WA task, in contrast, the ESL and JLM groups, who yielded comparable overall scores, each outperformed the JHL group. The participating children's performance was further investigated with different morpheme types taken into account. In the WS task, the JHL group tended to score highly on the inflectional morphemes relative to their performance on the root morphemes, whereas the ESL and JLM group’s performances were not sensitive to morpheme type. In the WA task, in contrast, all groups yielded higher scores on the inflectional morphemes than derivational morphemes. In addition, performance on the derivational morphemes widened a gap in scores between the JHL group and the other groups in favour of the latter. Thus, effects of morpheme type varied between two aspects of morphological awareness (i.e., morpheme recognition and production). The correlational analyses showed the lack of relationship between morpheme recognition and production for all groups. This suggests that the constructs of morphological awareness which the Japanese WS and WA tasks tapped into respectively are likely to be demonstrable independently of one another.

Table 18. *Summary of Japanese morphological awareness results*

Aspect of morphological awareness

Within-group difference		
ESL	JHL	JLM
WS < WA	WS ≈ WA	WS < WA
Between-group difference		
WS task		WA task
ESL ≈ JHL ≈ JLM		JHL < ESL ≈ JLM

Morpheme Type

Within-group difference					
WS task			WA task		
JHL	ESL	JLM	JHL	ESL	JLM
inflectional > root; inflectional ≈ derivational; root ≈ derivational	root ≈ inflectional ≈ derivational		inflectional > derivational		

Between-group difference				
WS task			WA task	
Root	Inflectional	Derivational	Inflectional	Derivational
ESL ≈ JHL ≈ JLM			ESL ≈ JHL, ESL ≈ JLM JHL < JLM	JHL < ESL ≈ JLM

5.5 A descriptive analysis of morphological errors

As in Chapter 4, in order to illuminate the nature of morphological awareness which might not have been fully captured in the ANCOVAs carried out above, the participating children's morphological errors were analysed descriptively (see Appendices 13 (WS) & 17 (WA) for the complete lists of individual responses). In doing so, two factors were taken into account: semantic transparency and scripts (*hiragana* only, and *hiragana* + *kanji* (abbreviated as H+K henceforth) in combination). Morphemic complexity was not examined since only three items were multi-morphemic and the rest were bi-morphemic in the WS task. Potential effects of scripts were considered, since the Japanese language represents three scripts (*kanji*, *hiragana* and *katakana*) and *kanji* and *kana* writing have different representational units: morphemes for *kanji*; and a mora, sub-syllabic rhythmic units in Japanese speech, for *kana* writing. Kanji-only items were disproportionately fewer than the other script types in both morphological tasks (two in the WS task and five in the WA task) and hence this script type is not included in the following analysis. The Japanese WA task, just like the English WA task, was not a spelling or *kanji* test and therefore script type effects were not examined on the script type used in the answers but in the item provided as a prompt in each target pair.

Similar to the procedures followed in Chapter 4, the target items in each morphological task were categorised according to the extent of response variability, graded from 1 to 3 (see Appendices 14 & 18 for the full lists of items by grade and morphological factor in the WS task and WA task respectively). Analysing the errors represented in Grade 2 and 3 items is the core focus of this section. Fisher's exact tests were performed to statistically assess the relationship between the degree of variability and the morphological factor concerned, followed by a description of patterns in the errors. Note that Version B of the Japanese WS or WA tasks were not included in the error analysis reported below, as only 4 JHLs completed them, in comparison to 11 ESLs and 14 JLMs (see Appendices 15 & 19 for the lists of individual responses to the Japanese WS and WA tasks Version B respectively).

5.5.1 Relationship between morphological factors and response variability

5.5.1.1 Japanese WS task

No significant associations were identified between either of the morphological factors and degrees of response variability in the ESL and JLM groups: Fisher's exact test (FET) = .41, *p* = 1.00 (semantic transparency × Grades 1-3) and FET = 2.16, *p* = 1.00 (script type × Grades 1-3) (ESLs); FET = 1.45, *p* = 1.00 (transparency × Grades 1-3) and FET = 2.05, *p* = 1.00 (script type × Grades 1-3) (JLMs). As for the JHL group, in contrast, an association between the type of scripts (two levels: hiragana-only and H+K items) and two levels of variability (Grades 2 and 3) was approaching significance, FET *p* = .059, with a medium effect size, φ = .41. As shown in Table 19, there was a tendency that hiragana-only items represented the highest degree of variability (Grade 3) more than they did the medium degree of variability (Grade 2), thus suggesting a potential difficulty in segmenting the hiragana-only items. Semantic transparency was not related to degrees of response variability, FET = .50, *p* = 1.00 (see Appendix 22 for a detailed analysis).

Table 19. *Relationship between variability and scrip types (JHLs)*

Variability	Hiragana	H+K
Medium (Grade 2)	7	10
High (Grade 3)	6	1

Note. One kanji-only item in the Grade 2 category is not included in the analysis.

5.5.1.2 Japanese WA task

The participating children's individual responses to the Japanese WA task were examined in a similar manner to the Japanese WS task, the only difference being that semantic transparency was not examined since the meaning of the target item was cued by the immediately preceding item. No significant association between script type (two levels: hiragana-only and H+K) and degrees of response variability (three levels: Grades 1-3) was identified in any of the groups, Fisher's exact test (FET) = 2.38, p = 1.00 (ESLs), FET = 1.85, p = 1.00 (JHLs) and FET = 1.2, p = 1.00 (JLMs) (see Appendix 22 for more details).

5.5.2 Descriptive patterns in morphological errors

5.5.2.1 Japanese WS task

5.5.2.1.1 Differentiation of derivational suffixes from inflectional suffixes

All groups appear to have struggled to differentiate a derivational suffix from an inflectional suffix. This pattern was further broken down into two sub-categories. One is the lack of differentiation of the derivational suffix -*tai* from the inflectional suffix -*i*, especially when both appear in the same sequence of *kana* characters たい /tai/. To take, as examples, 冷 + たい /tsume + tai/ "cold" (for 冷た + い /tsumeta + i) and 泳ぎた + い /oyogita + i/ "want to swim" (for 泳ぎ + たい /oyogi + tai/), all groups were typically able to judge the -*tai* or -*i* as the ending unit of each item but this was often the wrong way around: -*tai* segmented as such where it should have been -*i* to be segmented and *vice versa* (5 ESLs, 8 JHLs & 5 JLMs for the former and 2 children in each group for the latter).

An additional category is the lack of differentiation of a derivational verb-forming suffix (e.g., -*garu/meku*) from an inflectional suffix (e.g., -*ru/(k)u*). To take 'きらめ+ く /kirame + ku/ "to shine"' (for きら＋めく/kira + meku/) for example, the participating children (8 ESLs, 8 JHLs, 7 JLMs) identified the suffix -*ku* as an inflectional verbal suffix, instead of it being part of the derivational suffix -*meku*. The lack of recognition of the derivational suffix -*meku* as one unit could be related to their stronger familiarity with inflectional suffixes (e.g., –*(k)u/ru* and –*i*), which are more regular and less idiosyncratic than derivations in nature.

5.5.2.1.2 Identification of a non-morphemic unit

The Fisher's exact test performed above indicated the JHL group's potential difficulty with the hiragana-only items. Their segmentations for the hiragana-only items were characterised by instances of an identification of non-morphemic units. Examples include the following (the number of JHLs given in brackets): め + ずらしい (1), めずら + しい (5) (for めずらし + い /mezurashi + i/ "unique"); and うらや + ましがる (3), うら + やましがる (1) (for うらやまし＋がる /urayamashi + garu/ "to envy"). An additional observation from these examples is the JHL children's attempt to identify a 'false' free morpheme. To take the segmentation め + ずらしい for example, め /me/, which is identified as one unit, could be a lexical item meaning (an) eye(s) or (a) bud(s) (of plants). Similarly, the segmented unit うら /ura/ as in the segmentation 'うら + やましがる' could stand as a lexical item on its own, meaning 'the reverse side of something' or 'creek'. It appears that difficulties with morphological segmentations led these children to extract an alternative free morpheme which they knew the meaning of.

5.5.2.2 Japanese WA task

5.5.2.2.1 Difficulties with derivational prefixes

A closer examination of the Grade 2-3 errors revealed a pattern consistently identified across groups, namely, the lack of accuracy in producing derivational prefixes. Sino-prefixes (those of Chinese origin), in particular, seem to have posed significant challenges, such as *mu-imi* "meaningless" and *fu-jūbun* "insufficient", both of which were classed as Grade 3 items (i.e., the largest number of errors) for all groups. The participating children typically applied the same prefix used in the preceding pair (i.e., use of surface information), as follows:

a) 'goukaku "pass": fu-goukaku "fail":: imi "meaning": fu-imi (for *mu-imi*) "meaningless"' (1 ESL, 5 JHLs, 3 JLMs);

b) 'keikaku "planned": mu-keikaku "unplanned":: jūbun "sufficient": mu-jūbun (for *fu-jūbun*) "insufficient"' (3 ESLs, 3 JHLs, 1 JLM).

These items were also accompanied by blank responses: 8 ESLs, 7 JHLs and 3 JLMs for the former; 5 ESLs, 7 JHLs and 7 JLMs for the latter. Prefixes of native origin, such as the intensifier *ma*- as in *ma-(k)ka* “bright red” and *ma-(n)naka* “right in the middle”, were characterised by the varied nature of responses particularly from the JHL group, who produced non-naturally occurring forms as an answer, e.g., ‘maakka’ (2 JHLs), ‘akaru’ (1 JHL), ‘nakaka’ (1 JHL) and ‘manakata’ (1 JHL) (see Appendix 17 and Appendix 22 for more examples and a detailed analysis respectively).

5.5.3 Summary of error analysis of the Japanese morphological tasks

No associations were identified between each of the morphological factors (semantic transparency and script type) and the degree of variability in the segmentations by the ESL or JLM group. The type of scripts used, in contrast, appears to have been somewhat influential in the increasingly varied nature of segmentations by the JHL group. The error analysis added a more detailed picture by suggesting that differentiating a derivational suffix from an inflectional suffix posed special difficulties, owing to the shared *kana* sequence in which they appear, such as such as 冷<u>たい</u> /tsume<u>tai</u>/ and 泳ぎ<u>たい</u> /oyogi<u>tai</u>/. A tendency unique to the JHL group was that they recognised a smaller unit independently of its semantic relationship with the target item. Such non-morphological segmentations might have been due to the lack of available morphological clues in the mora-based *hiragana* script. The analyses of the WA errors underscored a tendency that the production of items with a derivational prefix attached, especially Sino-prefixes (e.g., -*mu*, -*fu*), was particularly challenging. It appears therefore that the low performance on the WA derivational items, relative to the inflectional items, as indicated by the ANCOVA analysis, could be attributed in part to difficulty in producing derivational prefixes. This issue will be revisited in the Discussion chapter, in relation to implications for morphological instruction.

5.6 Summary of the Chapter

In contrast to Sub-study 1, the participating children exhibited similar patterns of performances on the vocabulary tests, whereby expressive vocabulary was demonstrated to higher degrees than receptive vocabulary by all groups. As for the WS task, no between-group differences were identified either in overall performance or performance on each morpheme type. The within-group analyses revealed a potential morpheme type effect only for the JHL group: they scored less highly on the root morphemes than did they on the inflectional morphemes. The descriptive analysis of individual segmentations added further detail to this result by indicating that the JHL group tended to be more affected by script type during segmentation. In other words, segmenting hiragana-only items was associated with the largest number of errors. All groups of children appear to have had difficulty in distinguishing derivational suffixes from inflectional suffixes which appear in the same *kana* sequence. With respect to the WA task, group differences were more evident with the JLM group outperforming the JHL group, which is not surprising considering the difference in their language learning background. It is notable that, despite the socio-linguistic differences, the ESL group was comparable to the JLM group, while at the same time outperforming the JHL group especially on the derivational morphemes. All groups showed a similar pattern in performance across morpheme types in the WA task: they scored more highly on inflectional than derivational items. This could be informed further by the error analysis suggesting that all groups of children had difficulty producing derivational prefixes, especially derivational Sino-prefixes.

5.6.1 Summary of two sub-studies

As summarised in Table 20, two sub-studies have thus far identified the nature of vocabulary knowledge which was unique to each language and also to each group especially in English. As far as morphological awareness is concerned, target morphemes were identified through segmentation to different degrees across morpheme types in English (inflectional > root > derivational), whereas such effects were less salient in Japanese (observed only in the JHL group). Moreover, the potential influence of morphological factors on segmentation errors differed between languages and also between groups. In English, it was the increased degree of semantic opacity and morphologic complexity that were each associated with the largest proportion of errors given by all groups. In Japanese, there was a tendency that the JHL group's errors increased as the target item was presented in *hiragana* only, relative to the H+K items. Performance on each morpheme type in the WA task was similar across languages: all groups of children in each language yielded much higher scores on inflectional morphemes than derivational morphemes. In the Japanese WA task, in particular, such low performances on the derivational affixes could be attributed to a special difficulty with the production of derivational prefixes, a pattern somewhat more salient in the ESL and JHL groups than it was in the JLM group. No other morphological factors showed clear effects on the WA errors in either language.

The next step is to investigate each type of knowledge (vocabulary knowledge and morphological awareness) further by examining the relationship between the two in each language through correlational and regression analyses, an issue addressed in Research Question (RQ) 3. This issue will also be investigated from a cross-linguistic perspective, involving the two bilingual groups, so that the contribution of morphological awareness in one language to morphological awareness in the other language can be examined (RQ4).

Table 20. *Overview of the findings of Sub-studies 1 and 2*

	Sub-study 1			**Sub-study 2**		
Group	ESL	JHL	ELM	ESL	JHL	JLM
	English vocabulary			**Japanese vocabulary**		
Results	RV > EV	RV ≈ EV	RV < EV	RV < EV		
	English MA			**Japanese MA**		
	WS task			*WS task*		
Results (within-group)	inflectional > root > derivational			root ≈ inflectional ≈ derivational	inflectional > root root; inflectional ≈ derivational; root ≈ derivational	root ≈ inflectional ≈ derivational
MF	semantic transparency; morphemic complexity			NA	script type (*hiragana*)	NA
	WA task			*WA task*		
Results	inflectional > derivational			inflectional > derivational		
MF	NA			NA		

Note. RV: Receptive Vocabulary; EV: Expressive Vocabulary; MA: Morphological Awareness; WS: Word Segmentation; WA: Word Analogy; MF: Morphological Factor.

Chapter 6

RESULTS Part III

– Morphological awareness in relation to vocabulary knowledge –

The primary goal of this chapter is two-fold. One is to examine the nature of the relationship between morphological awareness and vocabulary knowledge in each language, thus involving the following groups: ESL, JHL and ELM groups for English; and ESL, JHL and JLM groups for Japanese. An additional goal is to investigate the extent to which different aspects of morphological awareness demonstrated in one language can be predicted by those of morphological awareness demonstrated in the other language and hence is concerned with the bilingual groups: ESLs and JHLs. In doing so, this chapter examines whether the cross-linguistic contribution of morphological awareness differs between groups by carrying out a series of multiple regression analyses expressed as path models. Consistent with Chapters 4 and 5, age and nonverbal IQ are used as control variables in the statistical analyses reported in this chapter. The following research questions are addressed:

3. What is the nature of the relationship between morphological awareness and vocabulary knowledge in English speakers and to what extent does it differ between ESL, JHL and ELM children? Similarly, how does the relationship in Japanese speakers differ between ESL, JHL and JLM children?

4. Does morphological awareness in one language act as a significant predictor of morphological awareness in the other language among ESL and JHL children?
   4a) If it does, is the nature of transfer different between groups?

6.1 Relationship between morphological awareness and vocabulary knowledge in English

Partial correlations, controlling for age and nonverbal IQ, were carried out to examine relationships between vocabulary knowledge and morphological awareness in English. Table 21 presents different patterns in the relationships between groups. The ESL group's BPVS scores were significantly correlated with the WS (both crude and sensitive) and WA scores. As for the JHL group, in contrast, no significant relationships were found between the vocabulary and morphological measures. When looking at the ELM data, their WA scores were correlated to their BPVS scores, at the approaching significance level (p = .06), thus representing a potential positive relationship between receptive vocabulary and morpheme production.

Table 21. *Correlations between vocabulary knowledge and morphological awareness*

	Vocabulary tests					
	ESL (n = 24)		JHL (n = 21)		ELM (n = 25)	
MA tasks	BPVS	TOWK-EV	BPVS	TOWK-EV	BPVS	TOWK-EV
WS(CS)	.56**	.37	-.13	-.22	-.01	16
WS(SS)	.45*	.29	-.30	-.27	.04	.06
WA	.76***	.36	.34	.27	.40†	.18

*p < .05, **p < .01, ***p < .001, † .05 ≤ p ≤ .07

A series of multiple regression analyses were carried out as path models in AMOS (Analysis of Moment Structures). Path analysis is a variation of multiple regressions in the sense that it employs multiple regression for its solution (Maruyama, 1998). It also allows researchers to analyse the relationship between a set of variables by depicting the influence of these variables (i.e., predictors) on another (i.e., outcome variables) through the use of a path diagram (Spaeth, 1975; Stage, Carter & Nora, 2004). This technique is used in the analyses reported in this chapter, in an attempt to examine the extent to which each aspect of morphological awareness was explained by variance in vocabulary knowledge, after taking into account the effects of the non-linguistic factors (age and nonverbal IQ). Due to the use of path diagrams, the multiple regression analyses reported below will be referred to as path models, as commonly seen in psycholinguistic research (Muter, Hulme, Snowling & Stevenson, 2004).

Another purpose is to examine whether the magnitude in the contribution of each predictor differs between groups. AMOS was chosen as it is capable of running the same model for multiple groups simultaneously, which yields more accurate and reliable results than performing it separately for each group (Arbuckle, 2010; Qian, 2007). In addition, AMOS allows the researcher to perform objective tests of differences between models (e.g., chi-square difference tests ($\Delta\chi^2$)) and also tests of between-group differences on regression coefficients of interest (i.e., critical ratios for differences which provide z-statistic values) (Schumacker & Lomax, 2004).

The BPVS/TOWK-EV scores were combined into a composite score, due to their strong correlations with one another for all groups (see Section 4.2.1). Both sets of scores were each converted into z-scores as they were on different scales, which were then added up (composite = zBPVS + zTOWK-EV). The aggregation of vocabulary scores was necessary also from the viewpoint of simplifying the models by reducing predictors, as running a complex model with several predictors and a small sample size could potentially overestimate effect size and also decrease the accuracy and stability of a path analysis (Field, 2005; Stage, et al., 2004). The WS crude, sensitive and WA scores in each language were entered separately (i.e., one set of scores at a time) in a model, when used as a predictor and/or an outcome variable. One reason for this procedure is the lack of significant correlations between the WS and WA scores within languages (see Section 4.4.4 and Section 5.4.4). However, for simplicity, crude scores alone will be reported in regression analysis, unless sensitive scores showed different results.

In order to model the relationship between vocabulary knowledge and morphological awareness and also to examine whether the relationship is unique to a certain group, path coefficients (i.e., standard regression coefficients, indicating the direct effect of the predictor concerned on the outcome variable) for all predictors were set to be equal across groups in the first nested model, followed by examining the extent to which allowing a particular coefficient to vary would exhibit improvement in model fit (the second nested model) after having reviewed misspecification statistics (Byrne, 2001; Schumacker & Lomax, 2004). The fit indices used are briefly described below (Section 6.1.1). Group-specific effects identified in regression models will be reported through the use of a path diagram, whereas those models with no significant group effects will be reported in tables. This approach was taken, following the guidelines and recommendations for reporting path analysis results suggested by Stage, et al. (2004).

6.1.1 Assessment of model fit

Path analysis is a common type of structural equation modelling (SEM) whose primary task is to determine the goodness of fit between the model specified by the researcher and the sample data (Byrne, 2001; Schumacker & Lomax, 2004). In the current study, the following fit indices, which are among the most widely reported in the SEM literature (Kline, 2011), will be reported for the relevant models:

1. A Chi-square statistic (χ^2)
2. Root Mean Square Error of Approximation (RMSEA) (Steiger, 1990), with a 90% confidence interval (CI) and p-values for testing the closeness of fit, expressed as$P_{close-fit}$.
3. Goodness-of-Fit Index (GFI) (Jöreskog & Sörbom, 1982)
4. Comparative Fit Index (CFI) (Bentler, 1990)

Chi-square is the only statistical test of significance for testing the exact-fit hypothesis, namely, discrepancies between the population covariances and those predicted by the model which corresponds to the data (Kline, 2011). A non-significant χ^2 indicates that the researcher would *not* reject the exact fit hypothesis, thus suggesting that the specified theoretical model fits the data adequately. However, several limitations of χ^2 have been addressed over the past few decades and researchers, as a result, typically use other approximate fit indices as adjuncts to the χ^2 statistic, including the indices 2-4 presented above. RMSEA can be considered as one of the most informative criteria in covariance structure modelling and values less than .05 indicate good fit (.00 = best fit), whereas values between .06 - .08 indicate mediocre fit and those greater than .10 poor fit (MacCallum, Browne & Sugawara, 1996). Over the past decade, researchers have stressed the importance of using a 90% confidence interval (CI) and testing the close-fit hypothesis in order to assess the precision of RMSEA estimates (Steigher, 1990; MacCallum et al., 1996): a wide CI indicates limited precision in the estimates, and conversely, a narrow CI is indicative of good precision and also of the model fit being reflective of the population. $P_{close-fit}$ is the p value calculated for the RMSEA estimates: the p value for RMSEA less than .05 should be greater than .50 (Byrne, 2004). The GFI is classified as an absolute fit index which estimates the proportion of covariances in the sample data matrix specified by the researcher by comparing it to no model at all (Jöreskog, 2004). The CFI is regarded as an incremental fit index which measures the relative improvement in the fit of the specified model to a baseline independence model, where all the relationships between the observed variables are assumed to be zero (Kline, 2011). Both GFI and CFI values range from .00 to 1.00 with the latter indicating perfect fit. It should be noted that providing a detailed account of each index or discussions of limitations associated with each index is beyond the scope of this study (see Hu & Bentler, 1998; Marsh, Hau & Wen, 2004 for a comprehensive overview of fit statistics).

6.1.2 Regression diagnostics

It is within the interest of this study to draw conclusions not only about the current sample of children but also conclusions which could, to some extent, reflect the populations represented by the sample. To that end, it is important that the regression models run in the current study meet underlying assumptions (Field, 2005). Following the procedures recommended by Field

(2005, pp. 157-205), the following assumptions were checked for every model:

- **Variable Type**: all predictors must be either quantitative or categorical (with two categories);
- **Non-zero variance**: the predictors must not have variances of zero;
- **No perfect multicollinearity**: Two or more predictors should not bear a perfectly liner relationship (i.e., $r = 1.0$) or be very highly correlated (e.g., $r > .9$); Variation Inflation Factors (VIF) values should be below 10 (Myers, 1990) and tolerance values should be greater than .2 (Menard, 1995) (both are produced in SPSS).
- **Predictors are uncorrelated with external variables** (or in other terms, an error term or random factors) that are not included in the model;
- **Homoscedasticity**: In the plots of the standardised residuals against the standardised predicted values of the outcome variables, the points are randomly and evenly dispersed throughout;
- **Independent errors**: Adjacent residuals should be uncorrelated; values produced from the Durbin-Watson test should be greater than 1 and below 3;
- **Linearity**: the relationship between the outcome variable and the predictor(s) modelled by the researcher is a linear one; the cloud of dots should lie around a straight line in the partial plots of the residuals of the outcome variable and each of the predictors.

As mentioned earlier, path models involve carrying out multiple regression for its solution and hence the assumptions for regression apply (Stage, et al., 2004). Unless otherwise noted below, these assumptions were met for the models examined below.

6.1.3 Path model predicting morpheme recognition in English

In a path model predicting morphological awareness as measured by the WS task scores, the first nested model where all the path weights were set to be equal across groups provided the greatest fit to the data, $\chi^2(6) = 9.69$, $p = .14$. As shown in Table 22, the contribution of each predictor to English morpheme recognition (WS crude scores) was comparable across groups and age was the only significant factor. It should be noted that the RMSEA .07 indicates mediocre fit, accompanied by the $P_{close-fit}$ value of .35. Moreover, although the lower bound of the CI (less than .05) supports the close-fit hypothesis, one cannot not reject the poor-fit hypothesis, due to the upper bound of the CI exceeding .10 (Kline, 2011). Hence one could argue that this model may lack precision in reflecting model fit in the population. However, one limitation of RMSEA estimates is that they can underestimate model fit in smaller samples: a 90% CI, in particular, can be seriously affected by sample size and model complexity such that it widens if the sample size is small but the number of parameters to be estimated is relatively large (MacClallum, et al., 1996). On the other hand, the GFI (.94) and CFI (.94), both of which are relatively insensitive to model complexity and sample size (Breivik & Oisson, 2001; Byrne, 2001), indicated that the model examined was a well-fitting model.

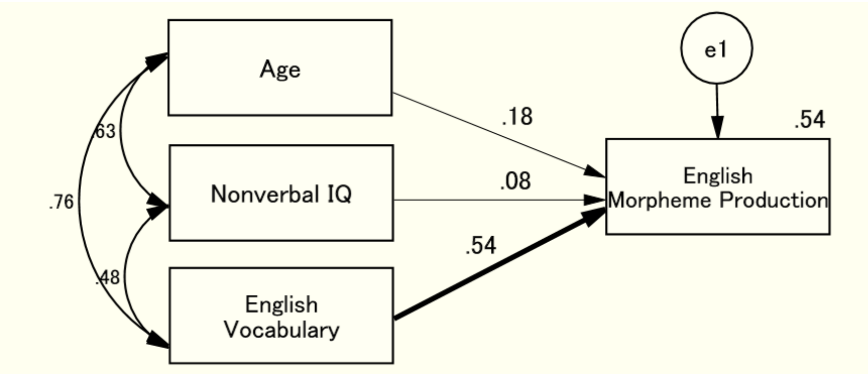
Table 22. *Decomposition of effects from path model predicting morpheme recognition in English*

	ESL (n = 24)				JHL (n = 21)				ELM (n = 25)			
	b	β	*t*	R^2	b	β	*t*	R^2	b	β	*t*	R^2
				.55				.64				.25
1. Age	1.46	.51	4.22***		1.46	.64	4.22***		1.46	.39	4.22***	
2. IQ	.12	.12	1.06		.12	.09	1.06		.12	.11	1.06	
3. EV	.44	.19	1.17		.44	.12	1.17		.44	.10	1.17	

Standard Error (SE): .35 (Age); .11 (IQ); .38 (EV).
Fit statistics. RMSEA (90% CI): .07 (.00- .19); $P_{close-fit}$: .35; GFI: .94 ; CFI: .97.
Note. EV: English Vocabulary. b = unstandardized coefficients; β = standardised coefficients.
**p* < .05, ***p* < .01, ****p* < .001, † .05 ≤ *p* ≤ .07

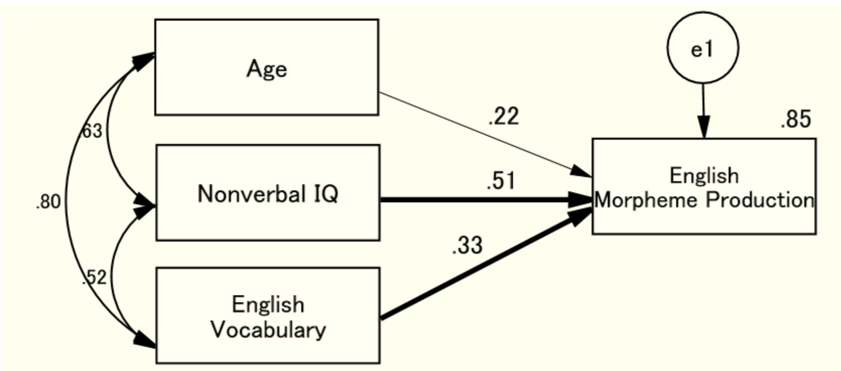
6.1.4 Path model predicting morpheme production in English

Following the procedures in the previous section, the next set of regression analyses was performed to predict morpheme production in English, as measured by the WA task. In the second nested model, the path coefficients for nonverbal IQ in the JHL group were set to vary from the other groups, and also those for age in the ELM group were set to vary from the other groups. This nested model significantly improved model fit from the initial model (where all path weights were set to be equal across groups), $\Delta\chi^2(2) = 11.82$, $p = .001$. As illustrated in Figures 10 to 12, each group showed different patterns of path weights. The contribution of nonverbal IQ was significantly larger for the JHL group than the other groups, as illustrated in Figure 11. In addition, the three predictors accounted for a high proportion of variance (85%) in English morpheme production. As for the ELM model (Figure 12), age was a significant predictor and its magnitude was significantly larger than the other groups. English vocabulary was a significant predictor in similar magnitude for all groups.



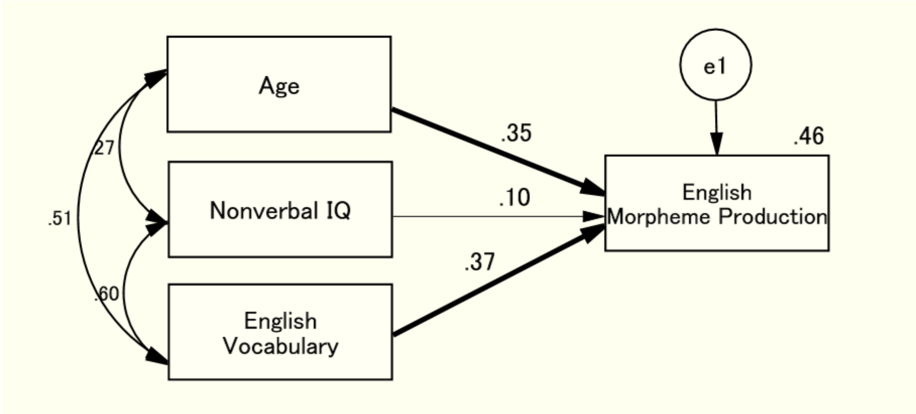
**Significant pathways are highlighted in bold.*

Figure 10. *A path diagram predicting English morpheme production (**ESL** model)*



**Significant pathways are highlighted in bold.*

Figure 11. *A path diagram predicting English morpheme production (**JHL** model)*



**Significant pathways are highlighted in bold.*

Figure 12. *A path diagram predicting English morpheme production (**ELM** model)*

Fit statistics (for Figures 10-12): $\chi^2(4) = 3.32$, $p = .51$; RMSEA (90% CI): .00 (.00 - .17); $P_{close-fit}$: .59; GFI: .98 ; CFI: 1.0.

Age and English vocabulary were highly correlated at .76 and .80 for the ESL and JHL groups respectively, which casts a question about multicollinearity. The assumption of non-multicollinearity was met, as indicated by the Variance Inflation Factor (VIF) and tolerance statistics. The VIF values fell below 10, the cut-off point for concern (Myers, 1990; Bowerman & O'Connel, 1990), ranging from 2.3 - 3.0 (ESLs), 1.7 - 3.8 (JHLs). Tolerance values were greater than the cut-off point, 0.2 (0.43 - 0.61 for ESLs and 0.4 - 0.6 for JHLs), as suggested by Menard (1995) (Both sets of values were computed in SPSS). The fit statistics indicated that the model examined represented an adequate fit to the data (see Appendix 23 for a decomposition of all the effects from this path model given in table format).

The regression analyses presented thus far indicated that the contribution of nonverbal IQ to morpheme production was unique to the JHL group. Unique to the ELM group was the significant contribution of age both to morpheme recognition and production, with the latter being robust in magnitude relative to the other groups. No significant group differences were observed when examining the contribution of vocabulary knowledge. Furthermore, the ability to recognise and produce morphemes was each differently explained by variance in vocabulary knowledge: English vocabulary was a significant predictor of morpheme production, but not of morpheme recognition in any of the groups. Therefore, English vocabulary knowledge is likely to be more strongly related to the ability to produce morphemes through analogy than to recognise morphemes through segmentation.

6.2 Relationship between morphological awareness and vocabulary knowledge in Japanese

Partial correlations controlling for age and nonverbal IQ were performed to examine a relationship between morphological awareness and vocabulary knowledge in Japanese, as presented in Table 23. The WA scores were positively related to the TJLA and TJEV scores respectively both in the ESL and JLM groups. As for the JHL group, the TJLA scores were positively correlated with the WS crude scores, and also with the WS sensitive scores (p = .06) and WA scores (p = .05) at the approaching significance level. A significant association was also identified between an increase in TJEV and WA scores in the JHL group. These findings suggest that the nature of the relationship between these two knowledge types may qualitatively differ between morpheme recognition and production, with the latter perhaps more strongly associated with receptive and expressive vocabulary knowledge. This issue which will be explored further in the analyses reported below.

Table 23. *Correlations between Japanese morphological and vocabulary variables*

	Vocabulary tests					
	ESL (n = 24)		JHL (n = 21)		JLM (n = 27)	
MA tasks	TJLA	TJEV	TJLA	TJEV	TJLA	TJEV
JWS(CS)	.25	.38	.52*	.19	.24	.20
JWS(SS)	.21	.36	.44†	.21	.21	.16
JWA	.79***	.86***	.45†	.72**	.67***	.41*

Note. TJLA: Test of Japanese Language Abilities; TJEV: Test of Japanese Expressive Vocabulary; JWS & JWA: Japanese Word Segmentation, Japanese Word Analogy task; CS: crude scores; SS: sensitive scores.
*p < .05, **p < .01, ***p < .001, † .05 ≤ p ≤ .07

6.2.1 Path model predicting morpheme recognition in Japanese

Multiple regression analysis was performed via a path diagram, to model the relationship between different aspects of Japanese morphological awareness and vocabulary knowledge. Due to the lack of correlations between the WS and WA scores, as presented in Section 5.4.4, these two sets of scores were treated as two separate predictors/outcome variables. The TJLA and TJEV were combined into a composite score, as indicated by the significant correlations with one another in all groups of children, suggesting that these two sets of scores were likely to be tapping into similar constructs of vocabulary knowledge in Japanese. Following the same procedures as in Section 6.1, a series of multiple regression analyses were performed by comparing a nested model where all path weights (i.e., standard regression coefficients) were constrained to be equal to another model where a particular coefficient was relaxed to vary across groups, based on the results of misspecification statistics provided in AMOS. If the latter model gave a better fit to the data, it was interpreted as group effects on the predictor concerned.

In predicting morpheme recognition, the initial model provided the greatest model fit, $\chi^2(6) = 2.33$, $p = .89$. That is, no group differences were identified on any of the pathways. In this model, Japanese vocabulary was a significant predictor, as shown in Table 24.

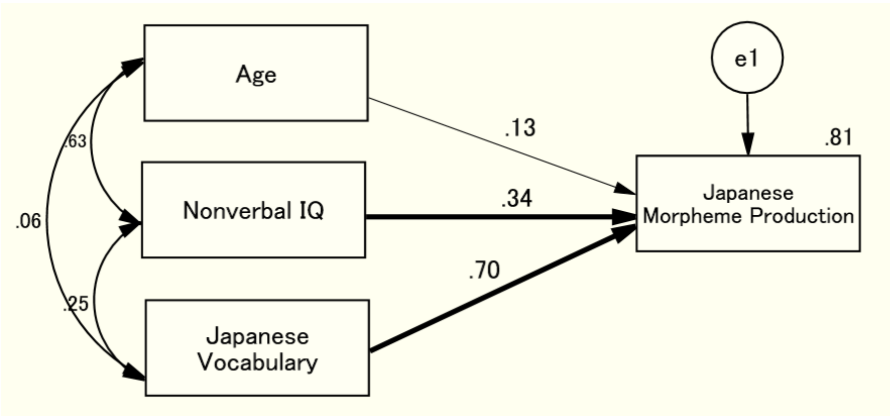
Table 24. *Decomposition of effects from path model predicting morpheme recognition in Japanese*

	ESLs (n = 24)				JHLs (n = 21)				JLM (n = 27)			
	b	β	*t*	R^2	b	β	*t*	R^2	b	β	*t*	R^2
				.27				.17				.10
Age	.24	.13	.80		.24	.11	.80		.24	.08	.80	
IQ	.07	.11	.10		.07	.10	.67		.07	.09	.67	
JV	.13	.44	2.97**		.13	.30	2.97**		.13	.22	2.97**	

SE: Age = .30; IQ = .10; JV = .04 (all groups)
Fit statistics. RMSEA (90% CI): .00 (.00- .07); $P_{close-fit}$: .92; GFI: .98 ; CFI: 1.00.
Note. JV: Japanese Vocabulary; b = unstandardized coefficients; β = standardised coefficients
*$p < .05$, **$p < .01$, ***$p < .001$, † $.05 \le p \le .07$

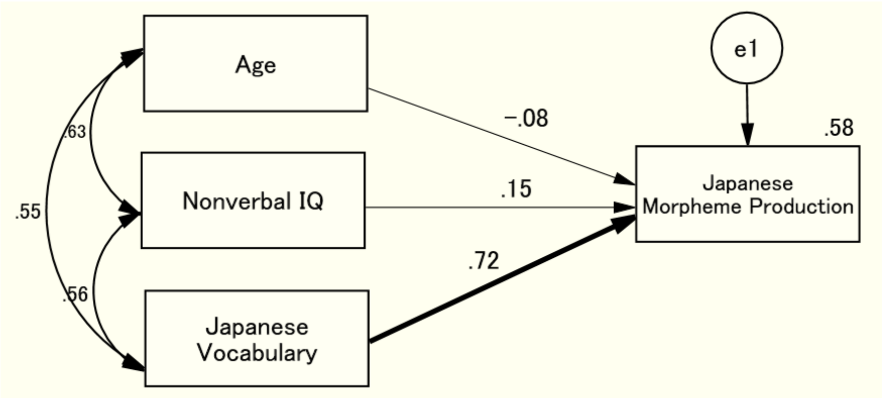
6.2.2 Path model predicting morpheme production in Japanese

Figures 13 to 15 each show a group-specific path model of Japanese morpheme production (WA scores) predicted by age, nonverbal IQ and Japanese vocabulary. In a nested model built subsequent to the initial model, the constraints for age were relaxed to vary across groups, together with those for nonverbal IQ in the JHL group set to vary from the other groups. This second nested model provided an improved fit to the data at the approaching significance level, $\Delta\chi^2(3) = 7.37$, $p = .06$. The other fit indices used indicated this was a well-fitting model (see below Figure 15). In this model, the pathway from age to morpheme production was significant only for the JLM group (Figure 15). Moreover, nonverbal IQ was a significant predictor of morpheme production for the ESL and JLM groups (Figures 13 & Figure 15) whereas its contribution was not significant for the JHL group (Figure 14). Japanese vocabulary was a significant predictor and its magnitude was similar across groups. In short, the nature of morpheme production could potentially be unique to each group, owing to the differential weightings of non-linguistic factors, namely, age and nonverbal IQ (see Appendix 23 for full effects decomposed in table format).



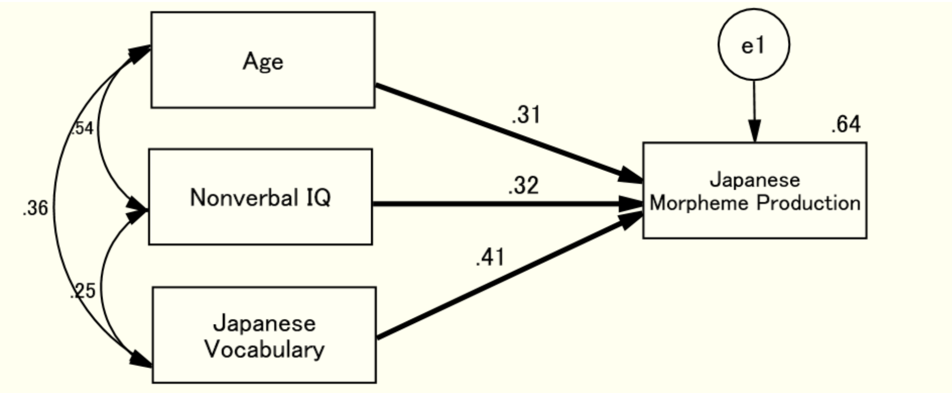
**Significant pathways are highlighted in bold.*

Figure 13. *A path diagram predicting Japanese morpheme production (**ESL** model)*



**Significant pathways are highlighted in bold.*

Figure 14. *A path diagram predicting Japanese morpheme production (**JHL** model)*



**Significant pathways are highlighted in bold.*

Figure 15. *A path diagram predicting Japanese morpheme production (**JLM** model)*

Fit statistics (for Figures 13-15): $\chi^2(3) = .30$, $p = .96$; RMSEA (90% CI): .00 (.00 - .00); $P_{close-fit}$: .97; GFI: 1.0 ; CFI: 1.0.

6.2.3 Summary of within-language analysis

The correlational and regression analyses presented in Sections 6.1 and 6.2 revealed the nature of the association between morphological awareness and vocabulary knowledge which was both unique to each group and common across groups and languages. Both in English and Japanese, an increase in overall vocabulary scores was associated with higher degrees of morpheme production demonstrated by all groups of children. Vocabulary knowledge was predictive of morpheme recognition only in Japanese. The JHL-specific association was identified, whereby nonverbal IQ made a significant contribution to predicting English morpheme production. In the model predicting Japanese morpheme production, the contribution of non-verbal IQ was, in contrast, non-significant for the JHL group and its magnitude was significantly larger for the ESL and JLM groups than it was for the JHL group.

It is worth noting that the group-specific nature of the relationship between morphological awareness and vocabulary knowledge existed not only between the bilingual and monolingual groups but also between the bilingual groups in both languages. This difference will be examined further by including between-language predictors (vocabulary knowledge and morphological awareness in the other language) as well as within-language ones in regression models. More specifically, the next step is, in relation to Research Question 4, to examine whether morphological awareness in one language was explained by vocabulary knowledge and morphological awareness in the other language, i.e., cross-linguistic influence among the ESL and JHL groups.

6.3 Cross-linguistic influence in ESL/JHL children

The relationship between the different aspects of morphological awareness in Japanese and English was examined first by carrying out partial correlations controlling for age and non-verbal IQ, as presented in Table 25. The ESL results indicated that the Japanese WS crude and sensitive scores were each positively related to the English WS sensitive scores, at the approaching significance level (p = .07). With respect to the JHL group, on the other hand, the Japanese WS crude scores were in a positive relationship with the English WS sensitive scores, whereas the positive relationship between the Japanese and English WS sensitive scores was nearing significance, p = .06. It is worth noting that the crude and sensitive scores in Japanese, both of which fall under the same measure of MA (morpheme recognition), were each differently associated with morphological awareness in English, as indicated, for instance, by the English WS sensitive scores being significantly (at the .05 level or below) related only to the Japanese WS crude scores but not to the sensitive scores in the JHL group.

Table 25. *Correlations between Japanese and English morphological awareness*

	Japanese MA tasks					
	ESL (n = 24)			JHL (n = 21)		
English MA tasks	JWS (CS)	JWS (SS)	JWA	JWS (CS)	JWS (SS)	JWA
EWS (CS)	.31	.33	-.11	.38	.30	-.04
EWS (SS)	.39†	.40†	.08	.45*	.40†	-.03
EWA	.27	.29	-.07	-.01	-.02	-.2

Note. JWS & JWA: Japanese Word Segmentation, Japanese Word Analogy task; EWS & EWA: English Word Segmentation & English Word Analogy task; CS: crude scores; SS: sensitive scores.
**p* < .05, ***p* < .01, ****p* < .001, † .05 ≤ *p* ≤ .07

6.3.1 Path analysis predicting English morphological awareness

As a next step, a series of multiple regression analyses were performed via path diagrams, in order to examine whether or not morphological awareness in one language would predict morphological awareness in the other language. In these models, as in the within-language analyses presented in Sections 6.1 and 6.2, age and nonverbal IQ were entered so that their effects could be taken into account when examining the contribution of the other linguistic predictors. English and Japanese overall vocabulary (the composite score of BPVS/TOWK-EV z-scores in English and TJLA/TJEV scores in Japanese) were each entered as a within- and/or between-language vocabulary predictor in order to examine morphological contributions over and above vocabulary knowledge. The WS crude, sensitive and WA scores in each language were entered separately (i.e., one set of scores at a time), when used as a predictor and/or an outcome variable for the following two reasons. One reason is the lack of correlations between these two morphological constructs (especially for the JHL group in English and both groups in Japanese). Another reason is related to the finding that Japanese WS crude and sensitive scores were each related to the English WS sensitive scores only but not crude scores, as given in Table 25. This suggests that treating crude and sensitive scores as separate predictors and entering one in each model at a time could potentially allow for the observation of cross-linguistic relationships which are specific to each level of sensitivity in morpheme recognition. However, as was done for the within-language analyses, for simplicity sake, crude scores alone will be reported, unless they showed different results to sensitive scores.

A potential group-specific contribution of morphological awareness was examined by looking at differences in path coefficients particularly on the between-language morphological awareness predictor. Similar to the analyses in Sections 6.1 and 6.2, this was achieved by constraining the path coefficients to be equal across groups in the first nested model, followed by examining the extent to which allowing a particular coefficient to vary in another nested model would improve model fit to the data. The models reported below are those which yielded group effects. Neither the model predicting English morpheme recognition nor the one predicting Japanese morpheme recognition showed significant group effects. These results are presented in Appendix 23.

6.3.1.1 Group effects

When examining a path model predicting English morpheme production, Japanese vocabulary was not making a significant contribution in either group. Re-running the model without it produced the same pattern of relationships as that produced by the model with the vocabulary predictor. In order to keep the model as simplified as possible, primarily due to the small sample size, the model without Japanese vocabulary is reported here. A nested model, where the nonverbal IQ and Japanese morphological awareness (WS scores) coefficients were each set to vary across groups, provided an improved fit to the data, relative to the initial nested model (where all coefficients were set to be equal), $\Delta\chi^2(2) = 9.81$, $p = .007$. As illustrated in Figures 16 and 17, the significant contribution of the Japanese morphological predictor was identified only in the ESL group and its magnitude was significantly larger than it was for the JHL group. The pathway from nonverbal IQ to English morpheme production was significant only for the JHL group. English vocabulary was a significant predictor in similar magnitude for both groups. Thus, the identified pattern of path weights suggests the following. While the positive role of English vocabulary is similar across groups, the ability to produce English morphemes is likely to be influenced by nonverbal IQ in the JHL group, whereas it is likely to be influenced by the ability to recognise Japanese morphemes though segmentation in the ESL group.

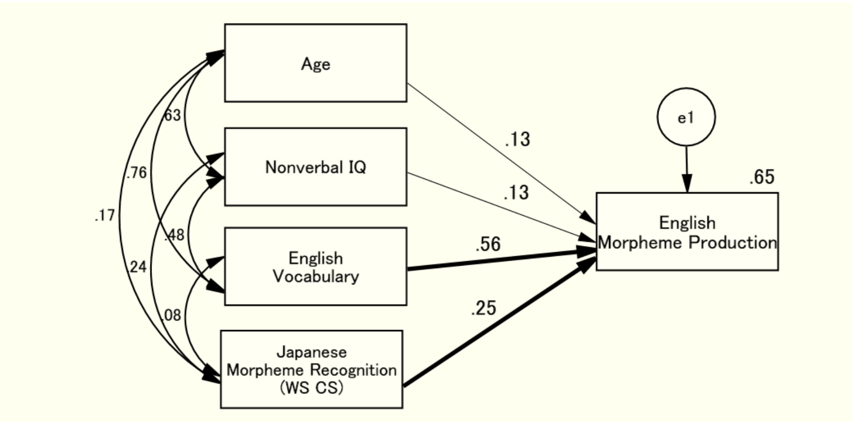
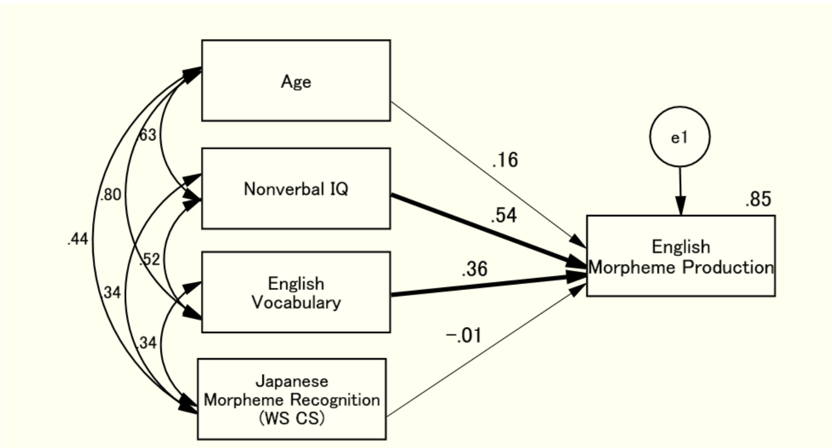


Figure 16. *A path diagram predicting English morpheme production (**ESL** model)*



**Significant pathways are highlighted in bold.*

Figure 17. *A path diagram predicting English morpheme production (**JHL** model)*

Fit statistics (for Figures 16 & 17): $\chi^2(2) = 2.93$, $p = .23$; RMSEA (90% CI): .10 (.00 - .34); $P_{close-fit}$ .27; GFI: .97 ; CFI: .99.

It should be noted that the model fit assessed by the RMSEA indicates poor fit with its value being as high as .10 together with the wide 90% CI and the low $P_{close-fit}$ value. However, the other indices (GFI and CFI), which are less sensitive to model complexity and sample size, demonstrated good fit of the model to the data.

6.3.2 Path model predicting Japanese morphological awareness

The between-language vocabulary predictor (i.e., English) and age were both non-significant predictors and their respective magnitudes were small in predicting Japanese morpheme production. Since re-running the model without these predictors did not change the pattern of path weights, the model without them is reported below. However, in order to retain some control over potential age effects, SPM raw scores were replaced with SPM standard scores. This did not alter the pattern of the relationship initially found and hence is reported below. To reiterate, this approach was important also to achieve a parsimonious model, due the small sample size in each group.

6.3.2.1 Group effects

The nested model where the coefficients for Japanese vocabulary and English WA scores were each set to vary across groups, provided the best fit to the data, $\Delta\chi^2(2) = 7.73$, $p = .02$. In this model, the cross-linguistic contribution of English morpheme production was significant only for the ESL group, as illustrated in Figures 18 and 19. The contribution of Japanese vocabulary was larger for the ESL group but was also significant for the JHL group. The contribution of nonverbal IQ, which was similar in magnitude between groups, was approaching significance, ($p = .06$) (see Appendix 23 for the decomposition of these effects given in table format).

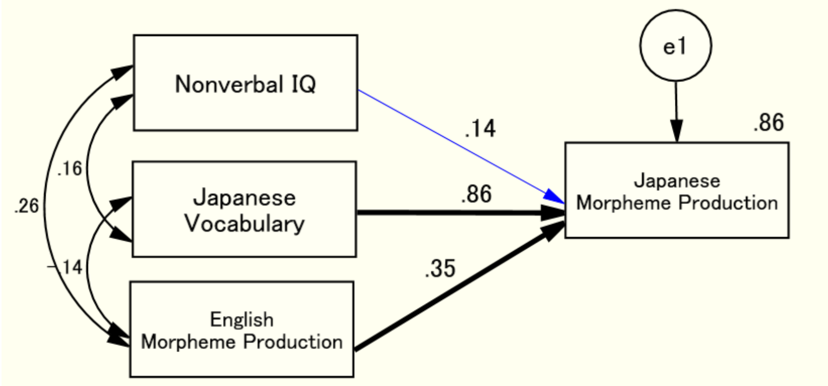
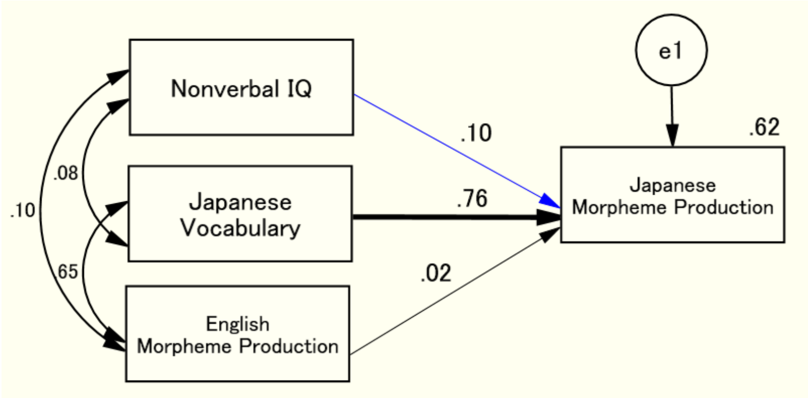


Figure 18. *A path diagram predicting Japanese morpheme production (**ESL** model)*



**Significant pathways are highlighted in bold and nearing significance is highlighted in blue.*

Figure 19. *A path diagram predicting Japanese morpheme production (**JHL** model)*

Fit statistics (for Figures 18 & 19): $\chi^2(1) = .00$, $p = .99$; RMSEA (90% CI): .00 (.00 - .00); $P_{close-fit}$ .99; GFI: 1.0 ; CFI: 1.0.

6.3.3 Summary of cross-linguistic influence of morphological awareness

The analyses carried out above depicted the group-specific nature of morphological transfer between Japanese and English. Evidence of transfer was more robust in the ESL group in both languages, as follows. The ability to identify Japanese morphemes through segmentation was predictive of the ability to produce morphologically complex words in English. Furthermore, the ability to produce morphologically complex items may be transferrable across languages, as indicated by the English WA scores being a significant predictor of the Japanese WA scores. No significant transfer effects were observed in the JHL group, however. A contribution unique to the JHL was identified in the pathway from nonverbal IQ to English and Japanese (with approaching significance) morpheme production. To reiterate, these results should be viewed as preliminary or suggestive evidence owing to the models lacking statistical power due to the small sample size. A much larger sample would be needed for these relationships to be more representative of the relevant populations.

Chapter 7

DISCUSSION

The overarching aim of the current study was to investigate different aspects of vocabulary knowledge and morphological awareness, together with their relations with one another in each language (English and Japanese) among respective groups of bilingual and monolingual children and also across languages between the bilingual groups. The aspects of vocabulary knowledge and morphological awareness in focus were a) receptive and expressive knowledge of lexical meanings and b) the ability to identify morphemes in a word and produce morphologically complex items (i.e., inflectional and derivational items), respectively, in three groups of children per language (ESLs/JHLs/ELMs in English; ESLs/JHLs/JLMs in Japanese). The bilingual data were further analysed to examine whether morphological awareness in one language influenced/ was influenced by morphological awareness in the other language, namely, transfer of morphological awareness between English and Japanese in the statistical sense.

There were four key findings. First, English receptive and expressive knowledge of lexical meanings were demonstrable to different degrees between three groups of children: the former yielded higher scores than the latter for the ESL group; it was the other way around for the ELM group; and these two sets of scores were comparable for the JHL group. In Japanese, in contrast, all groups of children consistently scored more highly when tested on their expressive knowledge than receptive knowledge. A second key finding is that all three English-speaking groups, as well-documented in the literature, recognised and produced inflectional morphemes more accurately than derivational morphemes, whereas such patterns were not consistently observed in the Japanese morphological tasks. While all three Japanese-speaking groups produced inflectional items more accurately than derivational items in the

Japanese WA task, such morpheme type effects were observed only in the JHL group in the Japanese WS task, where the other groups yielded comparable scores across morpheme types. A third key finding is concerned with the relationship between vocabulary knowledge and morphological awareness within languages. The ability to produce morphologically complex items was likely to increase with vocabulary knowledge in all groups of children in both languages. The ability to recognise morphemes (i.e., WS task scores) was, in contrast, associated with an increase in vocabulary only in Japanese. Lastly, the cross-linguistic analysis of the bilingual data indicated that morphological awareness was likely to increase in a reciprocal manner between Japanese and English in the ESL group. No significant cross-linguistic relationships were observed in the JHL group, thus suggesting that morphological awareness may increase in one language independently of another for this group.

These findings are discussed further below, organised in the order of the research questions (RQs) and are hence structured as follows. Results concerning the nature of vocabulary knowledge (RQ1) in English (Sub-study 1) and Japanese (Sub-study 2) are discussed under the same subheading. Following the vocabulary subheading are discussions about the nature of morphological awareness (RQ2) in English (Sub-study 1) and Japanese (Sub-study 2). The results on the nature of the within-language relationship between vocabulary knowledge and morphological awareness are then discussed, followed by discussions about the morphological transfer observed. It should be noted this chapter is not aimed at making generalisations about the nature of, and the relationship between vocabulary knowledge and morphological awareness in school-age monolingual and bilingual children. Any findings obtained should be interpreted and discussed as suggestive or preliminary evidence, due to the non-comprehensive approach taken in the current study. Limitations of the current study are presented and discussed in detail at the end of the chapter.

7.1 RQ1: the nature of vocabulary knowledge

7.1.1 English vocabulary knowledge (Sub-study 1)

The results from the BPVS and TOWK Expressive Vocabulary (TOWK-EV) tests revealed the group-specific nature of receptive and expressive vocabulary knowledge in the English-speaking children. Receptive vocabulary was demonstrated to higher degrees than expressive vocabulary by the ESL group, whereas these two types of vocabulary were comparable in scores for the JHL group. As for the ELM group, in contrast to the other groups, expressive vocabulary scores were higher than receptive vocabulary scores. When a series of t-tests were carried out for between-group differences, no differences were found between the JHL and ELM groups on the receptive vocabulary measure, whereas both groups scored more highly than did the ESL group. Group differences were more evident on the expressive vocabulary measure in the sense that the three groups' scores were all significantly different, in descending order of the ELM, JHL and ESL groups. The correlational analysis indicated that both types of vocabulary knowledge were positively correlated with one another, thus suggesting that receptive vocabulary is likely to increase with expressive vocabulary.

7.1.1.1 Receptive versus expressive vocabulary in the ESL group

The performances of the ESL group are consistent with the asymmetric nature of receptive and expressive vocabulary (in favour of the former) in L2 children, as evidenced in the literature (e.g., Golberg et al., 2008; Lugo-Neris et al., 2010; Magiste, 1979). The TOWK-EV involves orally naming the picture by producing the most descriptive lexical item. The only clue given was the picture. The BPVS, on the other hand, involves listening to aural input for the target item and choosing, from four pictures, a picture which best tells the meaning of the item. Higher degrees of vocabulary knowledge demonstrated through the BPVS than the TOWK-EV could be related to degrees of compatibility between the aural input and the visual stimuli (Mägste, 1979). The BPVS provides a fixed number of candidates for the child to match with the aural input and thus bears strong degrees of compatibility. The TOWK-EV, on the other hand, does not provide a fixed number of choices, which could weaken degrees of compatibility and result in increasing degrees of competition. More specifically, the TOWK-EV involves choosing (and producing) a single, most descriptive lexical item for the picture among close alternatives in the activated semantic representation in the mental lexicon. In these respects, engaging in such picture-naming activities possibly placed greater cognitive demands on the ESL children than did the word-picture matching activities.

Another angle to interpret this finding from is via the existing model of Bilingual Memory Representations. As reviewed in Chapter 2 (Section 2.6.1), Kroll and Stewart (1994) put forward the view that a direct conceptual link from the L2 gets established as the learner becomes more proficient in the L2, and that less proficient learners gain access to concepts through the L1 when performing L2 lexical tasks. The latter structure of bilingual memory could be associated with a certain degree of response inhibition (Mägste, 1979). In other words, it could be hypothesised that the presentation of stimuli in the L2 (English) activated the other language (Japanese in this context), for a given concept to be expressed in the L2 and hence this L2 → L1 → L2 process might have played an adverse role in the ESL children's lexical retrieval for production.

7.1.1.2 Receptive versus expressive vocabulary in the JHL group

Mägste (1979) and Kroll and Stewart (1994) respectively emphasise the role of relative competence in the L2 to the L1 in the extent to which the existence of another language affects comprehension and production in the L2. Mägste (1979) suggests that such effects are minimal as long as the bilingual learner is significantly dominant in one language and tested in that language, consequently yielding a performance similar to their monolingual peers. This could be somewhat explanatory for the comparable nature of receptive and expressive vocabulary demonstrated by the JHL group. Their dominant (or proficient) language is English, having been exposed to it since birth (together with Japanese) and also been schooled entirely in that language with their monolingual peers. The ESL group, in contrast, had Japanese as the language of instruction and it shifted to English upon arrival in the UK. In short, lesser degrees of Japanese interference, in comparison to the ESL group, in performing the English vocabulary tests might have been a potential factor underlying the balanced nature of receptive and expressive vocabulary in the JHL group.

7.1.1.3 Receptive versus expressive vocabulary in the ELM group

The reason for the above account to be only ‘somewhat explanatory’ is the fact that the JHL group’s performance on the TOWK-EV test was significantly lower than the performance of the ELM group. If Mägste’s account was to be fully supported, the JHL group’s performance would have resembled the ELM group’s performance (i.e., scores being comparable between groups). Contrasting with both the ESL and JHL groups, the ELM group demonstrated higher degrees of expressive vocabulary knowledge than receptive vocabulary knowledge. This ELM result seems to contradict the converging evidence in the literature, which suggests that (both child and adult) monolinguals typically possess a larger receptive vocabulary than expressive vocabulary (e.g., Zechmeister et al., 1993; Benedict, 1979; Clark, 1993; Karmiloff & Karmiloff-Smith, 2001). This contradicting result could be discussed further within the context of psycholinguistic studies on task effects on language comprehension and production. As described earlier, the BPVS involves differentiating four visual stimuli (pictures) consisting of three distracters and one correct picture, in order to select the one which best describes the meaning of the aural input. One potential problem here is category interference. Some distracters share perceptual features with the target item from the same category (e.g., animals), which could lead to competition during the lexical selection process (Kroll & Stewart, 1994; Ridooch & Humphreys, 1987; Humphreys, Price & Riddoch, 2000). Psycholinguists commonly investigate effects of perceptual overlaps on response latencies in picture/object naming and hence might not be directly applied to accuracy in picture naming. Nevertheless, it is reasonable to assume, in line with Kroll and Stewart (1994) in particular, that such overlaps involve processing a multiple set of corresponding lexical representations, thereby triggering increased conceptual activation and consequently greater interference at a word-picture matching stage. For instance, on the BPVS, a child, upon hearing the word *weasel*, looks at four pictures representing a mouse, weasel, snake and hedgehog. It is possible that in doing so, the semantic representation of the given animal (*weasel*) was activated together with those of the distracter animals. Hence, this extra activation might have added cognitive demands when choosing the correct word-picture. Moreover, levels of such activation could be higher for more proficient learners of that language (De Bot, 2004), namely the ELMs in this study. The TOWK-EV test, on the other hand, triggered lesser degrees of competition in the sense that there were no distracters representing similar perceptual features. A single picture was presented to elicit a single, most descriptive lexical item it in response to specific questions, ‘what is this?’ and ‘what is the person/object in the picture doing?’

7.1.1.4 Group differences

The explanation given for the ELM results above at first appears contradictory to that given for the ESL results. The latter explanation implied that added competition had a somewhat inhibitory effect on their performance on the TOWK-EV test, but not on the BPVS. This brings back the more fundamental differences between groups, namely, the difference in the nature of receptive and expressive vocabulary and the presence of another language in the mental lexicon. As regards the ESL group, having a smaller receptive/expressive vocabulary meant that the likelihood of not recognising the aural input was greater than it would have been for the ELM group. Hence, the ESL group is likely to have benefitted from recognising the meaning of the target item with more visual cues (pictures) than producing a lexical item on their own with few cues available. As for the ELM group, their expressive vocabulary was highly evident, possibly due to their lexical selection process not being constrained by category interference (i.e., competition among perceptually similar members from the same category). Such reduced conceptual activation, combined with higher levels of control over, and automaticity in language production, perhaps worked in favour of the ELM group, relative to the bilingual groups. It is, therefore, conceivable that constraints on lexical selection processes may become greater, as the bilingual's knowledge of another language becomes more entrenched, as in the ESL group in particular.

7.1.2 Japanese vocabulary knowledge (Sub-study 2)

In contrast to the English vocabulary results, all groups exhibited a similar pattern of performance on the Japanese vocabulary tests: they scored more highly on the expressive vocabulary test (TJEV) than the receptive vocabulary test (TJLA). Group differences were observed on both tests, where the scores from each group differed significantly in descending order of the JLM, ESL and JHL groups. It perhaps comes as no surprise that the JLM group's receptive and expressive vocabulary were significantly more demonstrable, particularly as Japanese was their language of instruction in Japan. It is worth noting that vocabulary scores significantly differed between the bilingual groups on each test.

7.1.2.1 Receptive versus expressive vocabulary in ESL/JHL/JLM groups

The identified nature of Japanese receptive and expressive vocabulary is incongruent with the existing evidence on the nature of English vocabulary (i.e., receptive > expressive), as reviewed in Sections 2.5 and briefly in 7.1.1.1. One explanation for this is the nature of the tests, more specifically, the difference in cognitive demands involved in the TJLA and TJEV. Both Japanese vocabulary tests were written tests: the former was a multiple-choice test, involving choosing the correct meaning of the target item from five items, whereas the latter involved completing the target word in a short sentence, using the first *kana* character presented as a cue. The discussion of potential category interference involved in the BPVS could be extended here. The TJLA might have placed heavier cognitive demands on the children by requiring them to differentiate four distracters from the correct item. For instance, the children saw the written expression 意外な知らせ /igaina shirase/ "unexpected news" with the target item *igaina* underlined and had to choose a meaning which best describes the item out of the following five items:

a) 急な /kyūna/ "sudden";
b) 思いがけない /omoigakenai/ "unexpected";
c) 外からの /sotokarano/ "external";
d) 嬉しい /ureshii/ "happy";
e) 悲しい /kanashii/ "sad".

It is possible that the semantic representation of the target item and the other items given as choices was all activated for the purpose of discriminating distracters and eventually arriving at the correct meaning (b). Such added conceptual activation, if present at all, was perhaps kept to a minimum in the TJEV, since the target item was cued by the presentation of the first *kana* character, which probably helped the children to narrow down the number of candidate answers. Furthermore, there were no written distracters presented in the TJEV, which might have contributed to reducing cognitive demands of the test and facilitated the demonstration of Japanese vocabulary knowledge.

7.1.2.2 Bilingual differences in the nature of Japanese vocabulary knowledge

Each of the Japanese vocabulary tests captured significant differences between the bilingual groups. The TJEV age-equivalent scores were not obtained due to the test not being standardised. The manual of the TJLA advises test administrators that the bilingual child's scores be regarded as age-appropriate if they correspond to their school year or fall one school-year below (Ono et al., 1989). The manual adds the following additional degrees of age-appropriateness: a) scores equivalent to the child's school year minus two indicate that the child may possess adequate vocabulary for communicative purposes; and b) a school-year equivalent being three or more years below the child's actual school year could indicate a potential danger of the child's vocabulary falling insufficient for him/her to keep up with their Japanese-medium classes. With reference to these indicators, the ESL group fell within the age-appropriate range (the school-year equivalent 4.8 corresponds to the ages of 9-11), whereas the lower end of the age-appropriate range (the school-year equivalent 2.6 corresponds to 7-9 years of age) for the JHL group was three years below their average chronological age. This is not to advocate the view that the JHL group's age-appropriate level should be a cause for concern or to imply any learning disorder or impairments. In fact, it is not surprising that their Japanese vocabulary was lacking age-appropriateness, considering that their language of instruction was English and exposure to Japanese was much more limited both in qualities and quantities. It is worth noting that the ESL group's vocabulary was demonstrated at an age-appropriate level, despite the fact that they were also extensively exposed to English through schooling, just like the JHL group (and the ELM group). This raises the need to consider the nature of Japanese support for both groups as a potential underlying factor for this vocabulary difference. This issue will be revisited and discussed further in Section 7.4.4.

7.2 RQ2: the nature of morphological awareness

7.2.1 English morphological awareness (Sub-study 1)

Consistent with the existing evidence, all three groups (ESLs, JHLs and ELMs) demonstrated a more accurate understanding of inflectional morphemes than derivational morphemes both in the Word Segmentation (WS) and Word Analogy (WA) tasks. No significant group differences in overall scores were identified in the WS task, whereas the ESL group yielded higher overall scores than did the ELM group in the WA task.

The identified pattern of performances across morphemes highlights a special difficulty in mastering derivations. This is in turn congruent with the agreed-upon view in the literature that children accelerate in their learning of morphological derivations, which are more numerous and idiosyncratic than inflectional morphemes, in the late primary school years and continue developing towards a mastery through adolescence (e.g., Anglin, 1993; Carlisle & Flemming, 2003; Tyler & Nagy, 1989). The current study adds to this view the following two descriptive patterns in the nature of morphological awareness obtained from the error analysis. The participating children, whether bilingual or monolingual, appear to have been adversely affected by semantic opacity and morphemic complexity during their morphological segmentations. In addition, the ability to correctly use both semantic and syntactic aspects of morphemes as well as the meaning of the root morpheme for written production could be a 'hard-to-come-by' construct of morphological awareness, thus contributing to the long-term learning of derivations.

7.2.1.1 Group differences: insights into bilingual advantages

The participating children were comparable both in performance on each morpheme type and overall performance in the WS task. The lack of group differences could be illuminated further, with reference to the Analysis/Control (A/C) model proposed by Bialystok (2001b). Bialystok advocates the view that analysis of linguistic knowledge and attentional control are two skill components of metalinguistic awareness, and that a bilingual advantage manifests itself differently, depending on which skill component was tapped into by a task. A task which requires the analysis of a representational structure via the use of more formal or explicit knowledge of the domain concerned is not necessarily solved better by either bilinguals or monolinguals. The nature of the WS task, which involves analysing the structure of a morphologically complex item for an identification of morphemes, fits well with this description. In line with the A/C framework is recent work on heritage language (HL) learners by Montrul and her colleagues (Montrul, 2010; Montrul, Foote & Perpiñán, 2008). Montrul (2010), in her review of HL studies, suggests the following. HL learners who are simultaneous bilinguals typically perform more highly than consecutive bilinguals on oral tasks which minimise the use of their metalinguistic knowledge. The former's advantage may, however, diminish in written tasks which require high levels of metalinguistic awareness. Drawing on these accounts, one could reasonably assume that the ESL group's growing metalinguistic awareness of English morphemes was demonstrable at a level comparable with the other groups, despite their shorter length of schooling in English.

A varied nature of bilingual advantages was identified in the WA task. After controlling for age, IQ and English proficiency, the ESL group yielded higher overall scores than did the ELM group, and each of the bilingual groups outperformed the ELM group on the production of derivational morphemes. No significant difference was identified both in overall scores or scores on morpheme type between the bilingual groups.

The low performance of the ELM group, relative to the other groups, is congruent with a study by Duncan et al. (2009). Duncan et al. associated the processes involved in producing morphologically complex items to be metalinguistically demanding for the EL1 children in their study. This challenge stems from a need for children to use knowledge of both semantic and syntactic aspects of morphemes, as well as the meaning of the root morpheme, as required in the WA task. The error analysis (Section 4.5) identified a performance pattern relevant to this difficulty: knowledge of the syntactic aspects of morphemes was not fully demonstrated and thus an alternative member of the same word family was commonly provided (e.g., *wealth* for *wealthy*). The higher scores obtained by the bilingual groups could then be interpreted as meaning that metalinguistic demands stemming from this challenge affected their performance to lesser degrees.

One explanation for such differences in performance is the Control aspect of the A/C model (Bialystok, 2001b). Bialystok suggests that bilinguals tend to exert superior performances on a task which requires controlling attention to specific aspects of a stimulus. This view has gathered supportive evidence from psycholinguistic studies which used a range of cognitive (e.g., a Stroop task and a tapping task in Gathercole et al., 2010) and linguistic tasks (e.g., a lexical decision task in Murphy & Pine, 2003). The current study featured ‘offline’ tasks and hence might lack in its applicability to these past psycholinguistic studies. Nevertheless, a feature of the WA task which could be remotely linked to the Control aspect is that the children were required to attend to the target pair without being ‘tricked’ by the surface features of the items in the immediately preceding pair. To take the pairs *happy*: *happiness* :: *high* : __________ (*height*) as an example, the first two items act to represent the morphological relationship which also applies to the immediately following pair. However, using the same derivational process (i.e., adding the suffix -*ness*) does not lead to the correct item. In other words, producing a correct derivational form requires the child to use the derivational process specific to the item *high* (*high* → *height*) without being distracted by the other derivational process (*happy* → *happiness*). These processes could bear some resemblance to those involved in exerting attentional control over specific aspects of the stimuli, as observed in the relevant psycholinguistic studies.

7.2.2 Japanese morphological awareness (Sub-study 2)

As was identified in the English WS task, no significant between-group differences were identified in overall performance or performance on each morpheme in the Japanese WS task. The Japanese WA task, in contrast, not only identified a group difference in overall scores between the monolingual group (JLMs) and the bilingual group (JHLs) but also between the bilingual groups in favour of the ESL group. The bilingual difference was evident especially on their performance on the derivational morphemes in the WA task. As regards within-group performances, while the participating children demonstrated higher degrees of morphological awareness of inflections than derivations in the WA task, this pattern was not observed consistently across groups in the WS task. The ESL and JLM groups each yielded comparable scores across morpheme types, whereas the JHL group tended to identify the inflectional morphemes more accurately than the root morphemes. Hence, the results of the Japanese WS task are not entirely in accordance with the asymmetric developmental trajectories of inflections and derivations well-documented in the literature on English-speaking children. It is notable that, while the JHL group's high performance on inflectional morphemes was observed both in the English and Japanese morphological tasks, the ESL group exhibited different patterns of performance across morpheme types between the Japanese and English WS tasks. In this respect, the ability to identify morphemes through segmentation perhaps tapped into language-specific skills in the ESL children.

These language-specific effects of morpheme type could be attributed in part to the fact that the majority of the test items in the Japanese WS tasks were bi-morphemic and hence represented a reduced range of morphological complexities, relative to the English WS task. This in turn might have made the performance of the ESL group (and also the JLM group) less sensitive to morpheme type. However, there remained morpheme type effects for the JHL group. Evidence from Japanese monolingual preschool children (Fujiwara, 1999) suggests that children aged as early as 4-5 years were able to distinguish inflectional endings from their stem. Although Fujiwara focussed on adjectival endings only, this finding could be linked to the JHL group's relatively high scores on the inflectional morphemes in the Japanese WS task. Their high performance was perhaps aided by the highly regular and less idiosyncratic nature of Japanese inflections, in comparison to derivational morphemes, as in English morphology. One could reasonably postulate, based on this finding, that the JHL group was perhaps at the stage of morphological development where the ability to identify inflectional suffixes was highly demonstrable while the ability to identify root morphemes in morphologically complex items had yet to accelerate.

7.2.2.1 Bilingual variability in the nature of Japanese morphological awareness

Recall that the bilingual groups (ESLs and JHLs) and the Japanese monolingual group (JLMs) were not to be directly compared due to the significant difference in their language learning backgrounds: the former were recruited in England, whereas the JLMs were recruited in Japan. In other words, no implications are to be drawn such as those that the bilingual children were underperforming and hence need to catch up to the JLM level. The JLM results are refereed to for the purpose of identifying the nature of morphological awareness which may be unique to each group or common across groups.

Consistent with the results of the English morphological results, no between-group differences were identified either in overall scores or scores on each morpheme type in the Japanese WS task, whereas significant group differences were evident in the Japanese WA ask. The differences in the latter task are worthy of discussion in two regards. One is that the ESL group's overall performance and performance on the derivational morphemes were each significantly higher than the JHL group. Another is that the ESL group's performance was comparable to the JLM group when both overall scores and scores on morpheme types were concerned. As was briefly touched upon earlier in Section 7.2.2, the consensus on special difficulties with derivations over inflections faced by English-speaking children could be extended to the Japanese morphological awareness results. At a stage where an acceleration of morphological awareness has yet to occur, demonstrating morphological awareness of derivations could be challenging for the JHL children and particularly so in a cognitively demanding task (Duncan et al., 2009), such as the WA task. The Japanese WA task, just like the English WA task, required the children to demonstrate their awareness of both semantic and syntactic roles of the morpheme(s), together with the meaning of the root morpheme, in an attempt to produce a derivational/inflectional form by themselves. Such a cognitively demanding nature of morpheme production could be one underlying factor which widened the difference in the overall and derivational scores between the JHL group and the other groups in favour of the latter.

The second point of note in the Japanese WA task results is that the ESL group performed in a comparable manner to the JLM group, after controlling for age, IQ and Japanese proficiency. The discussion within the A/C framework used for the English WA task may not apply here. This is because the concept of bilingual advantages cannot be operationalised due to the difference in educational contexts in which the bilingual groups and monolingual group had been schooled (UK and Japan respectively). An alternative viable explanation is the type of Japanese instruction received by each bilingual group at the time of testing. This issue will be discussed in detail in Section 7.4.4 below.

7.3 RQ3: within-language examinations of the relationship between morphological awareness and vocabulary knowledge

7.3.1 In English with the ESL, JHL and ELM groups

As indicated by the correlational and regression analyses, it was the English WA task scores, a measure of morpheme production, that were positively related to English vocabulary scores in similar magnitude for all groups. No WS scores, whether crude or sensitive scores, were associated with vocabulary knowledge in any group. The associations unique to the JHL and ELM groups were the significant contribution of nonverbal IQ and age, respectively, to predicting morpheme production.

The association between morpheme production and vocabulary knowledge is in accordance with the existing evidence from English-speaking children. To recap, morpheme production was measured by requiring the child to produce a lexical item which was either inflected or derived from the other member of the target pair, so that the completed target pair would represent the same morphological relationship as the immediately preceding pair (e.g., *strong*: *strength*:: *angry*:: ________ (*anger*)). In this WA task, knowing the meaning of the other member of the target pair (e.g., *angry*) is not sufficient. Knowledge of both semantic and syntactic roles of the affixed form and its root in the preceding pair (e.g., *strong*: *strength*) is needed to complete the target pair with a correct item. Thus, in line with the suggestion by Carlisle (2000), these morphological processes involved in the WA task could be more analogous to those in demonstrating lexical meanings and hence are likely to be more closely related to vocabulary knowledge than morpheme recognition as measured by the WS task may be.

7.3.2 In Japanese with the ESL, JHL and JLM groups

The regression analyses revealed a positive relationship between vocabulary knowledge and morpheme production (the WA scores) in all three groups of Japanese-speaking children. As discussed in the previous section, past research on morphological awareness in English-speaking children suggests that a morpheme production task was predictive of knowledge of lexical meanings (e.g., Carlisle, 2000). If this also held for Japanese-speaking children, the identified relationship specific to the WA task could be explained by the analogous nature of producing Japanese morphologically complex items to demonstrating lexical meanings through the Japanese vocabulary tests. One unique aspect of the Japanese results is that vocabulary knowledge was also predictive of morpheme recognition for all three groups. Thus, it could be postulated that the nature of morphological awareness and vocabulary knowledge is language-specific when morpheme recognition through segmentation is concerned. Considering the richly inflected and complex nature of Japanese morphology (Tsujimura, 2007), one would reasonably assume that the extent to which morphological awareness is integrated into vocabulary development could be higher in Japanese than in English and hence a closer relationship between the two in Japanese. This assumption is consistent with the suggestion by McBride-Chang et al. (2005a) that morphological awareness plays a more important role in word recognition in morphographic L1 learners than phonographic L1 learners. The current study only partially supports the well-documented positive association between morphological awareness and vocabulary knowledge in the literature, by suggesting the following. This association holds for the context of Japanese-speaking monolinguals and bilinguals, as well as English-speaking children, only when morpheme production is concerned. Positive roles of skills at carrying out morphological segmentation in vocabulary knowledge could be unique to Japanese, a highly inflected language relative to English.

7.3.2.1 The language-specific role of morpheme recognition in vocabulary knowledge

The WS task scores were not related to vocabulary knowledge in English. Drawing back on the suggestion by Carlisle (2000), one could postulate that the morphological processes involved in segmenting a word into morphemes lack similarity to those in demonstrating or deciphering lexical meanings through linguistic tasks. This finding at first appears contradictory to past research suggesting that an enhanced awareness of the structure of morphologically complex items coincides with vocabulary growth (Anglin, 1993; Bowers & Kirby, 2010). This could be due to methodological differences in measuring children's skills at identifying morphemes. Studies by Anglin (1993) and Bower and Kirby (2010) respectively used morphological tasks, whereby upon identifying the root of a target item, participating children were tested on their skills at mapping meanings onto affixes as well as the root. In Anglin's study, for instance, participating children did not receive a full mark for providing the meaning of 'to change' for the target item *changed*. In this task, it was not obligatory to explicitly identify affixes separately from their root. Therefore the meaning that the children deciphered through such morphological problem-solving perhaps did not fully capture their understanding of the morphological structure of the target item. In the WS task used in the current study, in contrast, the ability to distinguish affixes from their root morpheme was explicitly measured by requiring the children to put (a)slash(es) where morphological boundaries lay. That is, the WS task perhaps required higher degrees of explicit knowledge of morphemes than the morphological tasks used in the previous studies would have done. Such enhanced degrees of explicit morphological knowledge required might have increased the degrees of dissimilarity to the processes used by the children in demonstrating lexical meanings, thus rendering the nature of the relationship between these two types of knowledge independent of one another.

It should be noted that the lack of relationship between morpheme recognition and vocabulary was not identified in Japanese and hence the above discussion is specific to the relationship in English. As discussed in the previous section, morphological segmentation could be more closely related to vocabulary knowledge as far as a language with the more morphologically complex systems is concerned (Japanese in this context).

The lack of relationship between the English WS task and vocabulary scores could also be attributed in part to the children's unfamiliarity with the task. All three groups who completed the English tasks were unfamiliar with the English WS task, from which the researcher inferred that the type of literary instruction which they received at school did not feature, if not non-existent, explicit instruction about morphemes using segmentation as a method. Such unfamiliarity might have added to the lack of compatibility between the morphological processes involved in segmentation and those in demonstrating lexical meanings.

7.4 RQ4: Morphological transfer between English and Japanese among bilingual children

7.4.1 Bidirectional transfer in the ESL group

Morphological transfer between Japanese and English may be a phenomenon unique to the ESL group. The regression analyses indicated that Japanese morphological awareness, as measured by two levels of sensitivity (crude and sensitive scores), was found to be a significant predictor of English morpheme production (WA scores). Furthermore, English WA scores uniquely predicted Japanese WA scores in the ESL group. Thus, these bidirectional (i.e., Japanese ⇔ English) relationships for the ESL group could represent the following. The ability to recognise the morphological structure of Japanese inflectional and derivational items at both levels of sensitivity may increase with the ability to produce morphologically complex English items. In addition, the ability to produce morphologically complex items may be susceptible to positive transfer between Japanese and English.

This bidirectional morphological transfer might not be explained sufficiently solely in terms of the difference in morphological systems, as posed by Ramirez et al. (2010). Ramirez et al. suggest that transfer tends to occur from a language with more complex morphological systems to another with less complex systems. In view of this, the transfer from Japanese to English in the ESL group could be interpreted as the positive transfer of Japanese, the more richly inflected and complex language, to English morphological awareness. However, this alone does not help to understand the occurrence of the transfer observed in the other direction. Nor does it help to explain the lack of transfer for the JHL group.

One alternative explanation for the observed bidirectional transfer could be relative competence in Japanese. The ESL children's proficiency in Japanese was higher than the JHL group's proficiency and was demonstrated at the age-appropriate level, as indicated by the school-year equivalent TJLA scores (see Table 6). This result seems to support the assumption that morphological transfer from the more complex morphological system requires certain degrees of proficiency in that language, as suggested in Ramirez et al. (2010). In view of this, one could argue that the level of Japanese proficiency in the ESL group was above the proficiency threshold required for transfer from Japanese to English to occur. Although the exact threshold remains unclear, it could be set as high as levels comparable to monolingual peers who are age-matched or one school year below (Ono et al., 1989; Ono, 1994). Extending this to the lack of transfer in the JHL group, one could argue that Japanese proficiency in the JHL group may not have reached this threshold yet. This positive role of L1 proficiency is in accordance with the theoretical model of interdependent relationships between L1 and L2 academic proficiency (Cummins, 1984). The evidence of transfer in the other direction – from English WA scores to Japanese WA scores – is consistent with the existing evidence of the influence of the L2 on the L1. As suggested by Wang et al. (2006), this could be explained by a shift, or the emergence of a shift, in language dominance from Japanese to English in some of the ESL children, especially those who had been schooled in English for several years, prior to the study (see Table 6 for the standard deviation of length of residence).

7.4.1.1 Differential contributions of morpheme recognition and production

As discussed above with reference to past research especially by Carlisle (2000) (Sections 7.3.1 and 7.3.2), morpheme recognition and production were differently associated with vocabulary knowledge especially in English in the current study and it was the production task that was uniquely predicted by vocabulary knowledge.

Differential roles of morpheme recognition and production were also identified in the cross-linguistic analysis. The Japanese → English transfer in the ESL group was characterised by the contribution of morpheme recognition (the ability to segment words into morphemes) in Japanese to morpheme production in English. Morphological segmentation requires analysing the structure of morphologically complex items, in which respect it involves using formal or explicit knowledge of morphemes (Bialystok, 2001b). Therefore, as predicted, the children's attentiveness to Japanese morphemes seems to be positively transferable to English morphological awareness.

The productive skills that the WA task tapped into were transferrable in the other direction, from English to Japanese. This could be explained in part by the argument that morpheme production tasks are metalinguistically more demanding for children than recognition tasks (Carlise, 2000; Duncan et al., 2009). In view of this, the English WA task may have tapped into a growing metalinguistic awareness of English morphemes with which the ESL children were equipped through experience of schooling in English. It is reasonable to assume that the ESL children did not necessarily possess the equivalent metalinguistic skills required in morpheme production in Japanese, the L1 which they had acquired rather naturally and implicitly in Japan. This leads to the question of effects of different types of instruction across languages, which will be discussed further in Section 7.4.4.

7.4.2 Lack of transfer for the JHL group

Evidence of morphological transfer was not established in either direction for the JHL group. The JHL group was highly proficient in English and yet transfer from the more proficient language to the less proficient was not observed. Hence, their relative competence in each language alone may not be explanatory here. An alternative viable account could be that the morphological tasks perhaps tapped into the constructs of morphological awareness which were developing in one language independently of another in the JHL group. Related to this assumption is the finding from the McBride-Chang et al. study (2005a), which suggests that morphological awareness may play a more important role in vocabulary development in children with a morphographic L1 (e.g., Chinese and Japanese (*kanji*)) than those with a phonographic L1 (English). Ramirez et al.'s view could then be elaborated on by adding the following two accounts. One is that morphological transfer could occur in both directions between a morphologographic language (Japanese in this context) and a phonographic language (English), supposing that the learner is proficient in the former and is also receiving extensive exposure to the latter. An additional account is that morphological transfer between phonographic and morphographic languages (English and Japanese in this context) is less likely to occur in phonographic L1 (or proficient) learners and therefore morphological awareness may increase in an independent fashion across languages in this L1 group.

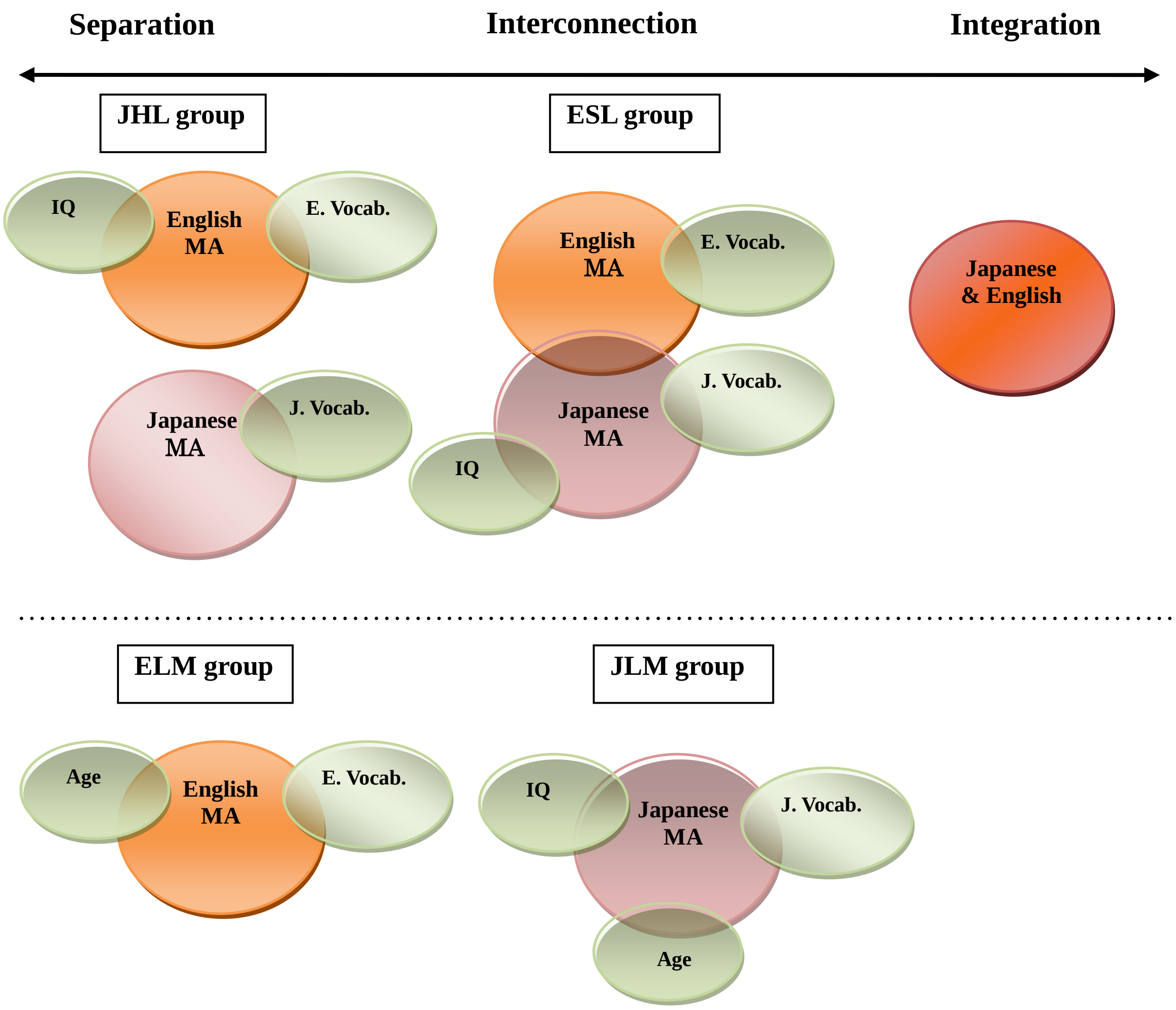
7.4.2.1 Contribution of nonverbal ability in the JHL group

Of additional interest in the JHL results is the significant contribution of nonverbal IQ, as measured by Raven's SPM+, to predicting English and Japanese (with approaching significance) morpheme production (WA scores) in the cross-linguistic regression models. In the model predicting English morpheme production, the magnitude of the contribution of nonverbal IQ was significantly larger for the JHL group than the ESL group. This significant association between an increase in SPM+ and WA cores could be accounted for by similarities in the constructs of nonverbal and verbal ability which each task respectively tapped into. The Raven's SPM+ is a nonverbal test of general ability, involving making sense of diagrammatic puzzles exhibiting serial changes (Raven et al., 2008). Raven's SPM+ can, therefore, be described also as a measure of analogous problem solving and/or the ability to identify relationships. The WA task also involves analogous thinking in a verbal context via making sense of the morphological relationship between two lexical items to complete a target pair with a missing item.

These similarities in analogous constructs alone may not suffice, however, when interpreting the finding that the significant contribution of nonverbal IQ was specific to the JHL group in the cross-linguistic models and was also significantly larger than the ELM group including the within-language model predicting English morpheme production (Section 6.1.4). The nature of bilingual advantages within the Control aspect of the A/C framework (Bialystok, 2001b) could be extended here. As discussed in Section 7.2.1.1, the higher scores on the derivational morphemes in the English WA task yielded by the bilingual groups in comparison to the ELM group was attributable in part to the bilinguals exerting superior attentional control over specific aspects of the linguistic stimuli. Drawing on the positive association between the WA and SPM+ scores, one could reasonably postulate that the bilingual advantage at exerting attentional control may be transferrable between analogous problem-solving in the verbal and nonverbal contexts. Variability in the nature of bilingual advantages within a bilingual population is not featured in the A/C model and therefore using the Control aspect cannot fully account for the fact that such analogous transfer was not observed in the ESL group. The finding by Gathercole et al. (2010) on Welsh-English bilinguals could fill this gap in explanation: bilingual advantages were observed in cognitive tasks by a group of Welsh-English simultaneous bilinguals who spoke both languages at home, a socio-linguistic environment similar to the one surrounding the JHL group. In essence, the contribution of nonverbal IQ to morpheme production uniquely identified in the JHL group could be explained by the following: a) analogous problem-solving featured in the SPM+ and WA tasks (Japanese and English); b) potential transferability of attentional control between nonverbal and verbal analogy tasks (English).

7.4.3 Multicompetence model

The varying nature of transfer identified across groups could be contextualised via the notion of multicompetence (Cook, 1991, 2003), a theoretical framework for the current study. Multicompetence embodies the view that different degrees of L1 and L2 knowledge ranging from separation to integration can coexist in the bilingual lexicon. The group-specific nature of morphological awareness identified through the within- and cross-linguistic examinations could then be illustrated as in Figure 20.



Note. E. Vocab.: English vocabulary; J. Vocab: Japanese vocabulary.

Figure 20. *The integration continuum of L1 and L2 morphological awareness (MA), based on the multicompetence model* (Cook, 2003, p9)

As emphasised by Cook (2003), degrees of integration between languages can vary from domain to domain (e.g., morphosyntax - phonology) and can also be influenced by various other within-subject factors (e.g., motivation). It should be therefore emphasised that the model illustrated here is specific to morphological awareness (morpheme production). The overlapping areas are reflective of the unique variance explained by the relevant predictors.

7.4.4 The differential contexts of L2 learning

The discussions developed thus far have witnessed significant differences in Japanese vocabulary and morphological scores, and also a potential difference in the level of Japanese proficiency, between the bilingual groups (ESL and JHL children). These differences could be attributed, to some extent, to aspects of the Japanese learning environment surrounding these children outside their week-day (English-medium) school. Two (among many of) aspects are discussed below. One is Japanese use at home. Each of the JHL children was from a Japanese-English bilingual family. Although 15 JHLs spoke both languages at home, they all used English as a family language (i.e., when all family members were present) and hence English was used much more frequently than Japanese. Thus, the home environment for Japanese support was perhaps richer for the ESL group, aided by the more consistent interaction in Japanese with their Japanese parents and other family members. A deeper understanding of the complexity of bilingual development would be reached by conducting a more systematic investigation into both parental factors (e.g., language use at home, academic/linguistic expectations in Japanese) and children's attitudinal factors (e.g., motivation, efforts and involvement in learning Japanese), and investigate how they are related to children's linguistic skills in each language (see Okamura-Bichard, 1985 for example).

An additional aspect is the type of L2 instruction received by the bilingual children (English for the ESLs and Japanese for the JHLs) in the UK. One of the two Japanese Saturday schools involved had two divisions in each school year, consisting of the Japanese-medium division (called *futsūka)* (i.e., the mainstream of the Saturday school) and Japanese language division (*nihongoka*). (The other school involved had the former division only.) Six of the ESL children in this study attended this school and all belonged to *futsūka*, where teaching was delivered in accordance with the content of the Japanese national curriculum, a context which approximates the naturalistic environment in Japan. In this context, textbooks in use are endorsed by the Japanese government and thus are the same as those used by their monolingual peers in Japan. Eleven JHLs were recruited from the same school and all belonged to *nihongoka*, where Japanese was taught as a subject, not used as the medium of instruction, through the use of a textbook designed for learners of Japanese as a second (or foreign) language. While receiving formal instruction in Japanese at weekends, the ESL children were exposed extensively to English via schooling with their monolingual and JHL peers. Thus, exposure to the L2 (English) was much more extensive and academic-oriented (i.e., formal) for the ESL group than it was for the JHL group (Japanese). One outcome of such differences could be a manifestation of varying degrees of metalinguistic awareness, depending on the language that the children were tested in, as well as task type (see also Murphy, 2010 for a review on child L2 learning across contexts).

The ESL children were developing Japanese in the curriculum which does not feature the tradition of teaching morphemes explicitly in a way consistent with the nature of the morphological tasks used in this current study (Coulmas, 1989). The JHL children, especially those receiving JSL/JFL support at their Saturday school, were also unfamiliar with the type of morphological tasks used, from which the researcher inferred that their Japanese learning did not feature explicit instruction about morphemes. It would be worthwhile to examine the extent to which targeting morpheme recognition and production in teaching would affect the degree of morphological transfer in each group.

7.5 Limitations

7.5.1 Sample size and group homogeneity

This study is not without limitations. One important limitation to note is its small sample size, which means the lack of statistical power in the models presented. (Although it might be worth noting that an identifiable statistic effect in a small sample could also indicate the robust nature of the finding). The transfer effects in particular need to be confirmed with a much larger sample, while taking into account the effects of a more comprehensive set of control predictors (e.g., phonological awareness, working memory, knowledge of *kanji*). In addition, each of the bilingual groups represented a wide age range within groups, which highlights the need to confirm these findings in a cross-sectional study with different age groups or to track the development of morphological and vocabulary knowledge in a larger group of children longitudinally. Another sampling issue is that the JHL group was not entirely homogenous especially in terms of the school environment. Three of the JHLs attended an independent school, whereas the rest of the group and the other groups all attended a state school. The ESL and JHL children were, moreover, recruited from various parts of England. This perhaps added heterogeneity within groups, since there is likely to be considerable instructional variability within state schools across regions.

7.5.2 Limitations of the tests/tasks

Before discussing limitations specific to a certain test/task, two important test/task-general limitations should be noted. One is that age effects were not completely controlled for due to the use of multiple age-related variables, apart from the age variable, in the statistical analyses. To take, as examples, the English and Japanese morphological tasks, the former had a single set of items completed by all three groups of children, whereas the latter came in two age-related versions and hence yielded two sets of scores per group. Either case is problematic due to the measures not completely adjusted on age. Therefore, age effects, if present at all, were to be removed as much as possible by taking care of the following, in addition to using age as a control variable in all the analyses performed. It was ensured that the test items were appropriate for the current sample by a) consulting databases on educational vocabulary for children (i.e., NINJAL data for Japanese items) at the item-sampling phase (see Section 3.5), b) showing the items to the school teachers prior to the testing session, and c) asking the participating children for feedback orally during the pilot phase and via the children circling unknown words as they completed the tasks in the main phase. All measures were piloted on a small group of ESL and JHL children (8 in total). A larger-scale validation phase involving groups of children differing in age would be necessary to carry out both quantitative and descriptive assessment of the appropriateness of the measures, especially, their sensitivity to age differences.

An additional issue is the lack of control over the children's decoding ability. This is particularly important because the majority of the tests/tasks used were written measures. Ideally, they would have been used as oral measures to minimise the potential influence of decoding ability. However, that would have necessitated the administration of each task on an individual basis, which would have significantly increased the length of testing per child and caused greater disruption to the regular activities of the participating schools. Including written measures which could be administered in a group was an important issue to consider and take on board, also from the viewpoint of keeping to a minimum burden on the bilingual children. The vast majority of the bilingual children were administered all the Japanese and English measures in a single session, as a result of which the testing took them twice as long as it did the monolingual sample who were tested in their L1 only.

7.5.2.1Vocabulary tests

As regards the English vocabulary tests, although they are both standardised measures and have been widely used as valid assessment tools on UK monolingual and EAL/ESL populations, they may not have been satisfactory in terms of format. The BPVS consists of a total of 168 items (12 items per set × 14 sets) and, as pointed out earlier in the chapter (Section 7.1.1), several items represented the same perceptual category (e.g., animal, vehicle) which might have added cognitive demands on the children. Based on the judgement by the researcher, at least 30 per cent of the target items were accompanied by three other perceptually similar (distractor) items. Such added demands, if present at all, might have been coupled by the monotonous and potentially time-consuming nature of the BPVS, which could result in the child experiencing fatigue and loss in concentration. To recap, the BPVS involves continuously matching the picture with the aural input until the child makes more than eight errors in a single age band. Thus, a child with a large receptive vocabulary could, for example, carry on all the way till the 168th item (Set 14) from the start of the set corresponding to his chronological age (e.g., Set 5 for a 10-year old). In such cases, the BPVS session alone lasted 30 minutes or longer per child, contrasting with the scoring manual's description of the test as a 'quick-and-easy-to-administer' test lasting 8-10 minutes. A major limitation of the TOWK-EV (Expressive Vocabulary) is the fact that it only has 32 test items, which is disproportionately fewer than the total number of items in the BPVS. Therefore, one could reasonably argue that the TOWK-EV is an over-simplified measure, perhaps underestimating expressive knowledge of lexical meanings especially in English-L1 (ELM) or English-dominant (JHL) children. Nevertheless, the observed high degrees of internal consistency for the TOWK-EV could serve as evidence suggesting that while the TOWK-EV may not have been an ideal choice, it was not completely inappropriate for the current sample, either.

An additional limitation, which applies to both BPVS and TOWK-EV, is the lack of their ability to reflect *degrees* of vocabulary knowledge associated with culturally different ways of word learning. As discussed in Chapter 2 (Section 2.4.2), picture recognition/labelling could be influenced by cultural experiences. For instance, in line with the findings of language minority children in Peña and Quinn (1997), the ESL children's prior experiences of word learning in Japanese might not have equipped them well with skills at labelling pictures using only one word, as required in the TOWK-EV. This in turn raises the possibility of cultural bias. In addition, forced word-picture matching, as required in the BPVS, does not distinguish between children's incorrect responses, providing no information about whether they possessed partial knowledge of the target item or they did not know the item at all (Stockman, 2000). Supplementary assessment tools, including those with sentential contexts and/or an elicitation of knowledge of multiple meanings of a word, would be necessary to further assess the children's knowledge of the lexical items, especially those marked as incorrect in these standardised tests.

Several limitations need to be pointed out, regarding the Japanese vocabulary tests, particularly the Test of Japanese Expressive Vocabulary (TJEV). The TJEV, a vocabulary test developed for this research, was piloted on a small group of eight ESL and JHL children prior to the main study. Ideally, the current study would have been split into two phases consisting of an instrument validation phase and a main testing phase. This calls for a much larger-scale future validation study in order to improve the reliability and validity of the TJEV. One specific aspect of the TJEV in need of improvement is its sensitivity to the maturity of vocabulary knowledge in children. Ceiling effects might have been present especially in the JLM group with the average score (27.1) being so close to the maximum score (30). Despite these limitations, however, the TJEV was found to be highly reliable as indicated by the Cronbach alpha coefficient and was also significantly correlated with the TJLA, a standardised Japanese vocabulary measure, and the morphological task (the WA task) for all groups of children, thus supporting its construct validity.

To reiterate, the approach taken in the current study to measuring vocabulary knowledge is far from comprehensive. Vocabulary knowledge is a multi-faceted construct and obtaining an accurate picture of its nature in children requires the use of both knowledge-based and processing-dependent measures designed to tap into the integration of various aspects of receptive and expressive vocabulary knowledge, such as syntax, collocation and associations. Moreover, vocabulary (or other aspects of linguistic) knowledge in school-age children develops constantly and significantly over the school years. Further convincing evidence would, therefore, come from longitudinal data which capture the rate of, and/or the direction of change in their developing vocabulary knowledge (Camilleri & Law, 2007; Kohnert & Han, 2007). Due to these limitations, it should be emphasised that the results of the vocabulary tests presented in the current study should not be interpreted as the full extent of vocabulary knowledge but as a snapshot of the children's receptive and expressive knowledge of lexical meanings demonstrable at the time of testing.

7.5.2.2 Morphological tasks

With respect to both the English and Japanese WS tasks, all target items were bi- or multi-morphemic, a condition whereby it was obligatory for the children to carry out segmentation. By also including mono-morphemic words (e.g., *plenty*, *flop*), children would be required to judge the morphological segmentability of items, thus reflecting their understanding of the structure of morphologically complex items more accurately. An additional way to obtain a more comprehensive picture would be to include a set of pseudo-words so that any effects of familiarity with real (especially root) words can be ruled out. Another limitation is that the target items in the English WS and WA tasks were sampled with the use of adult English corpora and were hence not satisfactorily reflective of the type of vocabulary that the children were exposed to at school. Research has been carried out to compile a child British English L1 corpus (the CLLIP corpus comprised of texts written for children from the BNC by Sealey & Thompson, 2004; a corpus comprised of spoken language by Mauranen, 2004). It was, however, impractical for the researcher, a novice user of the approach taken in these corpus projects, to systematically incorporate these corpora in the current study. Overcoming this issue would be necessary for improving the reliability and validity of the morphological tasks.

It should be noted that having as few as two measures per language is rather a simplistic approach to measuring morphological awareness, particularly as it is a multi-dimensional concept, intertwined with various other aspects of metalinguistic awareness, such as phonological awareness, orthographic awareness and syntactic awareness (Kuo & Anderson, 2006). Such intimate interrelations, on the other hand, pose significant challenges on researchers, making it difficult for them to arrive at a *bona fide* measure of morphological awareness which neatly disentangles morphological awareness from the other metalinguistic aspects.

On a more positive note, all three groups of children per language completed the same measures per language (English: ESLs, JHLs, ELMs; Japanese: ESLs, JHLs and JLMs) and a high degree of internal consistency – a measure of reliability – was observed for each experimental measure used. This could be interpreted as suggesting that any issues caused by the limitations as described above would have equally applied to every group and yet the measures were found to be reliable for all groups. Moreover, the measures revealed group-specific patterns of performance (especially, the English vocabulary measures) and illuminated the relationship between morphological awareness and vocabulary knowledge which was unique to each group within languages, together with cross-linguistic relationships specific to each bilingual group, as visualised in the multicompetence model in Figure 20. An enhanced understanding of the distinctive characteristics of the type of linguistic knowledge concerned in each group of learners can only be achieved by including multiple groups within a single design. Addressing this issue explicitly within its multiple-group design, the current study, however limited its scope may be, makes a unique contribution to the relevant fields, especially, vocabulary and morphological research within child SLA and bilingualism.

Chapter 8

CONCLUSION

The primary goal of the current study was to investigate in detail the nature of morphological awareness and vocabulary knowledge both in English and Japanese, together with the relationship between these two knowledge types. This focus may not be pioneering in the sense that there is already a large body of evidence established of a positive association between these two types of knowledge in the literature. What drove the researcher to pursue this topic nevertheless was the fact that this converging evidence had derived predominantly from English-speaking monolingual or bilingual children and hence much had yet to be learnt about the extent to which this association held in children learning Japanese as an L1/L2. What we learnt in the previous chapters was that the association did hold among the respective groups of Japanese-speaking children, namely, ESL, JHL and JLM groups. Moreover, the positive association was restricted to between morpheme production and vocabulary knowledge in English, whereas both morpheme production and recognition were positively related to vocabulary knowledge in Japanese. Hence, the current study illuminated the nature of the relationship between morphological awareness and vocabulary knowledge which not only differs between morpheme recognition and production (in English) but also across languages.

The current study bears some exploratory features in that it examined the transferability of morphological awareness between Japanese and English in two groups of Japanese-English bilingual children (i.e., ESL and JHL children). The focus, in doing so, was on examining whether the nature of morphological transfer observed was different between the bilingual groups. This aim was motivated by the notion of multicompetence (Cook, 1991, 2003), which highlights the importance of identifying the distinctive characteristics of each group of language users in their own right, whether bilingual (or multilingual) or monolingual.

This notion also embodies the dynamic relationship between L1 and L2 knowledge, accommodating the issues surrounding the potential influence of early exposure to the L2 on the development of the L1 and conversely the influence of L1 knowledge on the L2. Morphological transfer has been a focus of attention in the field of morphological research, possibly owing to the increasing number of children around the world being schooled entirely in the L2, or speaking a non-school language home (e.g., EAL children in the UK context). Despite this global trend, morphological transfer has been comparatively under-researched between English and Japanese especially in the context of children, even while there is a growing body of evidence on children speaking other oriental languages or languages with different scripts, including Chinese-English and Korean-English bilingual children. The current study made one of the first attempts to examine this topic systematically and it is hoped that its contribution, although preliminary or suggestive at this early stage, will offer a useful stepping stone for future morphological research in these bilingual populations.

8.1 The importance of morphological awareness in school-age children: insights into morphological intervention

Converging evidence in the literature supports significant contributions of morphological awareness to a wide range of linguistic and cognitive skills. In the context of reading development, researchers consistently identified the facilitative role of morphological awareness in both word reading and reading comprehension (Carlisle, 2000; Kieffer & Lesaux, 2008). Correlated also with other literacy-related skills (e.g., spelling and writing), morphological awareness can be considered as a general indicator of metalinguistic awareness (Carlisle, 1995), a core part of what schools are designed to teach and develop in children (Barac & Bialystok, 2011). The current study thus illuminated the relationship between two aspects (among many) of word knowledge which are both essential for general linguistic development and ultimately academic success for school-age children.

It should be noted that the relationship between morphological awareness and vocabulary knowledge was not identified in English when morpheme recognition was taken into account. This does not lead to the conclusion that the ability to segment a word into morphemes cannot develop with vocabulary knowledge. Positive effects of incorporating explicit instructions about the morphological structure of lexical items on vocabulary growth and reading ability have been reported in the context of English-L1 monolingual children (Bowers, 2006; Bowers & Kirby, 2010, Nunes & Bryant, 2006). With reference to the error analysis carried out, one could modestly suggest that focussing especially on semantically opaque and multi-morphemic items might be beneficial for further enriching word-specific knowledge in children. This could potentially contribute to establishing a less independent relationship between morphological segmentation skills and vocabulary knowledge in English-speaking children.

Japanese-speaking children could also benefit from explicit instructions about the morphological structure of Japanese words. As briefly mentioned in Section 7.4.4, the national curriculum for primary school education in Japan does not traditionally feature the teaching of morphemes in a way consistent with the WS task used in this current study (Coulmas, 1989). Morphological instructions could possibly be targeted at the structure of morphologically complex items which include derivational prefixes of limited productivity (e.g., Sino-prefixes) and also the differentiation of derivational suffixes from inflectional suffixes which share the same *kana* character (e.g., *-garu*/*-ru*). Incorporating these morphological instructions could further strengthen the positive relationship between morphological segmentation and vocabulary knowledge identified in all three groups of Japanese-speaking children in the current study.

The aforementioned pedagogical implications are not intended at suggesting their direct relevance to pedagogy on vocabulary/literacy development or any other aspects of classroom practice. The correlational and regression analyses performed indicate *statistical* relationships between variables while making *no* claims about causality (e.g., an increase in vocabulary scores was caused by increased skills at conducting morphological segmentation). Morphological intervention would perhaps shed light on its causal relationships with vocabulary knowledge. The pedagogical implications discussed above should *not*, therefore, be interpreted as effective provision for improving vocabulary knowledge and morphological awareness in children but rather as modestly suggested *food for thought* which could possibly be taken into account when developing a future morphological intervention study.

8.2 The group-specific nature of L1-L2 relationships

The findings overall suggest that one substantial difference between the two groups of bilinguals may lie in that the development of morphological awareness in Japanese and English could potentially be reciprocal in nature for the ESL group, whereas perhaps independent of one another for the JHL group. Highlighting these differing relationships is not to evaluate transfer outcomes as positive or negative: the lack of transfer for the JHL group, for instance, will not equate to a form of at-risk bilingualism. Within the framework of multicompetence, these group-specific relationships help us to reach a deeper understanding of the distinctive nature of English morphological awareness in relation to Japanese morphological awareness across groups, as illustrated in Figure 20 in Section 7.4.3. An additional theoretical assumption relevant to the ESL result is the concept of Common Underlying Proficiency (Cummins, 1984): the current study supports this concept by suggesting that the foundation of Japanese academic proficiency at the start of schooling in English may help maintain and continue developing Japanese word-specific knowledge, while at the same time developing English morphological knowledge adequately. The fact that this concept was not explanatory for the JHL results leads to the following postulation, in line with Ramirez et al.'s (2010) view on the nature of morphological transfer. There may be a potential threshold of proficiency in Japanese, the more morphologically complex language of the two, for facilitative relationships to be established between Japanese and English morphological awareness. It needs to be pointed out that general proficiency was measured by using a proxy measure, namely, a standardised receptive vocabulary test in each language. Hence, a more comprehensive language proficiency battery would be preferable.

The group-specific nature of morphological transfer also feeds back to the theoretical framework of multidimensionality of bilinguality. Of particular relevance in the current study were the following two dimensions: relative competence (proficiency in each language); and the classification of bilinguals by age of onset of acquisition (i.e., simultaneous (JHLs) and consecutive bilinguals (ESLs)). Although these aspects comprise only a small part of the complexity of bilinguality (see Table 1 in Section 2.3.1), they contribute to better understanding significant aspects of variability within the Japanese-English bilingual sample in the current study. These aspects could serve as a basis for incorporating additional or different aspects of bilinguality into a further examination of morphological transfer (and/or an examination of other linguistic skills from a cross-linguistic perspective).

8.3 Indirect links to the field of education research in Japan

One aspect of the rationale behind the current study was to add pedagogical insights indirectly to the field of educational research in Japan. The new teaching guidelines which encourage enhanced exposure to English in the primary curriculum have triggered practitioners and researchers to hotly debate its beneficial or detrimental effects on the development of Japanese (Ohtsu, 2005; Trikai, 2006; Matsukawa, 2004), a topic globally debated (Menyuk & Brisk, 2005; Paradis, 2007). The current study could tentatively position itself towards the former (i.e., pros) in this debate, particularly since the JHL results could hardly be interpreted as 'warnings' against early exposure to a second/foreign language.

Before elaborating on the indirect link between the JHL results and the Japanese EFL context, the Japanese EFL context in primary school settings will be briefly recapped here. A class of English language activities for Year 5-6 children (age 10-12 years) has been implemented nationwide since April 201l following the new teaching guidelines published in 2008. Under this new curriculum, it is obligatory for Year 5-6 children to receive a class of English language activities once a week, in addition to a class of Integrated Studies whereby children in Years 3-6 engage in English communicative activities (e.g., singing and playing games) as one of various other options. Thus, exposure to English has increased for Years 5-6 children and its aim is to equip these children with communicative competence and positive attitudes towards taking their FL (Foreign Language) learning further in secondary education. While this EFL (English as a Foreign Language) context is significantly different from the context in which the ESL group in the current study were learning English, it bears some resemblance to the Japanese learning context for the JHL group.

As described in Section 7.4.4, eleven of the JHL children involved in the current study had been learning Japanese primarily by attending weekly classes where Japanese was taught as an L2/FL. In terms of the nature of L2 learning, EFL and JHL children could be similar: formal learning of their respective L2s (or FLs) is conducted mainly in classroom settings, whereas their L1 is the societal language and exposure to the L2 becomes limited outside of these classroom settings. One salient difference between these groups is that L2 use at home is probably much more limited for EFL children in Japan. More specifically, the JHL children are exposed to Japanese through interacting with their mother, whereas Japanese monolingual children in Japan typically speak only Japanese at home (i.e., it is the *only* language they speak in the home). In short, L2 contact for the JHL group ranges from formal (classroom settings) to informal (interaction with mother), whereas L2 contact for EFL children in Japan tends to be predominantly via formal settings, although there is likely to be variability within groups.

One question to be raised is whether the nature of Japanese learning by the JHL group could somehow be viewed as damaging or detrimental to their English development. Although no developmental or diagnostic measures were used in the current study, one could reasonably argue that the JHL group possessed age-appropriate levels of English proficiency, as indicated by their BPVS scores. It is, therefore, unlikely that receiving Japanese support both at home and in instructional settings was adversely affecting the development of English. Hence, it could be hypothesised that EFL children's exposure to English, which is primarily via classrooms and hence is more limited than the JHL group's exposure to Japanese, is also unlikely to show signs of negative consequences for the development of Japanese.

There are other grounds raised by opponents of early onset of English exposure, such as the following (Ohtsu, 2005): added burden on the teachers; their insufficient English proficiency; misleading concepts of equating English proficiency to a cultivation of a well-balanced attitude towards the global society; necessity to take more action at secondary/high school English teaching rather than primary schools. In these respects, the argument for early onset of L2 exposure developed above is probably oversimplified and is hence only the tip of an iceberg of such a complex debate. Moreover, the argument was based on the JHL results, a context which could only be remotely relevant, projecting a somewhat mirror contextual image to the EFL context. Hence, further progress with the debate should be made with more direct evidence evaluating the effect of early exposure to English on the development of Japanese (L2 → L1 effects) in the EFL context. The current study, meanwhile, modestly lends indirect support to the non-detrimental association between an early onset of exposure to an L2/foreign language and L1 development during school years.

8.4 Suggestions for future research

Research on vocabulary knowledge and morphological awareness has each advanced considerably and become increasingly complex in nature over the past few decades, alongside the field of bilingualism research. While the current study offers its unique contribution to these rapidly evolving fields, it at the same time leads to various other issues and enquiries to be pursued in future research. The researcher would like to propose the following two specific suggestions. One next step would be to further examine the relationship between L1 and L2 morphological awareness by taking into account the effects of a more comprehensive set of non-linguistic (e.g., children's motivation and parents' attitude towards L1 maintenance) and linguistic factors (i.e., phonological awareness and knowledge of *kanji* in Japanese-speaking children). Another is to expand the scope of the current study into an examination of other literacy-related skills, such as reading comprehension and writing skills. The current study focussed on the nature of different aspects of word-specific knowledge and their relationship with one another. Further progress should be made with morphological research by examining its contribution to these higher-level cognitive skills. Relevant topics, especially those on the relationship between morphological awareness and reading development, have been extensively researched in the context of English-speaking children to date. Therefore, a much stronger need is to be emphasised for pursuing these topics in the context of Japanese-speaking monolingual and/or bilingual children.

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APPENDICES

Appendix 1: Consent form

A Project on Children's Vocabulary Development

- Your child's school has agreed to take part in a study carried out by Miss Yuko Hayashi, a doctoral student at the Department of Education, University of Oxford, in conjunction with her supervisor Dr Victoria Murphy.

- If your child takes part, the researcher (Yuko Hayashi) will come and see your child at school and do some fun language-based activities with them.

- **If you are happy for your child to take part, please fill in the form below and return it to your child's classroom teacher as soon as possible.**

- To find out more about the project, please read the attached information sheet and leaflet. Should you have any question regarding this study, you can also e-mail us at yuko.hayashi@education.ox.ac.uk, or telephone the researcher (Yuko Hayashi) on 07949 102102.

- If you have a concern about any aspect of this project, please speak to the researcher (Yuko Hayashi) who will do her best to answer your query. If you remain unhappy and wish to make a formal complaint, please contact Lars Malmberg at lars.malmberg@education.ox.ac.uk who will then direct your complaint to the appropriate body.

……………………………………………………………………..

I have read the study letter and leaflet and have understood the information about the activities of the study and how they may affect my child. I understand that participation in the study is voluntary and I or my child may withdraw at any time without giving any reason and without my child's education being affected in any way. I understand that neither my child nor my child's school will be identifiable in any research resulting from this study and all data collected will be accessible only to the named researchers involved in the study. I am aware who to contact should I have any concern or query about this study, and that this project has been reviewed by and received ethical clearance through the University of Oxford Central Research Ethics Committee.

I agree for my child to participate in the above study.

Name of School: St Barnabas Primary School

Name of Child: …………… (first name) ……………… (surname) Date of birth: ....

Name of parent / guardian ……………………………………………………………...

Signature ……………………………………… Date ……………………..................

Researcher: Yuko Hayashi

Appendix 2: Interview questions for participating children

1) What language do you speak at home?
2) What language do your parents speak to each other in?
3) What languages does your mother/father speak to you in?
4) Do you have any brothers or sisters?
5) What language do you speak to your brothers/sisters in?
6) Does anyone else live with you?
7) If yes – what language do they speak?
8) Where were you born?
9) If not in UK – how long have you been here?
10) Did you got to school anywhere else other than in this country?
11) If yes – what type of school did you go to? (i.e., nursery, primary schools)

11.1) Did you receive schooling in a language other than English?

Appendix 3: The Test of Japanese Expressive Vocabulary Test

日本語の語彙調査

学年 __________________年

名前

性別　　男　　女

誕生日 平成___________年___________月___________日

★ 1～30の絵を見て、かっこの中に適切な単語を入れましょう。

★ 答えを漢字で書いてもひらがなで書いてもどちらでも良いです。

＜問題＞　１～30の下線部に残りの文字を入れ、単語を完成させましょう。

例１）落し物を こ＿＿＿＿＿＿に届ける。答え こうばん（交番）

例２）庭に花を う＿＿＿＿＿＿。　　答え うえる（植える）

１．朝７時に お＿＿＿＿＿＿。

２．サンタクロースは え＿＿＿＿＿＿ から入る。

３．よごれた服を せ＿＿＿＿＿＿ する。

４．悲しくて な＿＿＿＿＿＿ を流す。

５．ゴロゴロと か＿＿＿＿＿＿ が鳴る。

６．車２台が しょ＿＿＿＿＿＿する。

７．横断歩道を わ＿＿＿＿＿＿ 。

８．お湯を わ＿＿＿＿＿。

９．畑 を た＿＿＿＿＿。

10．仕事中に い＿＿＿＿＿＿をする。

11．床に あ＿＿＿＿＿＿になる。

12．フライパンから け＿＿＿＿＿ が出る。

13．ボールを な＿＿＿＿＿＿。

14．海に も＿＿＿＿＿＿。

15．雪が つ＿＿＿＿＿＿。

16．国語の せ＿＿＿＿＿＿が伸びた。

17. 毎朝(まいあさ)し＿＿＿＿＿＿ を読(よ)む。

18. けがをした後(あと)、て＿＿＿＿＿を受(う)ける。

19. 靴(くつ)ひもをむ＿＿＿＿＿＿。

20. 落(お)ち込(こ)んでいる友達(ともだち)をなぐ＿＿＿＿＿＿＿＿。

21. 犬(いぬ)がほ＿＿＿＿＿。

22. 病院(びょういん)におみ＿＿＿＿＿に行(い)く。

23. 寝坊(ねぼう)して、学校(がっこう)にち＿＿＿＿＿＿した。

24. 警察(けいさつ)は、逃(に)げるど＿＿＿＿＿＿をつかまえた。

25. 散歩(さんぽ)の途中(とちゅう)で、道(みち)にま＿＿＿＿＿＿。

26. プレゼント用(よう)にほ＿＿＿＿＿＿ してもらう。

27. 「やれやれ」とた＿＿＿＿＿＿をつく。

28. 箱(はこ)の重(おも)さをは＿＿＿＿＿＿。

29. 寒(さむ)さで体(からだ)がふ＿＿＿＿＿＿。

30. 音楽(おんがく)に合(あ)わせてお＿＿＿＿＿＿。

Appendix 4: The word segmentation task

4.1 The English word segmentation task

Name____________________ Date____________________
Boy / Girl School____________________
Year Group 5 Date of Birth______________

Parts of words Task

☆Find the main part and other part(s) of each word below and put a slash (or slashes) between these parts.

Examples:

1. making → mak/ing
   * *'mak' are the letters from 'make'.*
2. enjoyment → en/joy/ment or enjoy/ment
3. books → book/s
4. companies → compani/es
   * *'compani' are the letters from 'company'.*
5. runner → run/ner
6. decision → deci/sion
   * *'deci' are the letters from 'decide'.*

1. impossible
2. recovery
3. enable
4. difference
5. information
6. educated
7. international
8. creative
9. definition
10. following
11. victoriously
12. involved
13. usually
14. goals
15. insignificance
16. uncomfortable
17. tried
18. furniture
19. ambitious
20. scarred
21. arrival
22. insensitive
23. shortened
24. competition
25. engineer
26. disagreement
27. responsibilities
28. accompanying
29. prepared
30. scientific

4.2 The Japanese word segmentation task

★ 次(つぎ)に出(で)てくる単語(たんご)はいくつかの部分(ぶぶん)に分(わ)けられます。／（スラッシュ）を使(つか)って、意味(いみ)を表(あらわ)す中心部分(ちゅうしんぶぶん)とその前後(ぜんご)につく部分(ぶぶん)に分(わ)けましょう。

★ まず、練習問題(れんしゅうもんだい)を解(と)いてみましょう。

＜練習問題(れんしゅうもんだい)＞

1．お米(こめ)	⟶	お／米(こめ)
2．あこがれた	⟶	あこがれ／た
3．走(はし)る	⟶	走(はし)／る
4．悲(かな)しんだ	⟶	悲(かな)しん／だ （悲(かな)しむ／だ）

★ それでは、練習問題(れんしゅうもんだい)と同(おな)じやり方で、次のページにある問題を解(と)いてみましょう！

Version A: For Years 3-4 or younger

＜問題＞

1．	いばる	16．	おかし
2．	小(こ)づつみ	17．	楽(たの)しみ
3．	明(あか)るさ	18．	不注意(ふちゅうい)
4．	不親切(ふしんせつ)	19．	調(しら)べたい
5．	よわみ	20．	あぶなかった
6．	めずらしい	21．	運(はこ)んだ
7．	ほめる	22．	真(ま)っ白(しろ)
8．	ごほうび	23．	うらやましがる
9．	きらめく	24．	さびしかった
10．	大(おお)ゆき	25．	すはだ
11．	寒(さむ)がる	26．	食(た)べたい
12．	冷(つめ)たい	27．	やわらかかった
13．	泳(およ)ぎたい	28．	ひびいた
14．	にぎやかに	29．	真面目(まじめ)に
15．	考(かんが)える	30．	はげしく

Version B: For Years 5-6 or older

1． あわただしい	16． やしなう
2． 憧(あこが)れた	17． 素早(すばや)く
3． 非常識(ひじょうしき)	18． 未公開(みこうかい)
4． 可愛(かわい)がる	19． きらめく
5． 衰(おとろ)える	20．ふさわしい
6． ざわつく	21． 大(おお)あらし
7． にぶかった	22． はなやかさ
8． 運(はこ)んだ	23． おしゃれ
9． 真夜中(まよなか)	24． 親(した)しみ
10．たくましさ	25． くわしかった
11． 小(こ)びと	26． みちびいた
12． 信(しん)じたい	27． 不幸(ふしあわ)せ
13． 険(けわ)しい	28． なぐさめたい
14． ゆずりたい	29． しきりに
15． ひとりでに	30． 無関心(むかんしん)

Appendix 5: The Word Analogy task

5.1 The English word analogy task

ANALOGY TASK

Look at the words in Pair 1 and complete Pair 2 by filling in the blank.

<Examples>

Pair 1		Pair 2	
1. push	pushed	jump	( )
2. walker	walk	teacher	( )
3. bird	birds	goose	( )
4. sleep	sleepy	cloud	( )
5. bounce	bounced	get	( )
6. beauty	beautiful	sun	( )

<u>Answers:</u>

1. jumped
2. teach
3. geese
4. cloudy
5. got
6. sunny

Pair 1		Pair 2	
1. jump	jumped	hold	( )
2. sing	song	live	( )
3. teacher	taught	writer	( )
4. walk	walked	shake	( )
5. see	saw	dance	( )
6. doll	dolls	leaf	( )
7. heard	hear	kept	( )
8. dog	dogs	person	( )
9. cried	cry	drew	( )
10. children	child	mice	( )
11. healthy	unhealthy	similar	( )
12. happy	happiness	high	( )
13. work	worker	invent	( )
14. final	finally	separate	( )
15. tight	tighten	large	( )
16. anger	angry	strength	( )
17. private	privacy	necessary	( )
18. magic	magician	piano	( )
19. tie	untie	appear	( )
20. decision	decide	action	( )
21. good	better	low	( )
22. treatment	treat	response	( )
23. mess	messy	effect	( )
24. push	pushed	lose	( )
25. adequate	inadequate	fair	( )

26.	help	helped	say	( )
27.	lucky	unlucky	possible	( )
28.	long	length	wide	( )
29.	warmth	warm	enthusiasm	( )
30.	longer	long	wealthier	( )

5.2 The Japanese Word Analogy task

＜練習問題＞

★左側の単語のペアと同じ関係になるよう、かっこの中に適当な単語を入れましょう。

１．	走る	走った	歩く	（ ）
２．	重い	重かった	強い	（ ）
３．	米	お米	菓子	（ ）
４．	関係	無関係	自由	（ ）
５．	頼み	頼む	願い	（ ）
６．	太さ	太い	甘さ	（ ）

答え

１．歩いた
２．強かった
３．お菓子
４．不自由
５．願う
６．甘い

＜問題＞(for Years 3-4 or younger)

1	きらう	きらった	来(く)る	(　　　)
2	米(こめ)	お米(こめ)	飲(の)み物(もの)	(　　　)
3	ながめ	ながめる	くもり	(　　　)
4	あわてる	あわてた	ねむる	(　　　)
5	昼(ひる)	真昼(まひる)	赤(あか)	(　　　)
6	おそろしい	おそろしがる	暑(あつ)い	(　　　)
7	いさましかった	いさましい	まぶしかった	(　　　)
8	動(うご)いた	動(うご)く	休(やす)んだ	(　　　)
9	雨(あめ)	大雨(おおあめ)	けが	(　　　)
10	痛(いた)がる	痛(いた)い	こわがる	(　　　)
11	忙(いそが)しかった	忙(いそが)しい	うらやましかった	(　　　)
12	石(いし)	小石(こいし)	声(こえ)	(　　　)
13	暗(くら)い	暗(くら)さ	むずかしい	(　　　)
14	重(おも)い	重(おも)かった	さむい	(　　　)
15	合格(ごうかく)	不合格(ふごうかく)	意味(いみ)	(　　　)
16	たのみ	たのむ	手伝(てつだ)い	(　　　)
17	うすぐらい	うすぐらかった	深(ふか)い	(　　　)
18	かたづける	かたづけた	急(いそ)ぐ	(　　　)
19	夜中(よなか)	真夜中(まよなか)	中(なか)	(　　　)
20	美(うつく)しい	美(うつく)しく	遠(とお)い	(　　　)
21	計画(けいかく)	無計画(むけいかく)	十分(じゅうぶん)	(　　　)
22	かんたん	かんたんに	ねっしん	(　　　)
23	酒(さけ)	お酒(さけ)	きげん	(　　　)
24	痛(いた)む	痛(いた)さ	なつかしむ	(　　　)
25	しずんだ	しずむ	たおれた	(　　　)
26	ゆるさ	ゆるい	明(あか)るさ	(　　　)
27	安(やす)い	安(やす)かった	はずかしい	(　　　)

28	待(ま)ち遠(どお)しく	待(ま)ち遠(どお)しい	近(ちか)く	(　　　　　)
29	太(ふと)さ	太(ふと)い	すずしさ	(　　　　　)
30	遊(あそ)ぶ	遊(あそ)びたい	さけぶ	(　　　　　)

＜問題＞(for Years 5-6 or older)

1	温(あたた)かかった	温(あたた)かい	めでたかった	(　　　　)
2	米(こめ)	お米(こめ)	勉強(べんきょう)	(　　　　)
3	ながめ	ながめる	にぎわい	(　　　　)
4	新(あたら)しい	新(あたら)しかった	とぼしい	(　　　　)
5	昼(ひる)	真昼(まひる)	白(しろ)	(　　　　)
6	おそろしい	おそろしがる	うらやましい	(　　　　)
7	動(うご)く	動(うご)いた	さえぎる	(　　　　)
8	けが	大(おお)けが	成功(せいこう)	(　　　　)
9	痛(いた)がる	痛(いた)い	寒(さむ)がる	(　　　　)
10	石(いし)	小石(こいし)	声(こえ)	(　　　　)
11	暗(くら)い	暗(くら)さ	めでたい	(　　　　)
12	重(おも)い	重(おも)かった	険(けわ)しい	(　　　　)
13	十分(じゅうぶん)	不十分(ふじゅうぶん)	意味(いみ)	(　　　　)
14	頼(たの)み	頼(たの)む	こだわり	(　　　　)
15	うすぐらい	うすぐらかった	すばらしい	(　　　　)
16	かたづける	かたづけた	つぶやく	(　　　　)
17	夜中(よなか)	真夜中(まよなか)	赤(あか)	(　　　　)
18	美(うつく)しい	美(うつく)しく	すばやい	(　　　　)
19	助(たす)けた	助(たす)ける	ふせいだ	(　　　　)
20	親切(しんせつ)	不親切(ふしんせつ)	完成(かんせい)	(　　　　)
21	かんたん	かんたんに	ふゆかい	(　　　　)
22	暗(くら)い	暗(くら)かった	思(おも)いがけない	(　　　　)
23	おどった	おどる	学(まな)んだ	(　　　　)
24	酒(さけ)	お酒(さけ)	機嫌(きげん)	(　　　　)
25	痛(いた)む	痛(いた)さ	なつかしむ	(　　　　)
26	ゆるさ	ゆるい	たくましさ	(　　　　)

27	待(ま)ち遠(どお)しく	待(ま)ち遠(どお)しい	おおげさに	(　　　　)
28	浮(う)かんだ	浮(う)かぶ	認(みと)めた	(　　　　)
29	太(ふと)さ	太(ふと)い	尊(とうと)さ	(　　　　)
30	遊(あそ)ぶ	遊(あそ)びたい	知(し)る	(　　　　)

Appendix 6: Frequency data on test items in the WS and WA tasks

The WS task Test items	BNC (100 million) Frequency scores of occurrences (tokens) (per million words)	LOB (a million) Frequency scores of (the total number of) occurrences in the corpus	Brown (a million) Frequency scores of (the total number of) occurrences in the corpus
impossible	71	279	260
recovery	39	46	26
enable	48	23	11
difference	113	117	23
information	387	146	269
educated	13	16	21
international	221	93	155
creative	25	47	46
definition	48	119	148
following	134	222	221
victoriously	*	4	180
involved	103	93	147
usually	191	239	206
goals	47	420	355
insignificance	47*	1	2
uncomfortable	14	24	13
tried	150	162	170
furniture	35	193	182
ambitious	15	11	92
scarred	*	4	122
arrival	34	17	18
insensitive	*(36)	12	7
shortened	*	4	6
competition	94	9	10
engineer	48	8	12
disagreement	12	4	62
responsibilities	29	22	25
accompanying	4	13	17
prepared	52	133	102
scientific	59	212	135

Appendix 6 Frequency data on test items in the WS and WA tasks

The WA task Test items	BNC (100 million) Frequency scores of occurrences (tokens) (per million words)	LOB (a million) Frequency scores of (the total number of) occurrences in the corpus	Brown (a million) Frequency scores of (the total number of) occurrences in the corpus
held	276	299	264
life	82	685	715
wrote/written	99/103	120/165	181/154
shook/shaken	53/8	53/16	57/11
danced	8	6	10
leaves	36	68	49
keep	505	266	264
people	1256	953	847
draw	46	45	56
mouse	10	6	10
dissimilar	184*	1	3
height	47	57	35
inventor	19*	1	11
separately	18	21	13
enlarge	471*	8	17
strong	197	163	202
necessity	18	37	40
pianist	21*	8	14
disappear	14	18	11
act	269	251	283
lower	28	120	123
respond	35	12	21
effective	99	107	129
lost	169	175	173
unfair	19	17	13
said	2087	2076	1961
impossible	71	129	84
width	13	12	14
enthusiastic	14	21	24
wealthy	1	18	12

*Note: frequency counts for some derived forms could not be obtained from the BNC corpus and hence frequency scores of their base forms are provided above; Darkened items are low-frequency items; an item was classed as low-frequent if the average sum of three counts fell below the threshold of 20 per million words.

Appendix 7: A summary of syllables and morphemes included in the test items in the WS task

Test items	syllables (No.)	syllables	morphemes (No.)	morphemes
impossible	4	im + pos + si + ble	3 2	im + possi + ble im + possible
recovery	4	re + cov + er + y	3 2	re + cover + y recover + y
enable	3	en + a + ble	2	en + able
difference	3	dif +fer + ence	2	differ + ence
information	4	in + for + ma + tion	3 2	in + form + ation inform +ation
educated	4	ed + u + cat + ed	2	educat + ed
international	5	in + ter + na + tion + al	3	inter + nation + al
creative	3	cre + a + tive	2	creat + ive
definition	4	def + i + ni + tion	2	defin + ition
following	3	fol + low + ing	2	follow + ing
victoriously	5	vic + to + ri + ous + ly	3	victori + ous + ly
involved	2	in + volved	3	in + volv + ed
usually	4	u + su + al + ly	2	usual + ly
goals	1	goals	2	goal + s
insignificance	5	in + sig + nif + i + cance	3	in + signifi + cance
uncomfortable	5	un + com + fort + a + ble	3	un + comfort + able
tried	1	tried	2	tri + ed
furniture	3	fur + ni + ture	2	furni + ture
ambitious	3	am + bi + tious	2	ambit+ ious
scarred	1	scarred	2	scar + ed
arrival	3	ar + ri + val	2	arriv + al
insensitive	4	in + sen + si + tive	3	in + sensi + tive
shortened	2	short + enned	3	short + en + ed
competition	4	com + pe + ti + tion	3	com + pet + ition
engineer	3	en + gi + neer	2	engine + er
disagreement	4	dis + a + gree + ment	3	dis + agree + ment
responsibilities	6	res + pon + sibl + i + ties	4	respons + ibli + ti + es
accompanying	5	ac + com + pa + ny + ing	3	ac + company + ing
prepared	2	pre + pared	3 2	pre + par + ed prepare + d
scientific	4	sci + en + tif + ic	2	scient + ific

Appendix 8: The English WS task individual segmentations

**Segmentations marked as correct are underlined.*

1. impossible

ESL (n=24)	JHL (n=21)	ELM (n=25)
im + possible (15)	im + possible (16)	im + possible (19)
im + possi + ble (3)	im + possi + ble (4)	impossible (2)
impossi + ble (2)	impossib + le (1)	imposs + ible (2)
imposs + ible (1)		impossi+ble (2)
impossible (no seg) (1)		
impossib + le (1)		
impos+sible (1)		

2. recovery

ESL (n=24)	JHL (n=21)	ELM (n=25)
recover + y (16)	recover + y (8)	recover + y (15)
re + conver + y (4)	re + conver + y (7)	re + covery (6)
reco + very (2)	re + covery (4)	reco + very (1)
rec + overy (1)	reco + very (1)	rec + overy (1)
re + covery (1)	rec + overy (1)	re+cov+ery (1)
		re+cover+y (1)

3. enable

ESL (n=24)	JHL (n=21)	ELM (n=25)
en + able (15)	en + able (20)	en + able (22)
enab + le (4)	e + nable (1)	enab + le (1)
ena + ble (4)		enabl+e (1)
en + ab + le (1)		Enable (1)

4. difference

ESL (n=24)	JHL (n=21)	ELM (n=25)
differen + ce (11)	differen + ce (8)	differen + ce (13)
differ + ence (8)	differ + ence (6)	differ + ence (7)
diff + eren + ce (1)	diffe + rence (2)	differ+ren+ce (2)
diffe + ren + ce (1)	difference (no seg) (2)	diffe + rence (1)
diffe + rence (1)	diff + eren + ce (1)	dif+ference (1)
differe + nce (1)	dif + ference (1)	difference (no seg) (1)
difference (no seg) (1)	diff + er + ence (1)	

5. information

ESL (n=24)	JHL (n=21)	ELM (n=25)
inform + ation (8)	inform + ation (7)	in+form+ation (7)
informa + tion (5)	in + form + ation (3)	inform + ation (7)
info + rmation (2)	in + forma + tion (3)	in + formation (4)
in + form + ation (2)	Infor + mation (2)	infor+mation (3)
information (no seg) (2)	info + rmation (1)	informat + ion (1)
informat + ion (2)	informati + on (1)	informa + tion (1)
in + formation (1)	in + for + mat + ion (1)	in+formati+on (1)
inform + at + ion (1)	information (no seg) (1)	information (no seg) (1)
in + format + ion (1)	informa + tion (1)	
	in + formation (1)	

6. educated

ESL (n=24)	JHL (n=21)	ELM (n=25)
educat+ ed (15)	educat+ ed (8)	educate + d (11)
educate + d (7)	educate + d (6)	educat+ ed (4)
educated (1)	educated (3)	edu+cated (4)
educ+ated (1)	edu + cated (2)	edu+ca+ted (2)
	edu + cat + ed (2)	edu+cate+d (2)
		edu+cat+ed (2)

7. international

ESL (n=24)	JHL (n=21)	ELM (n=25)
inter + national (11)	inter + national (11)	inter + national (13)
inter + nation + al (5)	inter + nation + al (5)	inter + nation + al (3)
internation + al (4)	internation + al (2)	internat+ itonal (2)
inter + na + tion + al (1)	in + tern + ation + al (1)	in+ter+national (2)
interna + tional (1)	internati + onal (1)	in+ternation+al (1)
interna + tion + al (1)	in + ter + national (1)	internation+al (1)
intern+ational (1)		in+ternational (1)
		internati+onal (1)
		International (1)

8. creative

ESL (n=24)	JHL (n=21)	ELM (n=25)
creat + ive (21)	creat + ive (16)	creat + ive (21)
crea + tive (2)	crea + tive (2)	cr+eat+ive (2)
cre + ati + ve (1)	cr + eat + ive (1)	cre+ative (1)
	cre + ative (1)	crea + tive (1)
	creative (no seg) (1)	

9. definition

ESL (n=24)	JHL (n=21)	ELM (n=25)
definit + ion (9)	defin+ition (5)	defin+ition (10)
defin+ition (7)	definit + ion (4)	defini + tion (4)
defini + tion (6)	def + ignition (3)	de+finition (2)
definiti + on (2)	defini + ition (2)	defi+nition (2)
	definition (2)	de+fin+ition (2)
	de + fini + tion (2)	def+niti+on (1)
	defi + nit + ion (1)	definiti + on (1)
	de + finit + ion (1)	def+ignition (1)
	def + ini + tion (1)	definit + ion (1)
		definition (1)

10. following

ESL (n=24)	JHL (n=21)	ELM (n=25)
follow + ing (24)	follow + ing (18)	follow + ing (23)
	following (no seg) (2)	foll+owing (2)
	follo + wing (1)	

11. victoriously

ESL (n=24)	JHL (n=21)	ELM (n=25)
victorious + ly (11)	victorious + ly (6)	victor + iously (11)
victor + ious + ly (4)	victor + ious + ly (5)	victorious + ly (9)
victor + iously (3)	victor + iously (5)	victor + ious + ly (2)
victori + ously (3)	victoriously (2)	victori+ously (1)
victori + ous + ly (1)	victori + ous + ly (1)	vic+tor+iously (1)
vic + torious + ly (1)	vict + orious + ly (1)	victoriously (1)
victo+riously (1)	vic + tori + iously (1)	

12. involved

ESL (n=24)	JHL (n=21)	ELM (n=25)
involv + ed (11)	involv + ed (7)	involv + ed (10)
involve + d (10)	involve + d (6)	involve + d (10)
in + volved (1)	in + volv + ed (3)	in + volved (3)
in + volv + ed (1)	in +volve + d (2)	in+vol+ved (1)
invo+led (1)	in + volved (2)	involved (1)
	involved (no seg) (1)	

13. usually

ESL (n=24)	JHL (n=21)	ELM (n=25)
usual + ly (23) usu+ally (1)	usual + ly (16) us + ually (2) usu + ally (1) usually (1) us + ual + ly (1)	usual + ly (8) usu+ally (7) us+ually (4) usu+all+y (2) usua+lly (1) usu+al+ly (1) us+ual+ly (1) Usually (1)

14. goals

ESL (n=24)	JHL (n=21)	ELM (n=25)
goal + s (24)	goal + s (20) go + als (1)	goal + s (21) go+als (4)

15. insignificance

ESL (n=24)	JHL (n=21)	ELM (n=25)
in + significan + ce (7) in + signigicance (4) insignificance (no seg) (3) insignifican + ce (2) in + signifi + cance (2) insignif + icance (2) insig + nifican + ce (1) insignifi + can + ce (1) in + sign + ificance (1) insignifi + cance (1)	in + significan + ce (5) in + signigicance (4) insignificance (no seg) (3) insignifican + ce (2) in + signifi + can + ce (1) in + signific + ance (1) in + sig + nificance (1) insignifi + cance (1) ins + igni + fic + ance (1) in + signifi + cance (1) insign + ificance (1)	insignifican + ce (7) in + signigicance (6) in+significan+ce (3) insignifi + cance (2) in + sign + ificance (2) in+sign+ifi+cance (1) insignifi+can+ce (1) in + signifi + cance (1) in + sign+ifi+can+ce (1) insignificance (1)

16. uncomfortable

ESL (n=24)	JHL (n=21)	ELM (n=25)
un + comfort + able (12) un + comfortable (5) uncomfor + table (3) uncomfort + able (1) uncom + for + table (1) uncom + fortab + le (1) uncomf+ortable (1)	un + comfortable (9) un + comfort + able (9) un + com + fort + able (1) uncomfortable (1) uncomfor + table (1)	un + comfortable (11) un + comfort + able (7) uncomfor + table (3) uncomfortable (1) un+com+fortable (1) uncomfort + able (1) uncom + for + table (1)

17. tried

ESL (n=24)	JHL (n=21)	ELM (n=25)
tri + ed (21)	tri + ed (14)	tri + ed (15)
trie + d (3)	trie + d (6)	trie + d (7)
	tried (no seg) (1)	t+ried (3)

18. furniture

ESL (n=24)	JHL (n=21)	ELM (n=25)
furni + ture (9)	furni + ture (9)	fur + niture (7)
furnit + ure (6)	furnit + ure (3)	furni + ture (6)
furniture (no seg) (4)	furnitu+ re (2)	furnitur+e (4)
furni + tu + re (2)	furniture (2)	furn + iture (4)
fur + niture (2)	furn + iture (2)	furnit + ure (2)
furn + iture (1)	fur + niture (1)	fur+ni+ture (1)
	fur + ni + ture (1)	fur+nit+ure (1)
	fur + nit + ure (1)	

19. ambitious

ESL (n=24)	JHL (n=21)	ELM (n=25)
ambitio + us (6)	ambit + ious (5)	am + bitious (6)
ambit + ious (5)	ambitio + us (5)	am+bit+ious (5)
ambi + tious (4)	am + bitious (4)	ambit + ious (5)
am + bitious (2)	am + bit + ious (2)	ambiti + ous (3)
ambitiou + s (2)	ambi + tious (2)	ambi + tious (3)
ambitious (no seg) (2)	am + bi +tious (1)	amb+itious (1)
amb + itio + us (1)	amb + itious (1)	ambitiou + s (1)
ambiti + ous (1)	ambitious (no seg) (1)	ambitious (no seg) (1)
ambi + tious (1)		

20. scarred

ESL (n=24)	JHL (n=21)	ELM (n=25)
scar + red (13)	scar + red (17)	scar + red (18)
scarr + ed (10)	scarr + ed (3)	scarr + ed (5)
scarred (no seg.) (1)	scarred (1)	s+carred (1)
		scarred (1)

21. arrival

ESL (n=24)	JHL (n=21)	ELM (n=25)
arriv + al (19)	arriv + al (18)	arriv + al (21)
arri + val (3)	arrival (1)	ar+rival (3)
arrival (2)	ar + rival (1)	arrival (1)
	arr + iv + al (1)	

22. insensitive

ESL (n=24)	JHL (n=21)	ELM (n=25)
in + sens + itive (6)	in + sensitive (8)	in + sensitive (13)
insens + itive (5)	in + sens + itive (7)	in + sens + itive (8)
in + sensitive (5)	insens + itive (3)	insens + itive (2)
insensi + tive (3)	insen + sitive (1)	insensiti+ve (1)
in + sensit + ive (2)	in + sensi + it + ive (1)	insensi + tive (1)
insensitive (no seg) (2)	insensitive (1)	
insen + siti + ve (1)		

23. shortened

ESL (n=24)	JHL (n=21)	ELM (n=25)
short + ened (10)	short + ened (10)	short + ened (17)
short + en + ed (9)	short + en + ed (7)	short + en + ed (4)
shorten + ed (3)	shorten + ed (3)	shorten + ed (3)
shorte + ned (1)	shortened (no seg) (1)	shortene+d (1)
shortened (no seg.) (1)		

24. competition

ESL (n=24)	JHL (n=21)	ELM (n=25)
compet + ition (6)	compet + ition (8)	com+petition (7)
competi + tion (5)	competi + tion (6)	compet + ition (4)
compe + tition (3)	competiti + on (2)	competit + ion (2)
competet + ion (3)	compe + tition (1)	com+peti+tion (2)
competiti + on (2)	competet + ion (1)	com+pet+ition (2)
competit + ion (2)	comp + eti + tion (1)	compet+it+ion (1)
compe + tit + ion (1)	comp + etition (1)	com+petit+ion (1)
compe + ti + tion (1)	com + petition (1)	comp+et+ition (1)
competition (no seg.) (1)		comptetition (1)

25. engineer

ESL (n=24)	JHL (n=21)	ELM (n=25)
engine + er (17)	engine + er (13)	engine + er (13)
engin + eer (3)	engin + eer (3)	engin + eer (7)
en + ginner (1)	engi + neer (3)	en + ginner (3)
engi + neer (1)	engi + ne + er (1)	engi + neer (2)
eng + ine + er (1)	en + ginner (1)	
engineer (1)		

26. disagreement

ESL (n=24)	JHL (n=21)	ELM (n=25)
<u>dis + agree + ment (12)</u> disagree + ment (6) dis + agreement (3) disagreme + nt (1) disagr + eeme + nt (1) disagreement (1)	<u>dis + agree + ment (12)</u> disagree + ment (6) dis + agreement (3)	disagree + ment (10) <u>dis + agree + ment (7)</u> dis + agreement (6) disagreement (2)

27. responsibilities

ESL (n=24)	JHL (n=21)	ELM (n=25)
respons + ibilities (5) responsibiliti + es (4) responsib + ilities (4) reposi + biliti + es (2) responsibl + ities (2) responsibilities (no seg) (2) reponsi + bilities (1) respons + ibilit + ies (1) re + sponsi + bilities (1) responsib + iliti + es (1) responsib + ilities (1)	respons + bilities (4) responsib + ilities (3) respons + ibil + ities (3) respon + sibilities (2) responsibilities (no seg) (2) re + spons + ibi + lit + ies (1) re + sponsi + bilitie + s (1) res + ponsilili + ties (1) res + ponsi + bilities (1) res + ponsibil + ities (1) responsibiliti + es (1) res + pons +ibil + ities (1)	respons + ibilities (5) responsib + ilities (3) reponsi + bilities (2) responsibilitie+s (2) responsibil + ities (1) responsibiliti + es (1) res + ponsibilities (1) resp + onsi + bilities (1) res + pons + ibilities (1) respon + sibilities (1) responsibili + ties (1) respons + ibilit + ies (1) respon + sibilities (1) responsibil + it + ies (1) responsibi + lities (1) respon + sibili + ties (1) reponsibili + tie + s (1)

28. accompanying

ESL (n=24)	JHL (n=21)	ELM (n=25)
accompany + ing (16) <u>ac + company + ing (4)</u> accom + pany + ing (2) accom + panying (1) accompanying (no seg.) (1)	<u>ac + company + ing (12)</u> accompany + ing (5) accompanying (no seg) (2) accomp + anying (1) ac + com + panying (1)	<u>ac + company + ing (15)</u> accompany + ing (7) accom + panying (1) accompa+nying (1) ac+com+panying (1)

29. prepared

ESL (n=24)	JHL (n=21)	ELM (n=25)
prepare + d (11)	prepare + d (7)	pre + pared (11)
prepar + ed (10)	prepar + ed (5)	prepar + ed (6)
pre + pare + d (2)	pre + pare + d (4)	prepare + d (5)
prepared (no seg.) (1)	pre + pared (3)	prep + ared (1)
	prepared (1)	pre + pare + d (1)
	prep + ared (1)	prepared (1)

30. scientific

ESL (n=24)	JHL (n=21)	ELM (n=25)
scien + tific (14)	scien + tific (13)	scien + tific (14)
scienti+ fic (5)	scienti+ fic (2)	scienti+ fic (4)
scientif + ic (2)	scien + ti + fic (2)	scientific (3)
scient + ific (1)	scient + ific (1)	scient + ific (3)
scien + tif + oc (1)	sc + ientific (1)	scientif + ic (1)
scientific (no seg.) (1)	scie + ntif + ic (1)	
	scientific (1)	

Appendix 9: A classification of the English WS items

9-a: By levels of variability within segmentations

ESL (n = 24)			JHL (n = 21)			ELM (n = 25)		
Grade 1	Grade 2	Grade 3	Grade 1	Grade 2	Grade 3	Grade 1	Grade 2	Grade 3
educated	impossible	difference	impossible	recovery	difference	enable	impossible	difference
creative	recovery	information	enable	educated	information	creative	recovery	international
following	enable	international	following	creative	international	following	information	victoriously
involved	definition	victoriously	goals	involved	definition	involved	educated	usually
usually	uncomfortable	insignificance	tried	usually	victoriously	goals	definition	insignificance
goals	arrival	furniture	scarred	engineer	insignificance	tried	engineer	uncomfortable
tried	engineer	ambitious	arrival	disagreement	uncomfortable	scarred	accompanying	furniture
scarred	disagreement	insensitive		accompanying	furniture	arrival	scientific	ambitious
prepared	scientific	shortened		prepared	ambitious			insensitive
		competition		scientific	insensitive			shortened
		responsibilities			shortened			competition
		accompanying			competition			disagreement
					responsibilities			responsibilities
								prepared

Note. Grade 1: almost all children (80-100%) in each group provided segmentations marked correct in the crude scoring system.
Grade 2: 51-79% of children provided segmentations marked as correct and the rest provided a variety of segmentations.
Grade 3: Less than half of children provided segmentations marked as correct and the rest provided a wide variety of segmentations.

9-b: By morphological factors

Semantic transparency		Morphemic complexity	
transparent	opaque	bi-morphemic	multi-morphemic
impossible	definition	impossible	international
recovery	victoriously	recovery	victoriously
enable	insignificance	enable	insignificance
difference	furniture	difference	uncomfortable
information	ambitious	information	insensitive
educated	competition	educated	shortened
international	responsibilities	creative	disagreement
creative	scientific	definition	responsibilities
following		following	accompanying
involved		involved	
usually		usually	
goals		goals	
uncomfortable		tried	
tried		furniture	
scarred		ambitious	
arrival		scarred	
insensitive		arrival	
shortened		competition	
engineer		engineer	
disagreement		prepared	
accompanying		scientific	
prepared			

Appendix 10: The English WA task individual responses

**Responses marked as correct are underlined.*

1. **jump: jumped :: hold : ______________**

ESL (n=24)	JHL (n=21)	ELM (n=25)
held (18)	held (16)	held (17)
holded (6)	holded (4)	holded (4)
	holding (1)	holding (1)
		holder (1)
		holed (1)
		hold (1)

2. **sing: song :: live : ______________**

ESL (n=24)	JHL (n=21)	ELM (n=25)
life (11)	life (11)	lived (15)
lived (8)	lived (5)	life (6)
blank (3)	live (3)	living (3)
love (1)	love (1)	live (1)
live (1)	die (1)	

3. **teacher : taught :: writer : ______________**

ESL (n=24)	JHL (n=21)	ELM (n=25)
wrote (13)	wrote (14)	write (11)
write (8)	write (2)	wrote (9)
blank (2)	blank (2)	writing (2)
written (1)	written (1)	writered (1)
	writing (1)	writed (1)
	writ (1)	written (1)

4. **walk: walked :: shake : ______________**

ESL (n=24)	JHL (n=21)	ELM (n=25)
shaked (17)	shaked (15)	shaked (12)
shook (7)	shook (5)	shaking (7)
	blank (1)	shook (4)
		shaken (1)
		shakes (1)

5. see: saw :: dance: ______________

ESL (n=24)	JHL (n=21)	ELM (n=25)
danced (21) dancing (2) daw (1)	danced (19) danct (1) blank (1)	danced (14) dancer (8) bogey (1) dancing (1) blank (1)

6. doll: dolls :: leaf: ______________

ESL (n=24)	JHL (n=21)	ELM (n=25)
leaves (18) leafs (6)	leaves (19) leafs (1) left (1)	leaves (22) leafed (2) leafs (1)

7. heard: hear :: kept : ______________

ESL (n=24)	JHL (n=21)	ELM (n=25)
keep (19) blank (2) kepe (1) keept (1) kepted (1)	keep (19) kept (1) blank (1)	keep (19) keeping (2) keeps (1) stolen (1) kepted (1) blank (1)

8. dog: dogs :: person : ______________

ESL (n=24)	JHL (n=21)	ELM (n=25)
people (18) persons (6)	people (19) persons (2)	people (20) persons (5)

9. cried: cry :: drew : ______________

ESL (n=24)	JHL (n=21)	ELM (n=25)
draw (13) drow (5) dry (3) drowed (1) dre (1) drewed (1)	draw (18) dorow (1) dry (1) drewed (1)	draw (18) drawing (3) drewing (1) write (1) blank (1) drewed (1)

10. children: child :: mice : _______________

ESL (n=24)	JHL (n=21)	ELM (n=25)
mouse (19) mices (2) micen (1) mic (1) blank (1)	mouse (18) mices (2) me (1)	mouse (22) mices (3)

11. healthy: unhealthy :: similar : _______________

ESL (n=24)	JHL (n=21)	ELM (n=25)
unsimilar (12) different (5) blank (3) similarly (2) insimilar (1) dissimilar (1)	unsimilar (9) different (7) blank (2) not similar (1) odd (1) dissimilar (1)	similarity (10) unsimilar (5) different (2) blank (2) same (2) opposite (2) not similar (1) similest (1)

12. happy: happiness :: high : _______________

ESL (n=24)	JHL (n=21)	ELM (n=25)
highness (12) height (3) highest (2) blank (2) higher (1) short (1) hight (1) tall (1) low (1)	highness (7) height (4) hight (3) blank (4) higher (2) low (1)	higher (16) highness (4) hight (1) highest (1) top (1) far (1) blank (1)

13. work: worker :: invent: _______________

ESL (n=24)	JHL (n=21)	ELM (n=25)
inventer (19) inventor (2) invented (2) blank (1)	inventer (10) inventor (9) invented (1) blank (1)	inventer (9) invented (8) inventor (2) blank (2) inventing (1) invention (1) invitation (1) inventioned (1)

14. final : finally :: separate : ______________

ESL (n=24)	JHL (n=21)	ELM (n=25)
separately (18) blank (3) separated (2) separating (1)	separately (17) separated (1) separating (1) unseparate (1) blank (1)	separated (10) separately (5) separation (4) separating (3) apart (1) separater (1) blank (1)

15. tight: tighten :: large : ______________

ESL (n=24)	JHL (n=21)	ELM (n=25)
largen (16) blank (3) larger (2) small (2) enlarge (1)	largen (15) larger (3) enlarge (2) tiny (1)	larger (13) largen (6) big (2) largest (2) small (1) larged (1)

16. anger: angry :: strength: ______________

ESL (n=24)	JHL (n=21)	ELM (n=25)
strong (9) blank (8) stronger (2) strength (2) strongly (2) strengthry (1)	strong (13) stronger (3) no strength (1) strengthened (1) strengthen (1) strengthening (1) blank (1)	strong (16) strengthen (4) blank (2) stronger (2) strengthed (1)

17. private: privacy :: necessary : ______________

ESL (n=24)	JHL (n=21)	ELM (n=25)
blank (10) necessarily (6) necessarys (1) necessa (1) necessaricy (1) neceste (1) necessary (1) necessaricy (1) unnecessary (1) necessity (1)	necessarily (7) necessity (6) blank (6) no (1) necessary (1)	necessarily (8) unnecessary (5) blank (4) necessary (4) necesser (1) necessarier (1) necessaryed (1) necessaring (1)

18. magic : magician :: piano : _______________

ESL (n=24)	JHL (n=21)	ELM (n=25)
pianist (15)	pianist (17)	pianist (15)
blank (5)	blank (2)	pianos (4)
pianonian (2)	pianition (1)	pianist (2)
pianian (1)	pianos (1)	pianoer (1)
pianos (1)		pianoesed (1)
		pianodener (1)
		pianoer (1)

19. tie : untie :: appear : _______________

ESL (n=24)	JHL (n=21)	ELM (n=25)
disappear (11)	disappear (17)	disappear (10)
unappear (8)	disapier (1)	appeared (6)
blank (4)	unappear (2)	appearance (3)
appeared (1)	blank (1)	appearing (2)
		disappear (2)
		unappear (1)
		blank (1)

20. decision : decide :: action : _______________

ESL (n=24)	JHL (n=21)	ELM (n=25)
act (15)	act (12)	act (6)
blank (5)	blank (7)	blank (6)
active (1)	activate (1)	actions (5)
acter (1)	anctious (1)	action (2)
actionet (1)		actionision (1)
actioned (1)		desaction (1)
		acted (1)
		actioned (1)
		auctioning (1)
		acting (1)

21. good : better :: low : _______________

ESL (n=24)	JHL (n=21)	ELM (n=25)
lower (15)	lower (15)	lower (20)
blank (4)	high (3)	high (1)
high (3)	blank (2)	bad (1)
bad (1)	worse (1)	higher (1)
higher (1)		lowered (1)
		blank (1)

22. treatment : treat :: response : _______________

ESL (n=24)	JHL (n=21)	ELM (n=25)
<u>respond (7)</u> blank (6) responsible (4) sponse (2) responsement (2) respo (2) responsed (1)	<u>respond (9)</u> blank (5) responsibility (2) reason (1) sponse (1) reply (1) responded (1) rist (1)	<u>respond (8)</u> responsible (6) responsive (2) responded (2) react (1) speak (1) reply (1) response (1) responsed (1) responsement (1) responser (1)

23. mess : messy :: effect : _______________

ESL (n=24)	JHL (n=21)	ELM (n=25)
effecty (11) <u>effective (4)</u> blank (3) affect (2) effection (1) effected (1) effection (1) effectly (1)	<u>effective (9)</u> effected (4) blank (2) effecting (1) uneffect (1) effecter (1) effectively (1) effection (1) effects (1)	effected (8) <u>effective (4)</u> effecting (4) effection (3) effects (2) effecter (1) effectively (1) effect (1) blank (1)

24. push : pushed :: lose : _______________

ESL (n=24)	JHL (n=21)	ELM (n=25)
<u>lost (15)</u> losed (9)	<u>lost (15)</u> losed (4) losened (1) low (1)	<u>lost (12)</u> loser (7) loss (3) loosen (1) losen (1) losed (1)

25. adequate : inadequate :: fair : _______________

ESL (n=24)	JHL (n=21)	ELM (n=25)
<u>unfair (22)</u> faired (1) blank (1)	<u>unfair (18)</u> fairing (1) blank (1) hair (1)	<u>unfair (18)</u> fairer (3) blank (2) fairness (1) fairing (1)

26. help : helped :: say : ______________

ESL (n=24)	JHL (n=21)	ELM (n=25)
said (23)	said (19)	said (22)
sayed (1)	sayed (1)	saying (1)
	blank (1)	sayer (1)
		blank (1)

27. lucky : unlucky :: possible : ______________

ESL (n=24)	JHL (n=21)	ELM (n=25)
impossible (15)	impossible (9)	impossible (13)
unpossible (5)	inpossible (9)	inpossible (8)
blank (2)	unpossible (3)	blank (2)
possible (1)		can (1)
possibly (1)		possibility (1)

28. long : length :: wide : ______________

ESL (n=24)	JHL (n=21)	ELM (n=25)
width (19)	width (15)	wider (13)
blank (2)	blank (4)	width (10)
wider (2)	fat (1)	widen (1)
small (1)	widen (1)	blank (1)

29. warmth : warm :: enthusiasm : ______________

ESL (n=24)	JHL (n=21)	ELM (n=25)
enthusiastic (13)	enthusiastic (11)	enthusiastic (7)
blank (8)	blank (9)	blank (5)
enthusias (1)	enthusiasm (1)	enthusiation (2)
enthuse (1)		existed (2)
enthusia (1)		inthusiasm (2)
		enthusiasm (2)
		enthusiasmer (1)
		cold (1)
		enthusiamed (1)
		enthusiase (1)
		enthusiast (1)

30. longer : long :: wealthier : ______________

ESL (n=24)	JHL (n=21)	ELM (n=25)
wealthy (8) wealth (8) blank (6) wealthier (1) wealthierer (1)	wealthy (11) wealth (5) blank (4) poorer (1)	wealth (10) wealthy (5) wealthey (1) blank (4) wealthierer (1) which (1) weal (1) wether (1) short (1)

Appendix 11: A classification of the English WA items

11-a. By levels of variability within WA responses

ESL (n=24)			JHL (n=21)			ELM (n=25)		
1	2	3	1	2	3	1	2	3
danced	held	life	danced	held	shook/shaken	leaves	held	life
people	wrote/written	shook/shaken	leaves	life	height	people	danced	wrote/written
inventor	leaves	height	keep	wrote/written	enlarge	mouse	keep	shook/shaken
unfair	keep	enlarge	people	dissimilar	necessity	lower	draw	dissimialr
said	draw	strong	draw	strong	respond	said	strong	height
	mouse	necessity	mouse	pianist	effective	impossible	pianist	inventor
	dissimilar	disappear	inventor	act			unfair	separately
	separately	respond	separately	lower				enlarge
	pianist	effective	disappear	lost				necessity
	act	wealthy	unfair	width				disappear
	lower		said	enthusiastic				act
	lost		impossible	wealthy				respond
	impossible							effective
	width							lost
	enthusiastic							width
								enthusiastic
								wealthy

Note. Grade 1: almost all children (80-100%) in each group provided segmentations marked correct.
Grade 2: 51-79% of children provided segmentations marked as correct and the rest provided a variety of responses.
Grade 3: Less than half of children provided segmentations marked as correct and the rest provided a wide variety of responses.

11-b. By morphemic complexity

morphemic complexity	
mono-morphemic	bi-morphemic
life	danced
held	leaves
wrote/written	dissimilar
shook/shaken	inventor
keep	separately
people	enlarge
draw	necessity
mouse	pianist
height	disappear
strong	lower
act	effective
respond	unfair
lost	said
	impossible
	width
	enthusiastic
	wealthy

Appendix 12: Segmentations marked as correct - Japanese WS task

Target items	Accepted segmentations
いばる“to boast”	いば＋る /iba + ru/
小づつみ“package”	小＋づつみ /ko + zutsumi/
明るさ“brightness”	明る＋さ /akaru + sa/
不親切“unkind”	不＋親切 /fu + shinsetsu/
よわみ“weak points”	弱＋み /yowa + mi/
めずらしい“unique”	めずらし＋い /mezurashi + i/
ほめる“to praise”	ほめ＋る /home + ru/
ごぼうび“treat”	ご＋ほうび /go + houbi/
きらめく“to shine”	きら＋めく /kira + meku/
大ゆき“heavy snow”	大＋ゆき /oo + yuki/
寒がる“to feel cold”	寒＋がる /samu + garu/
冷たい“cold”	冷た＋い /tume + tai/
泳ぎたい“to want to swim”	泳ぎ＋たい /oyogi + tai/
にぎやかに“merrily”	にぎやか＋に /nigiyaka + ni/
考える“to think”	考え＋る /kangae + ru/
おかし“confectioneries”	お＋かし /o + kashi/
楽しみ“fun”	楽し＋み /tanoshi + mi/
不注意“carelessness”	不＋注意 /fu + chūi/
調べたい“to want to investigate”	調べ＋たい /shirabe + tai/
あぶなかった“was dangerous”	あぶな＋かっ＋た /abuna + kat + ta/; あぶなかっ＋た /abunakat + ta/
運んだ“carried (past tense)”	運ん＋だ /hakon + da/
真っ白“sheer white”	真っ＋白 /mas + shiro/
うらやましがる“to envy”	うらやまし＋がる /urayamashi + garu/
さびしかった“was lonely”	さびし＋かっ＋た /sabishi + kat + ta/; さびしかっ＋た /sabishikat + ta/
すはだ“bare skin”	す＋はだ /su + hada/
食べたい“want to eat”	食べ＋たい /tabe + tai/
やわらかかった“was soft”	やわらか＋かっ＋た /yawaraka + kat + ta/; やわらかかっ＋た /yawarakakat + ta/ “was soft”
ひびいた“echoed (past tense)”	ひびい＋た /hibii + ta/
真面目に“conscientiously”	真面目＋に /majime + ni/
はげしく“violently”	はげし＋く /hageshi + ku/

Appendix 13: The Japanese WS task individual segmentations (version A)

**Responses marked as correct are underlined.*

1. いばる

ESL (n=13)	JHL (n=17)	JLM (n=13)
<u>いば＋る (11)</u> い＋ばる (1) いばる (1)	<u>いば＋る (12)</u> い＋ばる (5)	<u>いば＋る (12)</u> い＋ばる (1)

2. 小づつみ

ESL (n=13)	JHL (n=17)	JLM (n=13)
<u>小＋づつみ (9)</u> 小づつ＋み (2) 小づつみ (1) 小づ＋つみ(1)	<u>小＋づつみ (9)</u> 小づ＋つみ (5) 小づつ＋み (3)	<u>小＋づつみ (7)</u> 小づつ＋み (5) 小づつみ (1)

3. 明るさ

ESL (n=13)	JHL (n=17)	JLM (n=13)
<u>明る＋さ (10)</u> 明＋るさ (3)	<u>明る＋さ (11)</u> 明＋るさ (5) 明るさ (1)	<u>明る＋さ (10)</u> 明＋るさ (3)

4. 不親切

ESL (n=13)	JHL (n=17)	JLM (n=13)
<u>不＋親切 (8)</u> 不親＋切 (4) 不＋親＋切 (1)	不親＋切 (9) <u>不＋親切 (7)</u> 不親切 (1)	<u>不＋親切 (10)</u> 不親＋切 (2) 不親＋切 (1)

5. よわみ

ESL (n=13)	JHL (n=17)	JLM (n=13)
<u>よわ＋み (23)</u>	<u>よわ＋み (16)</u> よわみ (1)	<u>よわ＋み (23)</u>

6. めずらしい

ESL (n=13)	JHL (n=17)	JLM (n=13)
<u>めずらし＋い (8)</u> めずら＋しい (5)	<u>めずらし＋い (6)</u> めずら＋しい (5) めず＋らしい (3) めずらしい (2) め＋ずらしい (1)	<u>めずらし＋い (6)</u> めずら＋しい (4) めずらしい (1) め＋ずらしい (1) めず＋らしい (1)

7. ほめる

ESL (n=13)	JHL (n=17)	JLM (n=13)
ほめ＋る (12) ほめる (1)	ほめ＋る (13) ほ＋める (3) ほめる (1)	ほめ＋る (13)

8. ごほうび

ESL (n=13)	JHL (n=17)	JLM (n=13)
ご＋ほうび (8) ごほ＋うび (3) ごほう＋び (2)	ごほう＋び (9) ご＋ほうび (5) ごほうび (2) ごほ＋うび (1)	ご＋ほうび (8) ごほう＋び (4) ごほうび (1)

9. きらめく

ESL (n=13)	JHL (n=17)	JLM (n=13)
きらめ＋く (8) きら＋めく (4) きらめく (1)	きらめ＋く (8) きら＋めく (7) きらめく (2)	きらめ＋く (7) きら＋めく (4) きらめく (1) き＋らめく (1)

10. 大ゆき

ESL (n=13)	JHL (n=17)	JLM (n=13)
大＋ゆき (11) 大ゆ＋き (2)	大＋ゆき (16) 大ゆき (no seg.) (1)	大＋ゆき (13)

11. 寒がる

ESL (n=13)	JHL (n=17)	JLM (n=13)
寒＋がる (8) 寒が＋る (5)	寒＋がる (13) 寒が＋る (4)	寒＋がる (9) 寒が＋る (4)

12. 冷たい

ESL (n=13)	JHL (n=17)	JLM (n=13)
冷た＋い (8) 冷＋たい (5)	冷＋たい (8) 冷た＋い (8) 冷たい (no seg.) (1)	冷た＋い (8) 冷＋たい (5)

13. 泳ぎたい

ESL (n=13)	JHL (n=17)	JLM (n=13)
泳ぎ＋たい (8) 泳＋ぎたい (2) 泳ぎた＋い (2) 泳＋ぎ＋たい (1)	泳ぎ＋たい (9) 泳＋ぎたい (4) 泳ぎた＋い (2) 泳＋ぎ＋たい (1) 泳ぎたい (no seg.) (1)	泳ぎ＋たい (6) 泳＋ぎたい (5) 泳ぎた＋い (2)

14. にぎやかに

ESL (n=13)	JHL (n=17)	JLM (n=13)
にぎやか＋に (11) にぎや＋かに (2)	にぎやか＋に (8) にぎや＋かに (5) にぎ＋やか＋に (1) にぎや＋か＋に (1) にぎ＋やかに (1) にぎやかに (no seg.) (1)	にぎやか＋に (12) に＋ぎやかに (1)

15. 考える

ESL (n=13)	JHL (n=17)	JLM (n=13)
考え＋る (10) 考＋える (3)	考え＋る (11) 考＋える (6)	考え＋る (9) 考＋える (4)

16. おかし

ESL (n=13)	JHL (n=17)	JLM (n=13)
お＋かし (11) おか＋し (2)	お＋かし (10) おか＋し (4) おかし (3)	お＋かし (10) おか＋し (3)

17. 楽しみ

ESL (n=13)	JHL (n=17)	JLM (n=13)
楽し＋み (8) 楽＋しみ (5)	楽し＋み (14) 楽＋しみ (3)	楽し＋み (11) 楽＋しみ (2)

18. 不注意

ESL (n=13)	JHL (n=17)	JLM (n=13)
不＋注意 (9) 不注＋意 (4)	不＋注意 (10) 不注＋意 (7)	不＋注意 (9) 不注＋意 (4)

19. 調べたい

ESL (n=13)	JHL (n=17)	JLM (n=13)
調べ＋たい (6)	調べ＋たい (12)	調べ＋たい (7)
調＋べたい (4)	調べた＋い (2)	調べた＋い (4)
調べた＋い (3)	調べ＋た＋い (1)	調＋べたい (2)
	調＋べたい (1)	
	調べたい (1)	

20. あぶなかった

ESL (n=13)	JHL (n=17)	JLM (n=13)
あぶな＋かった (11)	あぶな＋かった (12)	あぶな＋かった (10)
あぶなかっ＋た (1)	あぶなかっ＋た (3)	あぶなかっ＋た (1)
あぶ＋なかった (1)	あぶ＋なかった (1)	あぶ＋なかった (1)
	あぶなかった (1)	あ＋ぶなかった (1)

21. 運んだ

ESL (n=13)	JHL (n=17)	JLM (n=13)
運ん＋だ (8)	運ん＋だ (9)	運＋んだ (7)
運＋んだ (5)	運＋んだ (8)	運ん＋だ (6)

22. 真っ白

ESL (n=13)	JHL (n=17)	JLM (n=13)
真っ＋白 (7)	真っ＋白 (12)	真っ＋白 (10)
真＋っ白 (5)	真＋っ白 (4)	真＋っ白 (3)
真っ白 (no seg.) (1)	真っ白 (no seg.) (1)	

23. うらやましがる

ESL (n=13)	JHL (n=17)	JLM (n=13)
うらやまし＋がる (10)	うらやまし＋がる (6)	うらやまし＋がる (11)
うらやま＋しがる (3)	うらや＋ましがる (3)	うらやましが＋る (1)
	うらやましが＋る (2)	うらや＋ましがる (1)
	うらやま＋しがる (2)	
	うらやま＋しが＋る (1)	
	うらやま＋し＋がる (1)	
	うら＋やましがる (1)	
	うらやましがる (no seg.) (1)	

24. さびしかった

ESL (n=13)	JHL (n=17)	JLM (n=13)
さびし＋かった (12)	さびし＋かった (12)	さびし＋かった (11)
さびしかっ＋た (1)	さびしかっ＋た (4)	さびしかっ＋た (1)
	さび＋しかった (1)	さび＋しかった (1)

25. すはだ

ESL (n=13)	JHL (n=17)	JLM (n=13)
す＋はだ (8) すは＋だ (4) すはだ (no seg.) (1)	す＋はだ (8) すは＋だ (8) すはだ (no seg.) (1)	す＋はだ (10) すは＋だ (3)

26. 食べたい

ESL (n=13)	JHL (n=17)	JLM (n=13)
食べ＋たい (6) 食べた＋い (4) 食＋べたい (3)	食べ＋たい (10) 食べた＋い (4) 食べたい (1) 食べ＋た＋い (1) 食＋べたい (1)	食べ＋たい (6) 食べた＋い (5) 食＋べたい (2)

27. やわらかかった

ESL (n=13)	JHL (n=17)	JLM (n=13)
やわらか＋かった (9) やわら＋かかった (3) やわらかかっ＋た (1)	やわらか＋かった (10) やわらかかっ＋た (4) やわら＋かかった (1) やわら＋かかっ＋た (1) や＋わらか＋かった (1)	やわらか＋かった (12) やわらかかっ＋た (1)

28. ひびいた

ESL (n=13)	JHL (n=17)	JLM (n=13)
ひび＋いた (6) ひびい＋た (4) ひ＋びいた (2) ひ＋び＋いた (1)	ひびい＋た (10) ひび＋いた (6) ひ＋びい＋た (1)	ひびい＋た (8) ひび＋いた (5)

29. 真面目に

ESL (n=13)	JHL (n=17)	JLM (n=13)
真面目＋に (11) 真面＋目に (1) 真＋面目に (1)	真面目＋に (11) 真面＋目に (2) 真＋面目＋に (2) 真面目に (2)	真面目＋に (12) 真＋面目に (1)

30. はげしく

ESL (n=13)	JHL (n=17)	JLM (n=13)
はげし＋く (7) はげ＋しく (5) はげしく (1)	はげし＋く (14) はげ＋しく (2) はげしく (1)	はげし＋く (13)

Appendix 14: A classification of the Japanese WS items

14-a. By levels of variability within segmentations

ESL (n = 13)			JHL (n = 17)			JLM (n = 13)		
1	2	3	1	2	3	1	2	3
いばる	小づつみ	調べたい	よわみ	いばる	めずらしい	いばる	小づつみ	めずらしい
よわみ	明るさ	食べたい	大ゆき	小づつみ	ごほうび	よわみ	明るさ	きらめく
ほめる	不親切	ひびいた	楽しみ	明るさ	きらめく	ほめる	不親切	泳ぎたい
大ゆき	めずらしい		真っ白	不親切	冷たい	大ゆき	ごほうび	食べたい
考える	ごほうび		はげしく	ほめる	にぎやかに	にぎやかに	寒がる	
おかし	きらめく			寒がる	うらやましがる	楽しみ	冷たい	
あぶなかった	寒がる			泳ぎたい	すはだ	真っ白	考える	
真っ白	冷たい			考える		うらやましがる	おかし	
さびしかった	泳ぎたい			おかし		さびしかった	不注意	
真面目に	考える			不注意		やわらかかった	調べたい	
	楽しみ			調べたい		真面目に	あぶなかった	
	不注意			あぶなかった		はげしく	運んだ	
	運んだ			運んだ		いばる	すはだ	
	うらやましがる			さびしかった			ひびいた	
	すはだ			食べたい				
	やわらかかった			やわらかかった				
	はげしく			ひびいた				
				真面目に				

Note. Grade 1: almost all children (80-100%) in each group provided segmentations marked correct.
Grade 2: 51-79% of children provided segmentations marked as correct and the rest provided a variety of responses.
Grade 3: Less than half of children provided segmentations marked as correct and the rest provided a wide variety of responses.

14-b. By levels of semantic transparency

Transparent	Opaque
小づつみ	いばる
不親切	明るさ
ごほうび	よわみ
きらめく	めずらしい
大ゆき	ほめる
泳ぎたい	寒がる
にぎやかに	冷たい
考える	楽しみ
おかし	あぶなかった
不注意	運んだ
調べたい	うらやましがる
真っ白	さびしかった
すはだ	ひびいた
食べたい	はげしく
やわらかかった	
真面目に	

14-c. By levels of script type

Hiragana-only	Hiragana + Kanji	Kanji-only
いばる	小づつみ	不親切
よわみ	明るさ	不注意
めずらしい	大ゆき	
ほめる	寒がる	
ごほうび	冷たい	
きらめく	泳ぎたい	
にぎやかに	考える	
おかし	楽しみ	
あぶなかった	調べたい	
うらやましがる	運んだ	
さびしかった	真っ白	
すはだ	食べたい	
やわらかかった	真面目に	
ひびいた		
はげしく		

Appendix 15: The Japanese WS task individual segmentations (version B)

For children in Years 5-6 or older

**Segmentations marked as correct are underlined.*

1. あわただしい

ESL (n=11)	JHL (n=4)	JLM (n=14)
あわただ＋しい (6) あわ＋ただしい (2) あわた＋だしい (1) あわただし＋い (1) あわただしい (no seg.) (1)	あわただ＋しい (2) あわた＋だしい (1) あわただし＋い (1)	あわただし＋い (7) あわただ＋しい (6) あわ＋ただしい (1)

2. 憧れた

ESL (n=11)	JHL (n=4)	JLM (n=14)
憧れ＋た (9) 憧＋れた (2)	憧＋れた (3) 憧れ＋た (1)	憧れ＋た (14)

3. 非常識

ESL (n=11)	JHL (n=4)	JLM (n=14)
非＋常識 (6) 非常＋識 (4) 非常識 (no seg.) (1)	非＋常識 (2) 非常＋識 (1) 非常識 (no seg.) (1)	非＋常識 (8) 非常＋識 (6)

4. 可愛がる

ESL (n=11)	JHL (n=4)	JLM (n=14)
可愛＋がる (9) 可愛が＋る (2)	可愛＋がる (2) 可愛が＋る (2)	可愛＋がる (12) 可愛が＋る (2)

5. 衰える

ESL (n=11)	JHL (n=4)	JLM (n=14)
衰え＋る (8) 衰＋える (3)	衰＋える (3) 衰え＋る (1)	衰え＋る (11) 衰＋える (3)

6. ざわつく

ESL (n=11)	JHL (n=4)	JLM (n=14)
ざわ＋つく (7) ざわつ＋く (4)	ざわ＋つく (2) ざわつ＋く (2)	ざわ＋つく (7) ざわつ＋く (7)

7. にぶかった

ESL (n=11)	JHL (n=4)	JLM (n=14)
にぶ＋かった (10) にぶ＋かっ＋た (1)	にぶ＋かった (2) にぶかっ＋た (1) にぶ＋かっ＋た (1)	にぶ＋かった (12) にぶ＋かっ＋た (2)

8. 運んだ

ESL (n=11)	JHL (n=4)	JLM (n=14)
運＋んだ (8) 運ん＋だ (3)	運＋んだ (4)	運ん＋だ (8) 運＋んだ (6)

9. 真夜中

ESL (n=11)	JHL (n=4)	JLM (n=14)
真＋夜中 (11)	真＋夜中 (3) 真夜＋中 (1)	**真＋夜中** (14)

10. たくましさ

ESL (n=11)	JHL (n=4)	JLM (n=14)
たくまし＋さ (10) たくま＋しさ (1)	たくま＋しさ (3) たくまし＋さ (1)	たくまし＋さ (12) たくま＋しさ (2)

11. 小びと

ESL (n=11)	JHL (n=4)	JLM (n=14)
小＋びと (11)	小＋びと (4)	小＋びと (14)

12. 信じたい

ESL (n=11)	JHL (n=4)	JLM (n=14)
信じ＋たい (10) 信じた＋い (1)	信じ＋たい (3) 信じた＋い (1)	信じ＋たい (10) 信じた＋い (4)

13. 険しい

ESL (n=11)	JHL (n=4)	JLM (n=14)
険し＋い (5) 険＋しい (5) 険しい (no seg.) (1)	険し＋い (3) 険＋しい (1)	険し＋い (10) 険＋しい (4)

14. ゆずりたい

ESL (n=11)	JHL (n=4)	JLM (n=14)
ゆずり＋たい (6) ゆず＋りたい (4) ゆずりた＋い (1)	ゆずり＋たい (2) ゆず＋りたい (1) ゆずりた＋い (1)	ゆずり＋たい (12) ゆずりた＋い (2)

15. ひとりでに

ESL (n=11)	JHL (n=4)	JLM (n=14)
ひとり＋でに (6) ひとりで＋に (5)	ひとり＋でに (3) ひとりで＋に (1)	ひとりで＋に (7) ひとり＋でに (7)

16. やしなう

ESL (n=11)	JHL (n=4)	JLM (n=14)
やしな＋う (8) やし＋なう (2) や＋しなう (1)	やしな＋う (2) やし＋なう (2)	やしな＋う (14)

17. 素早く

ESL (n=11)	JHL (n=4)	JLM (n=14)
素早＋く (8) 素＋早く (3)	素早＋く (2) 素＋早く (2)	素＋早く (8) 素早＋く (6)

18. 未公開

ESL (n=11)	JHL (n=4)	JLM (n=14)
未＋公開 (10) 未公＋開 (1)	未＋公開 (2) 未公＋開 (1) 未公開 (no seg.) (1)	未＋公開 (11) 未公＋開 (3)

19. きらめく

ESL (n=11)	JHL (n=4)	JLM (n=14)
きらめ＋く (9) きら＋めく (2)	きらめ＋く (2) きら＋めく (1) き＋らめく (1)	きらめ＋く (13) きら＋めく (1)

20. ふさわしい

ESL (n=11)	JHL (n=4)	JLM (n=14)
ふさわし＋い (6) ふさわ＋しい (4) ふさ＋わしい (1)	ふさわ＋しい (3) ふさわし＋い (1)	ふさわし＋い (7) ふさわ＋しい (7)

Appendix 15 the Japanese WS task individual segmentations (version B)

21. 大あらし

ESL (n=11)	JHL (n=4)	JLM (n=14)
大＋あらし (11)	大＋あらし (4)	大＋あらし (12)
		大あら＋し (2)

22. はなやかさ

ESL (n=11)	JHL (n=4)	JLM (n=14)
はなやか＋さ (9)	はな＋やかさ (3)	はなやか＋さ (9)
はな＋やかさ (1)	はなやか＋さ (1)	はな＋やかさ (3)
はなや＋かさ (1)		はなや＋かさ (2)

23. おしゃれ

ESL (n=11)	JHL (n=4)	JLM (n=14)
お＋しゃれ (10)	お＋しゃれ (3)	お＋しゃれ (13)
おしゃ＋れ (1)	おしゃ＋れ (1)	おしゃ＋れ (1)

24. 親しみ

ESL (n=11)	JHL (n=4)	JLM (n=14)
親し＋み (9)	親＋しみ (3)	親し＋み (11)
親＋しみ (2)	親し＋み (1)	親＋しみ (3)

25. くわしかった

ESL (n=11)	JHL (n=4)	JLM (n=14)
くわし＋かった (10)	くわし＋かった (4)	くわし＋かった (11)
くわしかっ＋た (1)		くわしかっ＋た (3)

26. みちびいた

ESL (n=11)	JHL (n=4)	JLM (n=14)
みちび＋いた (10)	みち＋びいた (3)	みちび＋いた (6)
みちびい＋た (1)	みちび＋いた (1)	みちびい＋た (6)
		みち＋びいた (2)

27. 不幸せ

ESL (n=11)	JHL (n=4)	JLM (n=14)
不＋幸せ (11)	不＋幸せ (4)	不＋幸せ (13)
		不幸＋せ (1)

28. なぐさめたい

ESL (n=11)	JHL (n=4)	JLM (n=14)
なぐさめ＋たい (10) なぐさめた＋い (1)	なぐさめ＋たい (3) なぐさ＋めたい (1)	なぐさめ＋たい (12) なぐさめた＋い (2)

29. しきりに

ESL (n=11)	JHL (n=4)	JLM (n=14)
しきり＋に (11)	しきり＋に (3) しき＋りに (1)	しきり＋に (14)

30. 無関心

ESL (n=11)	JHL (n=4)	JLM (n=14)
無＋関心 (11)	無関＋心 (3) 無＋関心 (1)	無＋関心 (14)

Appendix 16: Responses marked as correct - Japanese WA task

Target items	Accepted responses
1. きらう：きらった:: 来る：____________ **/kirau : kiratta :: kuru : ________/**	来た /kita/ “came”
2. 米：お米 :: 飲み物：____________ **/kome : okome :: nomimono : ________/**	お飲み物 /onomimono/ “beverage”
3. ながめ：ながめる：：くもり：____________ **/nagame : nagameru :: kumori : __________/**	くもる /kumoru/ “to become cloudy”
4. あわてる：あわてた :: ねむる：____________ **/awateru : awateta :: nemuru : ____________/**	ねむった /nemutta/ “slept (past tense)”
5. 昼：真昼 :: 赤：____________ **/hiru : mahiru :: aka : _________/**	真っ赤 /makka/ “bright red”
6. おそろしい：おそろしがる :: 暑い：____________ **/osoroshii : osoroshigaru :: atsui : __________/**	暑がる /atsugaru/ “to feel hot”
7. いさましかった：いさましい :: まぶしかった：_________ **/isamashikatta : isamashii :: mabushikatta : ________/**	まぶしい /mabushii/ “dazzling”
8. 動いた：動く::休んだ：____________ **/ugoita : ugoku :: yasunnda : __________/**	休む /yasumu/ “to rest”
9. 雨：大雨 :: けが：____________ **/ame : ooame :: kega : _________/**	大けが /ookega/ “big injuries”
10. 痛がる：痛い :: こわがる：____________ **/itagaru : itai :: kowagaru : _________/**	こわい /kowai/ “scary”
11. 忙しかった：忙しい ::うらやましかった：____________ **/isogashikatta : isogashii :: urayamashikatta : ______/**	うやらましい /urayamashii/ “to envy”
12. 石：小石：：声：___________ **/ishi : koioshi :: koe : __________/**	こごえ（小声） /kogoe/ “whisper (noun)”
13. 暗い：暗さ :: むずかしい：___________ **/kurai : kurasa :: muzukashii : ___________/**	むずかしさ /muzukashisa/ “difficulty”
14. 重い：重かった :: さむい：___________ **/omoi : omokatta :: samui : _________/**	さむかった /samukatta/ “was cold”
15. 合格：不合格 :: 意味：___________ **/goukaku : fugoukaku :: imi : ___________/**	無意味 /muimi/ “meaningless”
16. たのみ：たのむ：：手伝い：___________ **/tanomi : tanomu :: tetsudai : __________/**	手伝う /tetsudau/ “to help”
17. うすぐらい：うすぐらかった :: 深い：___________ **/usugurai : isugurakatta :: fukai : __________/**	深かった /fukakatta/ “was deep”
18. かたづける：かたづけた：：急ぐ：___________ **/katadukeru : kataduketa :: isogu : __________/**	急いだ /isoida/ “hurried (past tense)”
19. 夜中：真夜中 :: 中：___________ **/yonaka : mayonaka :: naka _________/**	真ん中 /mannaka/ “right in the middle”
20. 美しい：美しく :: 遠い：___________ **/utsukushii : utsukushiku :: tooi : __________/**	遠く /tooku/ “far”
21. 計画：無計画：：十分：___________ **/keikaku : mukeikaku :: jūbun : ________/**	不十分 /fujūbun/ “insufficient”
22. かんたん：かんたんに :: ねっしん：___________ **/kantan : kantanni :: nesshin : __________/**	熱心に /nesshinni/ “enthusiastically”
23. 酒：お酒：：きげん：___________ **/sake : osake :: kigen : __________/**	ごきげん /gokigen/ “good mood”

24. 痛む：痛さ ：： なつかしむ：___________ **/itamu : itasa :: natsukashimu : _________/**	なつかしさ /natsukashisa/ “nostalgia”
25. しずんだ：しずむ ：： たおれた：___________ **/shizunda : shizumu :: taoreta : __________/**	たおれる /taoreru/ “to fall over”
26. ゆるさ：ゆるい：：明るさ：___________ **/yurusa : yurui :: akarusa : __________/**	明るい /akarui/ “bright (light)”
27. 安い：安かった ：： はずかしい：___________ **/yasui : yasukatta :: hazukashii : __________/**	はずかしかった /hazukashikatta/ “was embarrassing”
28. 待ち遠しく：待ち遠しい ：： 近く：___________ **/machidooshiku : machidooshii :: chikaku : __________/**	近い /chikai/ “near”
29. 太さ：太い ：： すずしさ：___________ **/futosa : futoi :: suzushisa : ____________/**	すずしい /suzushii/ “cool (temperature)”
30. 遊ぶ：遊びたい：：さけぶ：___________ **/asobu : asobitai :: sakebu : __________/**	さけびたい /sakebitai/ “want to shout”

Appendix 17: The Japanese WA task individual responses (version A)

1. きらう：きらった：：来る：____________

ESL (n=13)	JHL (n=17)	JLM (n=13)
来た (11) くるった (1) 来ない (1)	来た (12) Blank (3) きりました (1) くるった (1)	来た (12) Blank (1)

2. 米：お米：：飲み物：____________

ESL (n=13)	JHL (n=17)	JLM (n=13)
お飲み物 (7) Blank (3) たべもの (2) 飲むもの (1)	お飲み物 (11) Blank (3) のんだ (1) 飲み物 (1) ふのみもの (1)	お飲み物 (10) のむもの (2) Blank (1)

3. ながめ：ながめる：：くもり：____________

ESL (n=13)	JHL (n=17)	JLM (n=13)
くもる (9) Blank (2) くも (1) くもめる (1)	くもる (13) Blank (2) くもりゆ (1) くもって (1)	くもる (11) Blank (2)

4. あわてる：あわてた：：ねむる：____________

ESL (n=13)	JHL (n=17)	JLM (n=13)
ねむった (9) ねむれた (4) ねむたい (1) ねむい (1) ねた (1)	ねむった (13) ねてる (1) ねてた (1) ねむれた (1) ねむってた (1)	ねむった (10) ねた (2) ねよう (1)

Appendix 17 the Japanese WA task individual responses (version A)

5. 昼：真昼：：赤：____________

ESL (n=13)	JHL (n=17)	JLM (n=13)
真赤／まっ赤／まっか／真っ赤(6) 赤い (2) Blank (2) まあか (1) ピンク(1) あお (1)	真赤／まっか／真っ赤 (7) 赤い (4) まあっか (2) Blank (2) 赤る (1) まあか (1)	真赤／まっ赤／真っ赤 (11) 赤色 (1) 赤い (1)

6. おそろしい：おそろしがる：：暑い：____________

ESL (n=13)	JHL (n=17)	JLM (n=13)
暑がる (9) Blank (2) あったかい (2)	暑がる (13) Blank (1) あつかった (1) あつい (1) あついがけ (1)	暑がる (9) 暑くなる (1) 暑そう (1) Blank (1) さむがる (1)

7. いさましかった：いさましい：：まぶしかった：____________

ESL (n=13)	JHL (n=17)	JLM (n=13)
まぶしい (12) Blank (1)	まぶしい (17)	まぶしい (12) Blank (1)

8. 動いた：動く：：休んだ：____________

ESL (n=13)	JHL (n=17)	JLM (n=13)
休む (12) やすみ (1)	休む (15) やんくた (2)	休む (12) 休まなかった (1)

9. 雨：大雨：：けが：____________

ESL (n=13)	JHL (n=17)	JLM (n=13)
大けが (12) Blank (1)	大けが (15) けがめ (1) Blank (1)	大けが (12) けがする (1)

10. 痛がる：痛い：：こわがる：____________

ESL (n=13)	JHL (n=17)	JLM (n=13)
こわい (12) Blank (1)	こわい (15) こわがい (2)	こわい (12) ころんだ (1)

11. 忙しかった：忙しい：：うらやましかった：___________

ESL (n=13)	JHL (n=17)	JLM (n=13)
うらやましい (13)	うらやましい (17)	うらやましい (13)

12. 石：小石：：声：___________

ESL (n=13)	JHL (n=17)	JLM (n=13)
こごえ (9)	こごえ (9)	こごえ (10)
Blank (2)	Blank (4)	おごえ (1)
ここえ (1)	ここえ (2)	なきごえ (1)
おうごえ (1)	なきごえ (1)	声をだす (1)
	こえし (1)	

13. 暗い：暗さ：：むずかしい：___________

ESL (n=13)	JHL (n=17)	JLM (n=13)
むずかしさ (12)	むずかしさ (16)	むずかしさ (9)
むずかしか (1)	むずかしかった (1)	むずい (3)
		むずかしそう (1)

14. 重い：重かった：：さむい：___________

ESL (n=13)	JHL (n=17)	JLM (n=13)
さむかった (12)	さむかった (16)	さむかった (12)
Blank (1)	さむいも (1)	さむそう (1)

15. 合格：不合格：：意味：___________

ESL (n=13)	JHL (n=17)	JLM (n=13)
Blank (8)	Blank (7)	無意味／むいみ (5)
無意味／むいみ (4)	不意味 (5)	不意味 (3)
不意味 (1)	無意味／むいみ (2)	Blank (3)
	いみかく (2)	不意 (1)
	いみく (1)	意味がわかる (1)

16. たのみ：たのむ：：手伝い：___________

ESL (n=13)	JHL (n=17)	JLM (n=13)
手伝う (9)	手伝う (12)	手伝う (11)
Blank (2)	手伝いむ (3)	Blank (1)
お手伝い (1)	手伝いました (1)	手伝って (1)
手伝った (1)	手つぶ (1)	手伝った (1)

17. うすぐらい：うすぐらかった：：深い：＿＿＿＿＿＿

ESL (n=13)	JHL (n=17)	JLM (n=13)
深かった (11) Blank (2)	深かった (16) Blank (1)	深かった (12) ふかそう (1)

18. かたづける：かたづけた：：急ぐ：＿＿＿＿＿＿

ESL (n=13)	JHL (n=17)	JLM (n=13)
急いだ (10) Blank (2) 急げた (1)	急いだ (8) 急げた (3) 急ぎます (1) 急ぐた (1) いそた (1) 急ぐけた (1) 急げる (1) いそかった (1)	急いだ (10) いそいでいる (1) いそいだ (1) いそがしい (1)

19. 夜中：真夜中：：中：＿＿＿＿＿＿

ESL (n=13)	JHL (n=17)	JLM (n=13)
まんなか／まん中／真ん中(8) まなか／ま中 (2) Blank (1) そと (1) よのなか (1)	まんなか／まん中／真ん中(9) Blank (2) お中 (1) なかか (1) まなかた (1) まよなかった (1) そと(1) まなか (1)	まん中／真ん中 (8) Blank (4) 中にはいる (1)

20. 美しい：美しく：：遠い：＿＿＿＿＿＿

ESL (n=13)	JHL (n=17)	JLM (n=13)
とおく／遠く (11) 遠いく (2)	とおく／遠く (11) 遠いく (2) 遠しく (1) といっく (1) 遠いつく(1) とうく(1)	とおく／遠く(11) 近い (1) 遠いく (1)

21. 計画：無計画：：十分：__________

ESL (n=13)	JHL (n=17)	JLM (n=13)
不十分／ふじゅうぶん (5) Blank (5) むじゅうぶん／無十分 (3)	Blank (7) むじゅうぶん／無十分 (3) 不十分 (3) じゅうぶんふく(2) 十分く (1) すくない (1)	Blank (7) 不十分 (2) 無十分 (1) 十分だ (1) む十分 (1) もう十分 (1)

22. かんたん：かんたんに：：ねっしん：__________

ESL (n=13)	JHL (n=17)	JLM (n=13)
ねっしんに (10) Blank (3)	ねっしんに (16) Blank (1)	ねっしんに (10) ねっしん (2) ねっしんだ (1)

23. 酒：お酒：：きげん：__________

ESL (n=13)	JHL (n=17)	JLM (n=13)
おきげん (8) ごきげん (3) おきぶん (1) きげんがわるい (1)	おきげん (11) Blank (2) ごきげん (2) きげんけ (1) きげんしゅ (1)	ごきげん (7) おきげん (3) Blank (1) ふきげん (1) きげんぎれ (1)

24. 痛む：痛さ：：なつかしむ：__________

ESL (n=13)	JHL (n=17)	JLM (n=13)
なつかしさ (12) なつかしい (1)	なつかしさ (13) なつかしい (1) なつかった (1) なつかしむた (1) なつかしさむ (1)	なつかしさ (6) なつかしい (5) なつかしむ (1) Blank (1)

25. しずんだ：しずむ：：たおれた：__________

ESL (n=13)	JHL (n=17)	JLM (n=13)
たおれる (13)	たおれる (8) たおる (5) たおれたむ (2) Blank (1) たおむ (1)	たおれる (11) たおれた (1) Blank (1)

26. ゆるさ：ゆるい：：明るさ：___________

ESL (n=13)	JHL (n=17)	JLM (n=13)
明るい (13)	明るい (17)	明るい (12) Blank (1)

27. 安い：安かった：：はずかしい：___________

ESL (n=13)	JHL (n=17)	JLM (n=13)
はずかしかった (11) はずかい (1) Blank (1)	はずかしかった (16) はずかた (1)	はずかしかった (9) Blank (2) はずかしがる (1) はげしかった (1)

28. 待ち遠しく：待ち遠しい：：近く：___________

ESL (n=13)	JHL (n=17)	JLM (n=13)
近い (11) Blank (2)	近い (13) 近き (1) 近くお (1) 近く遠しい (1) 近くし (1)	近い (11) ちかさ (1) Blank (1)

29. 太さ：太い：：すずしさ：___________

ESL (n=13)	JHL (n=17)	JLM (n=13)
すずしい (13)	すずしい (14) すずしさい (1) すずしさと (1) すずとい (1)	すずしい (12) Blank (1)

30. 遊ぶ：遊びたい：：さけぶ：___________

ESL (n=13)	JHL (n=17)	JLM (n=13)
さけびたい (13)	さけびたい (14) さけたい (2) さけぶそう (1)	さけびたい (10) Blank (3)

Appendix 18: A classification of the Japanese WA items

18-a. By levels of response variability

ESL (n = 13)			JHL (n = 17)			JLM (n = 13)		
1	2	3	1	2	3	1	2	3
来た	お飲み物	真っ赤	まぶしい	来た	真っ赤	来た	お飲み物	無意味
まぶしい	くもる	無意味	休む	お飲み物	無意味	くもる	ねむった	不十分
休む	ねむった	不十分	大けが	くもる	急いだ	真っ赤	暑がる	なつかしさ
大けが	暑がる		こわい	ねむった	不十分	まぶしい	大声	
こわい	大声		うらやましい	暑がる	たおれる	休む	むずかしさ	
うらやましい	手伝う		むずかしさ	大声		大けが	急いだ	
むずかしさ	急いだ		さむかった	手伝う		こわい	真ん中	
さむかった	真ん中		深かった	真ん中		うらやましい	熱心に	
深かった	熱心に		熱心に	遠く		さむかった	ごきげん	
遠く	ごきげん		明るい	ごきげん		手伝う	はずかしかった	
なつかしさ			はずかしかった	なつかしさ		深かった	さけびたい	
たおれる			すずしい	近い		遠く		
明るい			さけびたい			たおれる		
はずかしかった						明るい		
近い						近い		
すずしい						すずしい		
さけびたい								

Note. Grade 1: almost all children (80-100%) in each group provided segmentations marked correct.
Grade 2: 51-79% of children provided segmentations marked as correct and the rest provided a variety of responses.
Grade 3: Less than half of children provided segmentations marked as correct and the rest provided a wide variety of responses.

__18-b. By script type (used in the prompt in the target pair, not the answer)__

Hiragana-only	Hiragana + Kanji	Kanji-only
くもり	来る	赤
ねむる	飲み物	声
まぶしかった	暑い	意味
けが	休んだ	中
こわがる	手伝い	十分
うらやましかった	深い	
むずかしい	急ぐ	
さむい	遠い	
ねっしん	明るさ	
きげん	近く	
なつかしむ		
たおれた		
はずかしい		
すずしさ		
さけぶ		

Appendix 19: Individual responses in the Japanese WA task (version B)

For children in Years 5-6 or older

1. 温かかった：温かい：：めでたかった：___________

ESL (n=11)	JHL (n=4)	JLM (n=14)
めでたい (8) めでたし (1) めでたかい(1) めでたかい (1)	めでたい (3) めでた (1)	めでたい (14)

2. 米：お米：：勉強：___________

ESL (n=11)	JHL (n=4)	JLM (n=14)
お勉強 (10) Blank (1)	お勉強 (4)	お勉強 (14)

3. ながめ：ながめる：：にぎわい：___________

ESL (n=11)	JHL (n=4)	JLM (n=14)
にぎわう (9) にぎわめる (1) にぎわる (1)	にぎわいる (3) にぎめる (1)	にぎわう (14)

4. 新しい：新しかった：：とぼしい：___________

ESL (n=11)	JHL (n=4)	JLM (n=14)
とぼしかった (11)	とぼしかった (4)	とぼしかった (14)

5. 昼：真昼：：白：___________

ESL (n=11)	JHL (n=4)	JLM (n=14)
まっしろ (9) ましろ (2)	まっしろ (3) ましろ (1)	まっしろ (14)

6. おそろしい：おそろしがる：：うらやましい：___________

ESL (n=11)	JHL (n=4)	JLM (n=14)
うらやましがる (10) うらやまる (1)	うらやましがる (4)	うらやましがる (14)

7. 動く：動いた：：さえぎる：：___________

ESL (n=11)	JHL (n=4)	JLM (n=14)
さえぎった (9) さえぎた (2)	さえぎった (1) さえぎいた (1) さいた (1) さえがいた (1)	さえぎった (13) さえぎられた (1)

8. けが：大けが：：成功：___________

ESL (n=11)	JHL (n=4)	JLM (n=14)
大せいこう/大成功 (11)	大せいこう/大成功 (3) おおぜいこう (1)	大せいこう/大成功 (14)

9. 痛がる：痛い：：寒がる：___________

ESL (n=11)	JHL (n=4)	JLM (n=14)
さむい／寒い (11)	さむい／寒い (3) 寒がい (1)	さむい／寒い (14)

10. 石：小石：：声：___________

ESL (n=11)	JHL (n=4)	JLM (n=14)
こごえ (9) ここえ (2)	こごえ (2) ここえ (1) Blank (1)	こごえ (13) こせい (1)

11. 暗い：暗さ：：めでたい：___________

ESL (n=11)	JHL (n=4)	JLM (n=14)
めでたさ (11)	めでたさ (3) めでさ (1)	めでたさ (14)

12. 重い：重かった：：険しい：___________

ESL (n=11)	JHL (n=4)	JLM (n=14)
けわしかった (11)	けわしかった (3) けわかった (1)	けわしかった (14)

13. 十分：不十分：：意味：___________

ESL (n=11)	JHL (n=4)	JLM (n=14)
無意味 (8) 不意味 (3)	不意味 (3) Blank (1)	むいみ／無意味 (12) 不意味 (1) 意味不明 (1)

14. 頼み：頼む：：こだわり：____________

ESL (n=11)	JHL (n=4)	JLM (n=14)
こだわる (11)	こだわる (2) こだわりみ (1) Blank (1)	こだわる (14)

15. うすぐらい：うすぐらかった：：すばらしい：____________

ESL (n=11)	JHL (n=4)	JLM (n=14)
すばらしかった (11)	すばらしかった (4)	すばらしかった (14)

16. かたづける：かたづけた：：つぶやく：____________

ESL (n=11)	JHL (n=4)	JLM (n=14)
つぶやいた (9) つぶやけて (1) つぶやけた (1)	つぶやいた (1) つぶやくだった (1) つぶやけた (1) Blank (1)	つぶやいた (14)

17. 夜中：真夜中：：赤：____________

ESL (n=11)	JHL (n=4)	JLM (n=14)
まっか／真っ赤 (11)	まっか／真っ赤 (2) 真あか (1) Blank (1)	まっか／真っ赤 (14)

18. 美しい：美しく：：すばやい：____________

ESL (n=11)	JHL (n=4)	JLM (n=14)
すばやく(11)	すばやく (2) すばやしく (1) すばやいく (1)	すばやく(14)

19. 助けた：助ける：：ふせいだ：____________

ESL (n=11)	JHL (n=4)	JLM (n=14)
ふせぐ (7) ふせる (2) ふさける (1) Blank (1)	ふせいる (2) ふせぐ (1) ふせげる (1)	ふせぐ (13) ふせげる (1)

20. 親切：不親切：：完成：____________

ESL (n=11)	JHL (n=4)	JLM (n=14)
未完成 (8) 不完成 (2) むかんせい (1)	不完成 (3) 不成 (1)	みかんせい/未完成 (10) 不完成 (3) むかんせい (1)

21. かんたん：かんたんに：：ふゆかい：____________

ESL (n=11)	JHL (n=4)	JLM (n=14)
ふゆかいに (11)	ふゆかいに (2) ふゆかい (1) ふゆかく (1)	ふゆかいに (14)

22. 暗い：暗かった：：思いがけない：____________

ESL (n=11)	JHL (n=4)	JLM (n=14)
思いがけなかった (10) 思った (1)	思いがけなかった (4)	思いがけなかった (13) 思かった (1)

23. おどった：おどる：：学んだ：____________

ESL (n=11)	JHL (n=4)	JLM (n=14)
学ぶ (10) まなる (1)	まなる (2) 学んだ (1) Blank (1)	学ぶ (13) 学った (1)

24. 酒：お酒：：機嫌：____________

ESL (n=11)	JHL (n=4)	JLM (n=14)
ごきげん (8) おきげん (3)	おきげん (3) おうきげん (1)	ごきげん (11) おきげん (3)

25. 痛む：痛さ：：なつかしむ：____________

ESL (n=11)	JHL (n=4)	JLM (n=14)
なつかしさ (9) なつかしい (2)	なつかしさ (3) なつかしった (1)	なつかしさ (14)

26. ゆるさ：ゆるい：：たくましさ：____________

ESL (n=11)	JHL (n=4)	JLM (n=14)
たくましい (11)	たくましい (3) たくましさい (1)	たくましい (14)

27. 待ち遠しく：待ち遠しい：：おおげさに：___________

ESL (n=11)	JHL (n=4)	JLM (n=14)
おおげさな (2) おおげさ (2) おおげさしい (2) おおげしい (2) おおげさで (1) おげさ (1) Blank (1)	おおげさい (2) おおげさにい (1) Blank (1)	おおげさ (5) おおげさだ (5) おおげきしい (1) おおげさっぽく (1) おおげさい (1) Blank (1)

28. 浮かんだ：浮かぶ：：認めた：___________

ESL (n=11)	JHL (n=4)	JLM (n=14)
みとめる／認める (10) みとむ (1)	みとめる／認める (2) みとめぶ (1) みとめたぶ (1)	みとめる／認める (14)

29. 太さ：太い：：尊さ：___________

ESL (n=11)	JHL (n=4)	JLM (n=14)
とうとい／尊い (10) 尊しい (1)	とうとい／尊い (4)	とうとい／尊い (14)

30. 遊ぶ：遊びたい：：知る：___________

ESL (n=11)	JHL (n=4)	JLM (n=14)
知りたい (11)	知りたい (2) 知るぶ (1) Blank (1)	知りたい (14)

Appendix 20: Morphological awareness results

Chapter 4 English WS task results – overall performance

In order to investigate the children's performance across tasks, a repeated-measures ANCOVA was carried out with one related-samples variable Morphological Awareness tested at two levels (morpheme recognition and production) and one independent-samples variable Group, (ESLs, JHLs and ELMs). Age, nonverbal IQ and English proficiency were used as covariates.

As illustrated in Figure A20-a below, there was a marginal effect for Morphological Awareness, $F(1, 63) = 3.90$, $p = .05$, $\eta_p^2 = .06$. No significant Group effects or Morphological Awareness × Group interaction was identified. As indicated by planned contrasts, no significant group-differences were found on the WS task, $p > .05$. On the WA task, in contrast, the ESL group yielded higher scores than did the ELM group, $t(45) = 2.16$, $p = .03$, $d = .64$. No significant differences were found between the ESL and JHL groups on the one hand and the JHL and ELM groups on the other. Paired-samples t-tests showed that the JHL group performed significantly better on the WA task than the WS task, $t(20) = 3.32$, $p = .003$, $d = .51$.

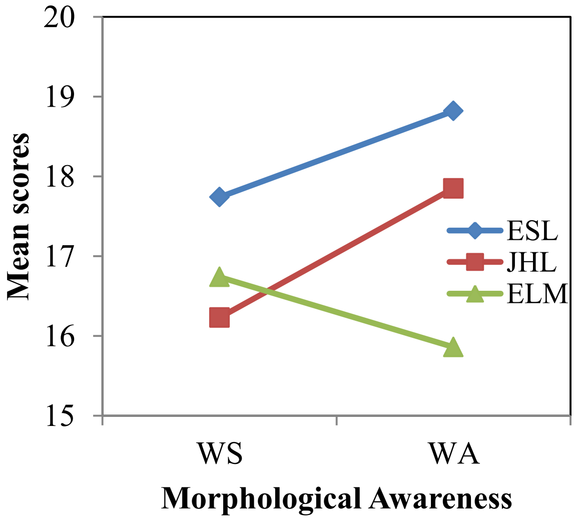

Figure A20-a. *Mean scores on the English WS and WA tasks*

The performances of both ESLs and ELMs each did not differ significantly across tasks. In other words, the JHLs' MA was more demonstrable in morpheme production than in morpheme recognition, whereas these two aspects of MA in the ESL and ELM groups were demonstrated comparably.

Chapter 5 Japanese WS task results – overall performance

The data from the Japanese WS and WA tasks were analysed using a repeated-measures ANCOVA with one related-samples variable, Morphological Awareness tested at two levels (morpheme recognition and production) and one independent-samples variable, Group (ESLs, JHLs and JLMs). Age and nonverbal IQ were used as covariates.

While no main effects for Morphological Awareness were identified, $p = .16$, a main effect for Group was observed, $F(2, 66) = 3.43$, $p = .03$, $\eta_p^2 = .09$, as illustrated below. An Morphological Awareness × Group interaction was not significant, $F < 1$. Planned contrasts revealed that no group differences were found on the WS task, $p > .05$. On the WA task, on the other hand, the JLM and ESL group both scored more highly than the JHL group, $t(42) = 3.43$, $p = .003$, $d = .97$ (JLM - JHL), $t(39) = 2.27$, $p = .02$, $d = .73$ (ESL - JHL). No differences were identified between the ESL and JLM group, $p > .05$. When investigating performance within each group, paired-samples t-tests indicated that both ESL and JLM groups yielded much higher scores on the WA task than they did on the WS task, $t(23) = 4.61$, $p < .001$, $d = .67$ (ESLs) and $t(26) = 5.8$, $p < .001$, $d = .79$ (JLMs). The JHL group's performance was, in contrast, found to be comparable across tasks, $p > .05$.

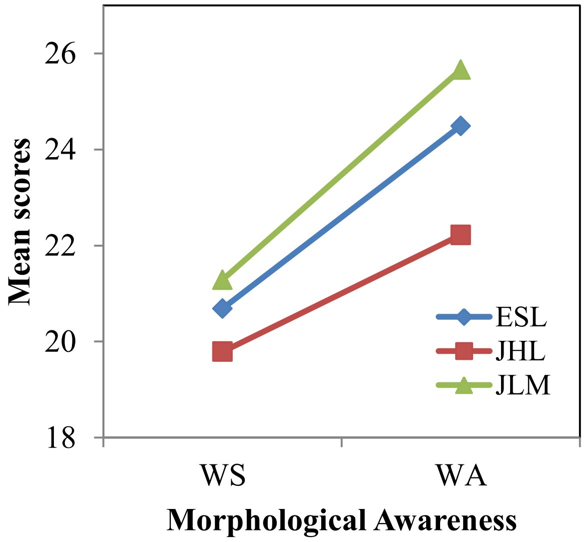

Figure A20-b. *Mean scores on the Japanese WS and WA tasks*

Appendix 21: Error analysis of English morphological tasks (Chapter 4)

English WS task

Relationship between morphological factors and response variability (ESL group)

Nine and twelve items were classified as Grade 2 and 3 items respectively, consisting of the following: seven semantically transparent/bi-morphemic and two opaque/multi-morphemic items in the Grade 2 category; and an equal number of transparent and opaque items (6 each) and five bi-morphemic and seven multi-morphemic items in the Grade 3 category. Table A (Appendix)21-a presents an association between each of semantic opacity and the multi-morphemic nature of items and the highly varied nature of segmentations (Grade 3): Fisher's exact test p = .02, a medium effect size of φ (phi) = .55 (semantic transparency); and Fisher's exact test p = .007, φ = .61 (morphemic complexity). In order to calculate odd ratios, a value of 0.5 was added to all the observed counts (e.g., 9 → 9.5; 0 → 0.5; 6 → 6.5; 7 → 7.5) due to the presence of zero frequencies (which would make an odd ratio of zero or infinity) (Fleiss, 2003; Haber, 1987). The odds of the items in the Grade 1 category being semantically transparent and bi-morphemic category were each much greater than those in the Grade 3 category (odds ratio: $\frac{6.5/6.5}{0.5/9.5}$ = 20; $\frac{7.5/6.5}{0.5/9.5}$ = 23). In short, these relationships could be interpreted as potential difficulty in segmenting semantically opaque and multi-morphemic items for the ESL group. In view of this, the ESL children's Grade 3 segmentations were also analysed descriptively so that more specific aspects of difficulty could be identified.

Table A21-a. *The relationship between variability and semantic transparency and morphemic complexity (ESLs)*

Variability	Transparent	Opaque		Bi-morphemic	Multi-morphemic
Low (Grade 1)	9	0	Low (Grade 1)	9	0
High (Grade 3)	6	6	High (Grade 3)	5	7

Descriptive patterns in erroneous segmentations (ESL group)

One overarching pattern identified was, in collective terms, ‘coarse segmentation’, whereby a base morpheme which contained its root (i.e., an irreducible, core part of a word). The ESL group typically recognised the base of the derivational form (‘difference’) without identifying the root (e.g., ‘differ), consequently producing the following segmentation ‘differen + ce’ (for ‘differ + ence) (11 ESLs). This tendency was salient particularly in multi-morphemic items including ‘un + comfortable’ (for ‘un + comfort + able’) (5 ESLs), ‘inter + national’ (for ‘in-ter + nation + al’) (11 ESLs), ‘victorious + ly’ (11 ESLs), ‘in + significance/in+significan+ce’ (11 ESLs) and ‘responsibiliti+es/responsibl+ities’ (6 ESLs). There, the base (e.g., ‘victorious’, ‘significant’ and ‘responsibility/responsible’) which contains the root was treated as the smallest meaningful component. Six ESLs did identify the root ‘respons(e)’ of the item ‘re-sponsibilities’ but treated the rest ‘-ibilities’ as one morpheme.

Relationship between morphological factors and response variability (JHL group)

As listed in Appendix 9, ten and thirteen items comprised the Grade 2 and 3 categories re-spectively. These ten Grade 2 items were further classified as follows: nine transparent and one opaque items, eight bi-morphemic and two multi-morphemic items. Thirteen Grade 3 items consisted of six semantically transparent/bi-morphemic items and seven opaque/multi-morphemic items. A significant association between semantic transparency/morphemic com-plexity and degrees of variability was identified between the Grade 1 and 3 categories, as shown in Table 21-b. In other words, the more semantically opaque the items were, the less consistent the children’s segmentations became, Fisher’s exact test p = .04, φ = .54 (odds ra-tio: $\frac{6.5/7.5}{0.5/7.5}$ = 12.43). (A value of 0.5 was added to all the observed counts due to the presence of zero frequencies.)

Table A21-b. *The relationship between variability and semantic transparency and morphemic complexity (JHLs)*

Variability	Transparent	Opaque		Bi-morphemic	Multi-morphemic
Low (Grade 1)	7	0	Low (Grade 1)	7	0
High (Grade 3)	6	7	High (Grade 3)	6	7

Descriptive patterns in erroneous segmentations (JHL group)

A closer investigation of individual segmentations by the JHL group revealed a pattern similar to the ones identified in the ESL group. Two additional features (2 & 3 below) were identified, which were not observed (at least as saliently) in the ESL group, as follows:

a. Coarse segmentation (lack of identification of a root; bi-morphemic segmentation for multi-morphemic items);
b. Identification of a non-morpheme unit in relation to meaning
c. Identification of a non-morpheme unit irrelevant to meaning

The JHL children typically identified the base with the root included therein as the smallest morpheme, as manifested in the following bi-morphemic segmentations (the number of children given in brackets): ‘differen+ce’ (8), ‘inter+national’ (11), ‘un + comfortable’ (9), ‘victorious + ly’ (6), ‘in + significance’ (4), ‘in+sensitive’ (8) and ‘respons + ibilities’ (5). As regards the second pattern, to take the item ‘information’ for example, while 10 JHLs segmented it as ‘inform/in+form + ation’, the others provided a wide variety of segmentations, including ‘info+rmation’, ‘infor+mation’, and ‘in+formation’. These suggest that a link between the root morpheme ‘inform’ and the entire form ‘information’ was not fully established in the mental lexicon, or not readily accessible for these children, which perhaps triggered them to find other components which they thought were somehow related to the meaning of ‘information’, such as the shortened form ‘info’ and ‘formation’. In addition, it appears that the lack of success in finding a morpheme resulted in the children attempting to find an alternative component (free morpheme) by sounding out, irrespective of its semantic relationships with the target item (e.g., ‘def’ (deaf) as in ‘def + inition’, ‘am’ in ‘ambitious’ or ‘fur’ in ‘fur + niture’) or segmenting it phonologically (i.e., syllable), such as ‘defi + ni + tion’.

Relationship between morphological factors and response variability (ELM group)

Eight and fourteen items were respectively graded as 2 and 3 in terms of variability. These eight Grade 2 items were further classified as follows: six semantically transparent and two opaque items; and seven bi-morphemic items and one multi-morphemic item. As was identified in the other two groups, significant associations were identified between the Grade 1 and 3 categories. That is, the segmentations became increasingly varied (Grade 1 → 3) as the item was semantically opaque and increased in internal complexity to more than three morphemes, Fisher’s exact test, p = .04, φ = .46 (transparency × variability) (odds ratio: $\frac{6.5/8.5}{0.5/8.5} = 12.67$) and χ^2 (1) = 7.18, p = .007, φ = .57 (morphemic complexity × variability (odds ratio: $\frac{8.5/6.5}{0.5/8.5} = 21.83$), as presented in Table A21-c.

Table A21-c. *The relationship between variability and semantic transparency and morphemic complexity* ***(ELMs)***

Variability	Transparent	Opaque		Bi-morphemic	Multi-morphemic
Low (Grade 1)	8	0	Low (Grade 1)	8	0
High (Grade 3)	8	6	High (Grade 3)	6	8

Descriptive patterns in erroneous segmentations (ELM group)

Similar tendencies to those found in the other groups were identified, listed as follows:

1. Coarse segmentation (lack of identification of a root; bi-morphemic segmentation for multi-morphemic items);
2. Identification of a non-morpheme unit irrelevant to meaning

Instances of bi-morphemic segmentations for multi-morphemic items include the following: ‘inter + national’(13); ‘victorious + ly (9) /victor + iously (11)’; ‘in + significance (6)/insignifican + ce (7)’; ‘respons + ibilities (5)/responsib + iliites (3)’; ‘un + comfortable’(11); and ‘in + sensitive’ (13).

Another observation was that, as was the case with the JHL group, the ELM group resorted to extracting a smaller unit that could stand on its own and treating the rest as a bound morpheme, such as ‘fur’ in ‘fur + niture’ and ‘am’ in ‘ambitious’. The vast majority of the ELM group, when they encountered these items, started sounding them out loud in an attempt to find a smaller word (i.e., the root) hidden. However, it did not always lead to a success. Perhaps the phonological change involved in the derivational process (e.g., define → definition), prevented the children from identifying the morphological link between the entire form and its root. In short, the ELM group’s individual segmentations were characterised by instances of bi-morphemic segmentations especially for multi-morphemic items, and those of non-morphological segmentations, which resulted in the identification of an alternative unit independent of the meaning of the target item.

English WA task

Relationship between morphological factors and response variability (ESL group)

A total of fifteen and ten items fell under the Grade 2 and 3 categories respectively, each consisting of seven mono-morphemic and eight bi-morphemic items and five mono-morphemic and five bi-morphemic items. No significant relationship was identified between the morphemic complexity and the variability categories (Grades 1-3), Fisher’s exact test = 1.30, p = 1.0. As a next step, these children’s Grades 2-3 responses were analysed descriptively in relation to the ANCOVA results (Section 4.4.3).

Descriptive patterns in erroneous responses (ESL group)

The following four patterns were identified in their erroneous responses:

1. Overgeneralisation of inflectional suffixes;
2. Production of non-naturally occurring derivational forms;
3. Morphologically related items in an incorrect syntactic category;
4. Influence of surface features.

The ESL group typically produced such overgeneralised forms as (the number of children given in brackets) ‘kepted’(1), ‘shaked’ (17), ‘drewed’(2), ‘mices’ (2) and ‘losed’(9). These responses do demonstrate an awareness of the inflectional ending -ed and -(e)s, but in an erroneous manner, where the relationship between the correct irregular form and its stem was not recognised. The second pattern, the production of non-naturally occurring derivational forms, was more salient than the first. The ESL group produced the following items, to complete the target pair (answers, followed by the number of children given in brackets): ‘in-similar (for dissimilar)’(1), ‘necessaricy (for necessity)’ (1), ‘responsement (for respond)’ (2); and ‘effection (for effective)’ (1). Moreover, there were instances where a naturally occurring item was erroneously given: ‘necessarily (for necessity)’, active (for act)’, ‘responsible (for respond)’; and ‘wealth (for wealthier)’. In these examples, although marked as incorrect, these ESL children did demonstrate their morphological knowledge to the extent that they produced an alternative morphologically-related item –another member of the same word family. An additional feature both in their inflectional and derivational responses was that some of the ESL children used the surface features of the first pair (given as a prompt) in an attempt to produce a correct form, as in ‘unsimilar (prompt: health-healthy)’ (12 ESLs), high-ness’ (happy-happiness) (12 ESLs), ‘largen’ (tight-tighten) (16 ESLs); and ‘effecty (mess-messy)’ (11 ESLs) (see Appendix 10 for more examples of individual responses).

Relationship between morphological factors and response variability (JHL group)

Twelve items in the Grade 2 category consisted of 6 mono-morphemic and 6 bi-morphemic items, whereas there were an equal number of mono-morphemic and bi-morphemic items (3 each) in the Grade 3 category. No significant association was identified between morphemic complexity and the degrees of variability, Fisher's exact test = .92, p = 1.0. In relation to the ANCOVA results in Section 4.4.3, the JHL group's individual responses were further analysed, in order to describe a more detailed pattern which may underlie their higher performance on inflectional morphemes than derivational morphemes.

Descriptive patterns in erroneous responses

Three out of the four patterns described above were identified in the JHL group, as follows:

1. Overgeneralisation of inflectional suffixes;
2. Morphologically related items in an incorrect syntactic category;
3. Influence of surface features.

As was observed in the ESL group but in much fewer instances, inflectional items were given in overgeneralised form, as in 'holded (for held) (4 JHLs) and 'losed (for lost)' (4 JHLs). As was the case with the ESL group, a large number of the JHLs (15 out of 21) produced 'shaked' for 'shook/shaken' (either was correct). A more prominent feature lay in the production of alternative morphologically-related items, as follows (the number of JHLs given in brackets): 'strengthened (for strong)' (1); 'necessarily (for necessity)'(7); 'responsibility (for respond)'(2); and effected (for effective) (4). Although these responses were marked as incorrect, they could at the same time be interpreted as a demonstration of the JHL children's morphological awareness, especially, their awareness of a word family. An additional pattern, although not as robust as the other groups, was that some JHL children were affected by the surface features of the prompt pair, thus providing the following: 'largen (tight-tighten)' (6); 'unsimilar (healthy: unhealthy) (9) and 'unappear (tie-untie)' (1). What was relatively absent, although not non-existent, was the production of non-naturally occurring items with existing affixes attached (e.g., 'undisappear', 'pianition', 'effecter'), in comparison to the ESL group.

Relationship between morphological factors and response variability (ELM group)

Seven and seventeen items were included in the Grade 2 and 3 categories respectively. The former consisted of 4 mono-morphemic items and 3 bi-morphemic item, whereas the latter consisted of 7 mono-morphemic and 10 bi-morphemic items. Consistent with the other groups, no relationships were identified between different degrees of variability within responses and levels of morphemic complexity (Fisher's exact test = .89, p = 1.0).

Descriptive patterns in erroneous responses (ELM group)

Similar to the analyses reported above, the ELM group's individual responses were descriptively analysed in order to add detail to the difference in scores on the production of inflections and that of derivations (in favour of the former), as indicated by the ANCOVA results (Section 4.4.3). The following patterns, identical to those for the ESL group, were identified:

1. Overgeneralisation of inflectional suffixes;
2. Production of non-naturally occurring derivational forms;
3. Morphologically related items in an incorrect syntactic category;
4. Influence of surface features.

Overgeneralisation was manifested in the following examples (the number of ELMs given in brackets): 'holded (for held)' (4), 'shaked' (for shook/shaken) (12) and 'losed' (for lost) (1). The second tendency was more prominent and captured an unnatural combination of an affix and its morpheme, such as: 'necessarier (for necessity)'(1); disaction (for act)' (1); 'responsement (for respond)'(1); 'effection (for effective)' (3); and 'enthusiation (for enthusiastic) (2). Looking on the more positive side, one could interpret these errors as the children's attempt to create a morphologically complex item by using their knowledge of affixes. In addition, also as identified in the JHL data, some ELMs provided other members of the same word family, such as 'lived (for life)' (15), 'write (in response to 'writer')' (11), 'similarity (for dissimilar)' (10), 'separated (for separately)' (10), 'necessarily', (8) 'unnecessary (both for necessity) (5), 'appearance (for disappear)' (3), 'responsive (for respond)' (2); and 'effected (for effective) (8) (see Appendix 10 for more examples). Although these forms do not accurately reflect the semantic and syntactic relationship between the two items in the prompt pair, the ELM group still produced forms which were morphologically related to the preceding item, thus demonstrating some knowledge of a word family. Consistent with the other two groups, there was also a tendency, although not as salient as the other patterns described thus far, where some of the ELMs were influenced by the surface features of the prompt pair when producing the target item, as in 'highness (for height)', 'unsimilar (for dissimilar)', and 'largen (for enlarge).

Appendix 22: Error analysis of Japanese morphological tasks (Chapter 5)

Japanese WS task

Relationship between morphological factors and response variability (ESL group)

Grades 2 and 3 categories consisted of seventeen and three items respectively. These seventeen Grade 2 items were comprised of nine transparent and eight opaque items and, in terms of scripts, seven hiragana-only and eight H+K (*hiragana* + *kanji* in combination) items. (An addition two were kanji-only items and were thus not included in the analysis.) Three Grade 3 items were classified as follows: two transparent items and one opaque item in terms of transparency; and one hiragana-only items and two H+K item in terms of scripts. Neither transparency nor scripts were significantly associated with the levels of variability within segmentations, Fisher's exact test (FET) = .41, p = 1.00 (semantic transparency × Grades 1-3) and FET = 1.9, p = 1.00 (script types × Grades 1-3). The ANCOVA results (Section 5.4.2) revealed a main effect for morpheme type, indicating that the JHL group performed better on the inflectional morphemes than the root morphemes. The performance of the other groups (ESLs and JLMs), in contrast, did not differ across morpheme types. However, this result was based on their correct segmentations and hence the more exact nature of their erroneous segmentations and any pattern underlying them relative to morpheme type have yet to be surfaced. This issue will be investigated below by describing incorrect segmentations from the Grade 2 and 3 categories.

Descriptive patterns in erroneous segmentations (ESL group)

The following two patterns were salient in erroneous segmentations by the ESL group:

a. Differentiation of a derivational adjective-forming from an inflectional suffix;

b. Lack of identification of derivational verb-forming suffixes.

The first pattern emerged was the lack of correct differentiation of the derivational adjective-forming suffix *-tai* as in '調べ + たい /shirabe + tai/' from the adjectival inflectional suffix *-i* immediately following the stem ending *-ta*, as in '冷た+い /tsumeta + i/'. To take, for example, '冷 + たい /tsume + tai/ (for 冷た + い /tsumeta + i "cold")' (5 ESLs) and '調べた + い /shirabeta + i/' (for 調べ + たい /shirabe + tai/ "want to investigate") (3 ESLs). These children were able to judge the *-tai* and *-i* as the ending unit of each item in both items but the other way around (*-tai* segmented where it should have been *-i* to be segmented and *vice versa*). What was also evident within these erroneous differentiations was the children's ability to identify bona fide morphemes in the target item. For example, '調べた' in '調べた + い /shirabeta + i/' can stand as a word by itself meaning 'investigated (past tense)', and is thus semantically related with the entire form '調べたい'. It could be, therefore, the syntactic aspect of the affix *-tai* (an adjective-forming derivational suffix ('want to')) that the children did not fully link with the meaning of the target item.

An identification of verb-forming derivational suffixes such as *-garu* and *-meku* also caused some difficulty, as in 'きらめ+ く /kirame + ku/' (for 'きら＋めく/kira + meku/ "to shine"') (8 ESLs), '寒が + る /samu + garu/' (for '寒 + がる /samu + garu/ "to feel cold"') (5 ESLs) and 'うらやましが + る /urayamashiga + ru/' for ('うらやまし＋がる/urayamashi + garu/ "to envy"') (2 ESLs). Two observations can be made, based on these errors. One is that the suffix *-garu* as in both '寒+がる/samu+garu/' and 'うらやまし＋がる /urayamashi+garu/' was not identified to the same extent, with the *-garu* in 'うらやまし＋がる' identified more correctly (10 out of 13 ESLs) than the *-garu* in '寒+がる' (8 ESLs). Another is that more than half of the ESLs segmented the *-ku* in /kira + meku/ on its own as an inflectional verbal suffix, instead of it being part of the derivational suffix *-meku*. In this respect, the ESL children' limited identification of derivational affixes, including *-meku*, *-garu* and *-tai* could be related to their stronger familiarity with inflectional suffixes (e.g., *-(k)u/ru* and *-i*), which may have impeded their recognition of these affixes (e.g., *-garu*, *-meku* and *-tai*) as one unit.

One of the concerns for the Japanese WS tasks was that the children might conduct morphological analysis simply by relying on the graphical difference between *kanji* and *kana* writing (Shibatani, 1990) (Section 2.10.3). There were errors of this type but the proportions of these were very small (see Appendix 13) and morphological segmentation was predominant throughout the task.

Relationship between morphological factors and response variability (JHL group)

Eighteen and seven items fell under the categories of Grade 2 and 3 respectively. These items were further classified as follows: ten semantically transparent and eight opaque items in the Grade 2 category; and four semantically transparent and three opaque items in the Grade 3 category. When cross tabulation was performed, an association between the type of scripts (two levels: hiragana-only and H+K items) and the degree of variability (two levels: Grades 2 and 3) was significant at the approaching significance level, FET, $p = .06$, with a medium effect size, $\varphi = .41$. As shown in Table A22, hiragana-only items represented the highest degree of variability (Grade 3) more than the medium degree of variability (Grade 2), thus suggesting special difficulty with the segmentation of *hiragana* items for the JHL group. The odds of the items in the Grade 3 category being hiragana-only were much greater than those in the Grade 2 category were ($\frac{6/1}{7/10} = 8.57$).

Table A22. *Relationship between variability and scrip types*

Variability	Hiragana	H+K
Medium (Grade 2)	7	9
High (Grade 3)	6	1

Note. One kanji-only item in the Grade 2 category is not included in the analysis.

Descriptive patterns in erroneous segmentations (JHL group)

In order to further investigate the special difficulty which the hiragana-only items might have caused for the JHL group, their Grade 3 segmentations are analysed descriptively. Identification of a non-morphological unit through segmentation was a salient pattern underlying the segmentations for hiragana-only items. For instance, the following segmentations could be interpreted as these children's attempt to segment a morpheme, the meaning of which they were familiar with but was unrelated to the target item (the number of JHLs given in brackets):

a. 'めず+らしい /mezu + rashii/' (3), 'め + ずらしい /me + zurashii/ "unique"' (1) (both for 'めずらし＋い /mezurashi + i/');
b. 'ごほう + び /gohou + bi/' (9) (for 'ご + ほうび /go + houbi/ "treats"'), and 'うら + やましがる /ura + yamashigaru/ "to envy"' (1) (for 'うらやまし＋がる /urayamashi + garu/').

To take the 'めず+らしい /mezu + rashii/' , 'め+ずらしい /me + zurashii/' for example, the children treated 'らしい' as one unit, which could serve as an ending for a speculative auxiliary verb in a different context, whereas the 'め' alone can stand as a word on its own meaning '(an) eye(s)' or ' (a) bud(s) (of plants)'. In addition, as also observed in the ESL group, inclination towards extracting inflectional verbal suffixes was captured in the following instances: 'きらめ＋く /kirame + ku/' (for 'きら＋めく/kira + meku/) (8 out of 17 JHLs); 'うらやましが＋る /urayamahsiga + ru/' (3 JHLs) (for 'うらやまし＋がる' /urayamashi + garu/); 'すは＋だ /suha + da/' (8 JHLs) (for 'す＋はだ' /su + hada/). These identified suffixes -*ku*, -*ru* and -*da* are all inflectional verbal suffixes, which are more regular and less numerous than derivational affixes, as in English. Thus, the increasing instances of non-morphological segmentations were characterised by the JHL children's attempt to extract familiar units irrespective of their semantic relationship with the target item.

Relationship between morphological factors and response variability (JLM group)

The Grade 2 category consisted of foruteen items which were further classified into eight transparent and six opaque items on the one hand and five hiragana-only and seven H+K items (and two kanji-only items). Four items in the Grade 3 category were classified into the following: three transparent and one opaque items; and two hiragana-only and two H+K items. Consistent with the ESL results, no significant associations were found between transparency/script type and the levels of variability in the segmentations, FET = 1.45, p = 1.00 (transparency × Grades 1-3) and FET = 1.62, p = 1.00 (script type × Grades 1-3).

Descriptive patterns in erroneous segmentations (JLM group)

When the JLM group's erroneous segmentations were analysed descriptively, the following tendency was identified, overlapping with one of them tendencies for the ESL group: Differentiation of a derivational adjective-forming suffix from the inflectional suffix.

The JLM group tended not to recognise the derivational adjective-forming suffix -*tai* as such, as follows (the number of JLMs given in brackets): '調べた + い /shirabeta + i/' (4), '調 + べたい /shira+betai/' (2) (for '調べ + たい /shirabe + tai/') and '泳ぎた + い /oyogi+ i/' (2), and '泳 + ぎたい /oyo+ gii/' (5) (for '泳ぎ + たい/oyogi + tai'). Both words bear a semantically transparent relationship between the root '調べ "an investigation"' / '泳ぎ "a swim"' and their respective entire forms '調べたい "wan to investigate"'/ '泳ぎたい "want to swim"', which perhaps did not necessarily help these JLMs to identify the target suffixes. Another example of this sort is '冷たい /tsumetai/'. Five JLMs treated -*tai* as the ending and *tsume*- as the root. Segmenting this item was perhaps particularly difficult since the inflectional adjectival suffix -*i* (い) and the target derivational suffix -*tai* (たい) were both graphically present in the word 冷たい'. This potentially enhanced difficulty might have resulted in these children relying on the graphical difference and treating the *kanji* included (e.g., '冷') as the main part and the rest as the affix(es).

Another point of note is the JLM children's recognition of the inflectional suffix -*i* was not entirely consistent across items. To take the Grade 3 item 'めずらしい /mezurashii/' for example, less than half (6 out of 13) of the JLMs segmented the -*i* on its own with the rest treating -*shii* (an inflectional ending for compound adjectives, as in 'itaita-shii' (looking painful), and -*rashii* (an inflectional ending for a speculative auxiliary verb) as one unit. Although this is just one example, considering that it triggered a wide variety of segmentations, one could assume that the lack of success in identifying morphemes triggered the children to attempt to identify alternative smaller units that they were familiar with, independently of their semantic relationships with the target item.

Japanese WA task

Descriptive patterns in erroneous responses (ESL group)

Ten and three items belonged to the Grade 2 and 3 categories respectively, each consisting of four hiragana-only and four H+K items (and two kanji-only item) in the Grade 2 category; and three kanji-only items in the Grade 3 category. No significant relationships were identified between script types and the level of variability within responses, Fisher's exact test (FET), p = .67.

As a next step, individual responses were examined descriptively, with the linguistic properties of morphemes (inflections and derivations) taken into account. All three Grade 3 items involved producing an item with an appropriate derivational prefix attached, as in 'ma-kka (bright red)', 'mu-imi (meaningless)', 'fu-jyūbun (insufficient)'. Typical responses included (the number of ESLs given in brackets) 'aka-i (for 'ma-kka')' (2) and 'fu-imi (for 'mu-imi')' (1) and 'mu-jyūbun (for 'fu-jyūbun)' (3). These responses could be interpreted as the children's attempt to produce an inflectional/derivational item, in relation to the meaning of the target item, as in 'aka-i (red)' for 'ma-kka (bright red)'. In addition, the production of 'fu-imi' and 'mu-jyūbun' suggests that the children used the surface feature of the preceding item which included the prefix '-mu' and '-fu' therein.

Descriptive patterns in erroneous responses (JHL group)

No relationships were identified from the following classifications between the morphological factor and levels of response variability: four hiragana-only and six H+K items in the Grade 2 category; and one hiragana-only and one H+K items (and three kanji-only items) in the Grade 3 category, FET = 3.44, p = 1.00.

When examining the JHL group's Grade 2 responses more closely in relation to the ANCOVA result (which highlighted the lower performance on the derivational morphemes than inflectional ones), the derivational items accompanied by the large number of errors were 'ma-nnaka (right in the middle)' and 'ko-goe (small voice, whispering)'. The former exhibited non-naturally occurring items given as answers (the number of JHLs provided in brackets), such as 'nakaka'(1) 'manakata'(1) 'mayonakakatta'(1), as well as blank answers. The latter was accompanied by responses including 'kokoe' (2) 'koeshi' (1) and blank answers (4). One common feature in these items is that the derivational process for each item involves phonological shift with the prefix (*-ma* → *-man*) and also the root (*-koe* → *-goe*), as opposed to the phonologically transparent relationship between items in the prompt pair.

Descriptive patterns in eroneous responses (JLM group)

Consistent with the other groups, no clear patterns emerged when script effects were considered, FET = 1.09, p = 1.00. The Grade 2 category included six hiragana-only and three H+K items (and two kanji-only items), whereas the Grade 3 category included one hiragana-only item (and two kanji-only items).

With respect to the linguistic aspects of morphemes, as observed in the other groups, producing an item with a derivational prefix of Chinese origin attached, such as 'mu-imi' and 'fu-jyūbun', triggered higher degrees of variability, as represented in the Grade 3 category. A common pattern in their erroneous responses was the use of the same prefix as in the prompt pair in producing the target item, such as 'fu-imi' (for 'mu-imi') (3 JLMs) and 'mu- jyūbun'

(2 JLMs) (for ‘fu-jyūbun’), together with blank answers for ‘mu-imi’ (3 JLMs) and ‘fu-jyūbun’ (7 JLMs) respectively.

Appendix 23: Decomposition of effects from regression models (Chapter 6)

Table A23-a. *Decomposition of effects from multiple regression predicting morphological production in English (Section 6.1.4)*

	ESLs (n = 24)				JHLs (n = 21)				ELM (n = 25)			
	b	β	*t*	R^2	*b*	β	*t*	R^2	*b*	β	*t*	R^2
				.56				.86				.37
1. Age	.59	.18	1.78		.59	.22	1.78		1.21	.35	2.20*	
2. IQ	.09	.08	.80		.75	.51	4.92***		.09	.10	.80	
3. EV	1.46	.54	3.93***		1.46	.36	3.93***		1.46	.37	3.93***	

Note. SE: .33 (Age); .12 (IQ); .37 (EV) for ESL group; .33 (Age); .15 (IQ); .37 (EV) for the JHLs; SE: .55 (Age); .12 (IQ); .37 (EV) for ELM group. b = unstandardized coefficients; β = standardised coefficients
**p* < .05, ***p* < .01, ****p* < .001, † .05 ≤ *p* ≤ .07

Table A23-b. *Decomposition of effects from multiple regression predicting morpheme production in Japanese*

	ESLs (n = 24)				JHLs (n = 21)				JLM (n = 27)			
	b	β	*t*	R^2	b	β	*t*	R^2	b	β	*t*	R^2
Model 1				.81				.58				.64
Age	.34	.13	1.17		-.18	-.08	-.42		1.24	.31	2.48*	
IQ	.31	.34	3.65***		.18	.15	.78		.31	.32	3.65***	
JV	.3	.70	9.11***		.3	.72	9.11***		.3	.41	9.11***	

SE: Age: .29 (ESLs); .43 (JHLs); .50 (JLMs), IQ: .09 (ESLs & JLMs); .23 (JHLs); JV: .03 (all groups)
Note. JV: Japanese Vocabulary; b = unstandardized coefficients; β = standardised coefficients
**p* < .05, ***p* < .01, ****p* < .001, † .05 ≤ *p* ≤ .07

Appendix 24: The ethical approval letter and CUREC form 1

SOCIAL SCIENCES & HUMANITIES
INTER-DIVISIONAL RESEARCH ETHICS COMMITTEE

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Co-ordinator of the IDREC
Social Sciences Divisional Office

UNIVERSITY OF OXFORD

Ref. SSD/CUREC1/3/IDREC

17 August 2009

Yuko Hayashi
Worcester College

Dear Yuko Hayashi,

Application for research ethics approval

Ref No.: SSD/CUREC1/09 – 189

Title: Japanese and English lexical development among Japanese school children: Exploring L1 and L2 morphological awareness and vocabulary size in different response modalities.

The above application has been considered on behalf of the Social Sciences and Humanities Inter-divisional Research Ethics Committee (IDREC) in accordance with the procedures laid down by the University for ethical approval of all research involving human participants.

I am pleased to inform you that, on the basis of the information provided to the IDREC, the proposed research has been judged as meeting appropriate ethical standards, and accordingly approval has been granted.

Should there be any subsequent changes to the project, which raise ethical issues not covered in the original application, you should submit details to the IDREC for consideration.

Yours sincerely,

Chris. Ballinger

Dr Chris. Ballinger

cc: Dr. Victoria Murphy, Department of Education, 15 Norham Gardens
Lisa Currie, Department of Education, 15 Norham Gardens

CAJB/CAJB

University of Oxford
CENTRAL UNIVERSITY RESEARCH ETHICS COMMITTEE (CUREC)
IDREC checklist

***Principal investigator/supervisor/student researcher:**	Yuko Hayashi
FOR STUDENT RESEARCH PROJECTS ONLY ***Name of Supervisor:***	Dr Victoria Murphy
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FAQ 12

Before completing this checklist, please ensure you have consulted the following CUREC guidance documents available on the CUREC website at http://www.admin.ox.ac.uk/curec/resrchapp/index.shtml:

Guidance on approval process
Glossary
FAQs

This checklist is the first stage of the University of Oxford's scrutiny procedure for *research involving *human participants. (Definitions of terms marked with an asterisk are to be found in CUREC's glossary and guidance).

The University aims to ensure that all research is subject to *appropriate* ethical scrutiny. This form is designed to identify those projects which fall outside CUREC's remit; those which fall within CUREC's remit but which pose low risks to participants and so need scrutiny only through this checklist; and those which fall within CUREC's remit and which pose greater risk to participants and so need more scrutiny. If you need further advice or if you have comments about this form, please consult the relevant IDREC officer (please see: http://www.admin.ox.ac.uk/curec/oxonly/contact.shtml).

FAQ 26

The checklist should be completed by the *principal investigator/supervisor/student researcher (under the guidance of his/her supervisor) undertaking or supervising research which comes under CUREC's responsibility. Please carry out a risk assessment of the project, in consultation with all researchers involved, using the checklist and CUREC's other documentation.

This form does not cover research governance, satisfactory methodology, or the health and safety of employees and students. As principal investigator, it is your responsibility to ensure that requirements in these areas are met.

Office use only:

IDREC Ref. No. ___________________   **Date of confirmation that checklist accepted on behalf of IDREC: // //**

Section A

Title and brief lay description of *research (about 150 words), plus description (about 200 words) of the nature of participants (including the criteria for inclusion/exclusion, method of recruitment, attaching samples of participant information and consent forms), purpose of the research, methods to be used, and use to which the results/data will be put.

Japanese and English lexical development among Japanese school children: Exploring L1 and L2 morphological awareness and vocabulary size in different response modalities

Description of Study: This research investigates two subcomponents of vocabulary knowledge: vocabulary size (VS) (i.e., *breadth* of vocabulary knowledge) and morphological awareness (MA) (i.e., *depth*). In child first (L1) and second language (L2) acquisition research respectively, increased MA (i.e., awareness of the intra-structure of words, e.g., *kind* → *unkind*) has been argued to be associated with an increase in VS, both of which are crucial for success in school (e.g., Anglin, 1993; McBride-Chang, Cheung, Chow, Chow & Choi, 2006). Child L2 learners in this study will be tested both in their L1 and L2 to allow for the examination of potential language transfer of vocabulary knowledge and its direction (i.e., from L1 to L2 and/or from L2 to L1). This approach will contribute to enhancing our understanding of the influence of early L2 learning on continued L1 development as well as L2 development. An additional variable to be examined is response modality effects, which concerns whether children's vocabulary knowledge will be manifested differently across two modality conditions (i.e., oral versus written response to test stimuli). Incorporating modality effects, together with the other variables as outlined above, allows us to obtain a more complete picture of developing L1 and L2 lexicons.

Participants, Methodology and Findings: Participants will be Japanese children and their L1-English monolingual peers in Year 3 and Year 6 classrooms in England and their L1-Japanese monolingual peers in Japan. Initially, contact will be made with the head teachers of Japanese complementrary schools in England (e.g., Derby, London, Manchester, and Telford) and those of state schools in England and Japan respectively. Participation in this study will be on an opt-in basis and signed letters of consent will be obtained from parents/guardians of the children via the schools prior to the research (the consent form as well information sheets will be written in Japanese for Japanese parents) (see attached sample information sheets and consent form in English). The researcher's contact details will be given so that she will be available to discuss the research with teachers/parents in school and by e-mail and telephone. Children will give oral consent to the researcher at the beginning of each session and their oral consent will be noted on top of their response sheets. Children will be informed that they will be free to withdraw at from the study at any stage. In addition, if a child is clearly uncooperative or unhappy towards the researcher in any assessment, then testing will be discontinued. Further if a child should become unwell or distressed during a session, then the session will be discontinued and the event will be reported to the child's classroom teacher. Research will be carried out over up to one individual session for a nonverbal task and two individual sessions in each language and thus L1 children will attend 3 sessions, whereas L2 children will attend 5 sessions.

The tasks consist of theree standardised educational tests (British Picture Vocabulary Scale, Test of Word knowledge, Test of Japanese Language Abilities) and four morphological tests (two per language: English and Japanese). Two English morphological tasks have been modelled on the experimental tasks that have been used for research purposes, whereas Japanese morphological tasks are being developed by the researcher, which will be piloted prior to data collection (see attached examples of these morphological tasks). The maximum time for adminstering the nonverbal task will be 30-35 minutes (the first session) and 15 minutes for each of the subsequent sessions where vocabulary/morphology tasks will be administered. At the beginning of the first session, the researcher will ask L2 children qustions regarding their (linguistic) background information (sample interview questions are attached). The researcher will ensure that she receives full training in adminstering all tasks and that best practice is employed at all times when working with the children in accordance with the BPS ethical guidelines **(MSD/IDREC/2005/P2.1.2)**. It will also be ensured that the researcher will receive a CRB clearance prior to data collection, and that she is sensitive to Child Protection issues, and avoids working in situations that could leave them exposed to accusations of abuse. Data protection policies will be strictly adhered to, and each child will be given a code number which will be used to label all data from the study. The linking codes for personal details will be kept in a locked filing cabinet. The findings of the study will be used for research purposes to provide information on the nature of developing L1 and L2 vocabulary knowledge and their relationship with one another. In addition, these findings will be made available to the teacher and parents if requested. This research is also capable of offering insight into when it would be best to begin L2 learning, with reference to the findings that illuminate the influence of early L2 learning on the development of L1 as well as L2 vocabulary.

List all *sites where project will be conducted:	Primary schools, Japanese complemntray schools in England and primary schools in Japan
Anticipated duration of project:	**__7-10__** months
Anticipated start date:	1 /11 /2009
Anticipated end date:	1 /09 /2010
Name and status (e.g. 3rd year undergraduate; post-doctoral research assistant) of others taking part in the project:	

Section B

(Please put a tick in the yes/no column as appropriate to indicate your response).

	YES	NO
1). Does your study primarily aim to monitor and/or improve the performance of a particular service provider?		✓
2) Will your conclusions be applicable wholly or primarily to that service provider?		✓
3) Are you conducting your study on behalf of or at the request of a service provider?		✓

If you have answered ‘yes’ to any question in section B it is likely that your study is *audit, not *research. Please check CUREC glossary and if your study is audit you need not submit your proposal for ethical scrutiny. If you have answered ‘no’ to all questions please proceed to section C.

Section C
(Please put a tick in the yes/no column as appropriate to indicate your response).

Question	YES	NO
1) Will the research involve *human participants recruited by means of their status as present or past NHS *patients or their relatives or carers or present or past NHS staff?		✓
2) Will the research involve *personal data of any of the people listed in question C 1 above ?		✓
3) Will the research in whole or part be carried out on NHS premises or using NHS facilities?		✓
4) Does the research involve administering any drug, placebo, or other substances to participants in the European Union (EU)?		✓
5) Does the research involve ionising radiation in the EU?		✓
6) Does the research involve human genetic research in the EU?		✓
7) Does the research involve magnetic resonance imaging in the EU?		✓
8) Does the research involve use of organs or other bodily material of past and present NHS patients?		✓
9) Does the research involve any other *invasive procedure (Class A) not described above?		✓
10) Does the research involve *human participants aged 16 and over who do not have *capacity to consent for themselves? ***[Please note that the definition of *capacity has been altered by the Mental Capacity Act 2005; see the*** Glossary ***on the CUREC website for further information]***		✓

If you have answered 'yes' to any question in section C please stop work on this checklist as you will need to submit your proposal to the appropriate NHS ethics committee. Further details may be obtained from the websitehttp://www.nres.npsa.nhs.uk. Please submit the NHS Ethics Committee approval to the relevant IDREC officer for information when received.
If your research involves any of the above procedures but will be carried out by University of Oxford staff wholly outside the EU your research will be scrutinised by OXTREC (http://www.tropicalmedicine.ox.ac.uk/oxtrecframeset.htm). **If you have answered 'no' to all questions so far, please proceed to section D.**

Section D

(Please put a tick in the yes/no column as appropriate to indicate your response).

	YES	NO
1) Is the study to be funded by the US National Institutes of Health or another US federal funding agency?		✓

If you have answered 'yes' to the question in section D please stop work on this checklist as you will need to submit your proposal to OXTREC which uses separate documentation (http://www.tropicalmedicine.ox.ac.uk/oxtrecframeset.htm)**.**
If you have answered 'no' to all questions so far, please proceed to section E.

Section E

(Please put a tick in the yes/no column as appropriate to indicate your response).

	YES	NO
1) Are all the data about people to be used in your study previously collected anonymised data which neither you nor anyone else involved in your study can trace back to the individuals who provided them (e.g. census data, administrative data, secondary analysis)? Please refer to the definition of *personal data in the glossary and FAQ no. 6 for further guidance.		✓

FAQ 6

If you have answered 'yes' to the question in section E please stop work on this checklist as you do not need to secure ethical approval for your study. There is no need to submit any details to IDREC as such research does not constitute research involving human participants for review purposes.
If you have answered 'no' to all questions so far, please proceed to section F.

Section F

Methods to be used in the study (**tick** as many as apply: this information will help the committee understand the nature of your research and may be used for audit).

METHOD USED	PLEASE TICK
Unstructured interview	
Semi-structured interview	
Structured interview	✓
Questionnaire	
Analysis of existing records	
Participant performs verbal/paper and pencil/computer based task	✓
Measurement/recording of motor behaviour	
Audio recording of participant	

Video recording or phtotography of participant	
Physiological recording from participant	
Participant observation	
Systematic observation	
Observation of specific organisational practices	
Other (please specify)	

Section G

(Please put a tick in the yes/no column as appropriate to indicate your response).

1). Have you made arrangements to obtain written *informed consent from participants?	**YES**	**NO**
	✓	
2) Have you made arrangements to ensure that *personal data collected from participants will be held in compliance with the requirements of the Data Protection Act?	**YES**	**NO**
	✓	
3) If your research involves any use of *personal data obtained from a *third party, have you checked to ensure that the *third party has arrangements in place to permit disclosure?	**YES**	**NO**
	✓	
4) Does the research involve as participants *people whose ability to give free and informed consent is in question?	**YES**	**NO**
	✓	
5) Does the research involve any alteration of participants' normal patterns of sleeping, eating, or drinking?	**YES**	**NO**
		✓
6) Is there a significant risk that the research will expose participants to visual, auditory, or other environmental stimuli of a level or type that could have short- or long-term harmful physical effects?	**YES**	**NO**
		✓
7) Is there a significant risk that that the research will induce anxiety, stress or other harmful psychological states in participants that might persist beyond the duration of the test/interview?	**YES**	**NO**
		✓

	YES	NO
8) Does the research involve exposing participants to any physical or psychological hazard, beyond those of their usual everyday life, not covered by questions 9 and10?		✓
9) Does the research involve any *invasive procedure (Class B)?		✓
10) Will the research elicit information from participants that might render them liable to criminal proceedings (e.g. information on drug abuse or child abuse)?		✓
11) Does the research involve the *deception of participants?		✓
12) Will the research require a participant to spend more than 2 hours in any single session on activities designed by the researcher (NB this time restriction does not refer to situations where participants are observed going about activities not devised by the researchers e.g. observation of lessons in schools)?		✓
13) Will the research involve a significant risk of any harm of any kind to any participant not covered above?		✓
14) Do you intend to follow any professional/CUREC guidelines (please provide details) The British Psychological Society guidelines on ethics of research on human participants	✓	

If any of your answers in section G are in a shaded box, please complete section H. If all your answers in section G are in the unshaded boxes, please complete section I.

Section H

One or more aspect(s) of your research project suggest(s) that it may pose risks to participants (see shaded box(es) ticked in section G).

FAQs 19-22

Are all the aspects of your project which caused you to tick a shaded box in section F fully covered by research protocol(s) which has/ve received IDREC/CUREC approval?	**YES**	~~**NO**~~
	Please give IDREC protocol number (s). **MSD/IDREC/2005/P2.1.2** Please proceed to section I.	Please complete this form AND form CUREC/2 and submit both to the relevant Inter Divisional Research Ethics Committee.

FAQ 26

If you answered NO to question 1) in Section G concerning informed consent but a section of the Code of Practice governing your research activity is relevant, are you going to apply the standard set out in the Code of Practice?	Name of Code of Practice and section number: Please proceed to section I.	Please complete this form AND form CUREC/2 and submit both to the relevant Inter Divisional Research Ethics Committee.

Section I

FAQs 19&26

Complete this section only if you do not need to submit form CUREC/2.

I understand my responsibilities as principal researcher/supervisor/student researcher as outlined on p.1 of this form and in the CUREC glossary and guidance.
I declare that the answers above accurately describe my research as presently designed and that I will submit a new checklist should the design of my research change in a way which would alter any of the above responses so as to require completion of CUREC 2/full scrutiny by an IDREC. I will inform the relevant IDREC if I cease to be the principal researcher on this project and supply the name and contact details of my successor if appropriate.

FAQs 28&32

Signed by principal researcher/supervisor/student researcher:…………………… ………………
Date:…………………
Print name (block capitals)…YUKO HAYASHI……………………………………………………

Signed by supervisor:……………………………………………………………(for student projects)
Date:…………………
Print name (block capitals)………………………………………………………………………………

I understand the questions and answers that have been entered above describing the research, and I will ensure that my practice in this research complies with these answers.

Signed by associate/other researcher: …………………………………………………………….
Print name (block capitals)………………………………………………………………………………
Date ………………

I have read the research project application named above. On the basis of the information available to me, I:
(i) consider the principal researcher/supervisor/student researcher to be aware of her/his ethical responsibilities in regard to this research;
(ii) consider that any ethical issues raised have been satisfactorily resolved or are covered by CUREC approved protocols, and that it is appropriate for the research to proceed without further formal ethical scrutiny at this stage (noting the principal researcher's obligation to report should the design of the research change in a way which would alter any of the above responses);
(iii) am satisfied that the proposed project has been/will be subject to appropriate *peer review and is likely to contribute something useful to existing knowledge and/or to the education and training of the researcher(s) and that it is in the *public interest.
(iv) [FOR DEPARTMENTS/FACULTIES WITH A DEPARTMENTAL RESEARCH ETHICS

COMMITTEE (DREC) OR EQUIVALENT BODY - PLEASE DELETE IF NOT APPLICABLE] confirm that this checklist (and associated research outline) has been reviewed by the Department's Research Ethics Committee (DREC)/equivalent body, and attach the associated report from that body.

Signed:…………………………………………..**(Head of department or nominee e.g Chair of DREC, Director of Graduate Studies for student projects)**
Print name (block capitals)………………………………………………………………………………
Date:……………………

Please send an electronic copy and a signed paper copy of this completed checklist to whichever of the IDRECs is more suitable (Social Sciences or Medical Sciences) keeping a copy for yourself. IDRECs and/or CUREC will review a sample of completed checklists and may ask for further details of any project.
Revised July 2008